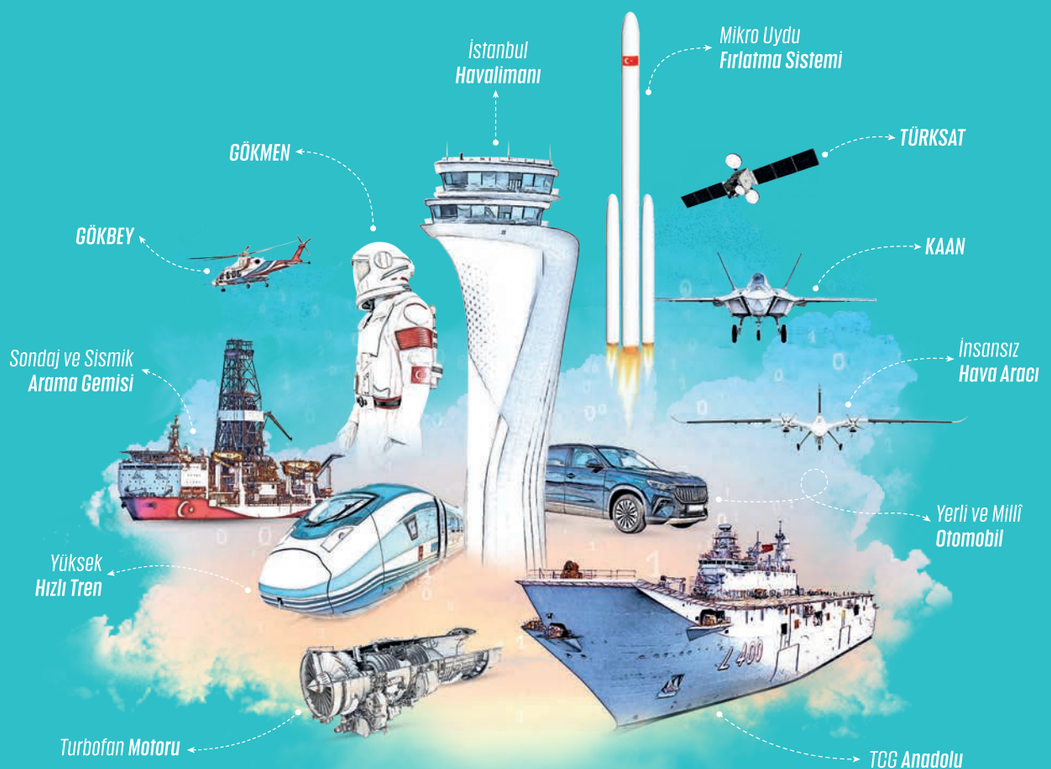
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Teknoloji Yolculuğumuz



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Vocational Foreign Language The Field of Aircraft Maintenance 11 Course Material

VOCATIONAL AND TECHNICAL
ANATOLIAN HIGH SCHOOL

THE FIELD OF AIRCRAFT MAINTENANCE

VOCATIONAL FOREIGN LANGUAGE
(THE FIELD OF AIRCRAFT MAINTENANCE)



11 COURSE MATERIAL

VOCATIONAL AND TECHNICAL ANATOLIAN HIGH SCHOOL
THE FIELD OF AIRCRAFT MAINTENANCE

VOCATIONAL FOREIGN LANGUAGE

(THE FIELD OF AIRCRAFT MAINTENANCE)

COURSE MATERIAL
11

Authors
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Oylum VATANSEVER

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İSTİKLÂL MARŞI

Korkma, sönmez bu şafaklarda yüzen al sancak;
Sönmeden yurdumun üstünde tüten en son ocak.
O benim milletimin yıldızıdır, parlayacak;
O benimdir, o benim milletimindir ancak.

Çatma, kurban olayım, çehreni ey nazlı hilâl!
Kahraman ırkıma bir gül! Ne bu şiddet, bu celâl?
Sana olmaz dökülen kanlarımız sonra helâl.
Hakkıdır Hakk'a tapan milletimin istiklâl.

Ben ezelden beridir hür yaşadım, hür yaşarım.
Hangi çılgın bana zincir vuracakmış? Şaşarım!
Kükremiş sel gibiyim, bendimi çiğner, aşarım.
Yırtarım dağları, enginlere sığmam, taşarım.

Garbın âfâkını sarmışsa çelik zırhlı duvar,
Benim iman dolu göğsüm gibi serhaddim var.
Ulusun, korkma! Nasıl böyle bir imanı boğar,
Medeniyyet dediğin tek dişi kalmış canavar?

Arkadaş, yurduma alçakları uğratma sakın;
Siper et gövdeni, dursun bu hayâsızca akın.
Doğacaktır sana va'dettiği günler Hakk'ın;
Kim bilir, belki yarın, belki yarından da yakın.

Bastığın yerleri toprak diyerek geçme, tanı:
Düşün altındaki binlerce kefensiz yatanı.
Sen şehit oğlusun, incitme, yazıktır, atanı:
Verme, dünyaları alsan da bu cennet vatanı.

Kim bu cennet vatanın uğruna olmaz ki feda?
Şüheda fışkıracak toprağı sıksan, şüheda!
Cânı, cânânı, bütün varımı alsın da Huda,
Etmesin tek vatanımdan beni dünyada cüda.

Ruhumun senden İlâhî, şudur ancak emeli:
Değmesin mabedimin göğsüne nâmahrem eli.
Bu ezanlar -ki şehadetleri dinin temeli-
Ebedî yurdumun üstünde benim inlemeli.

O zaman vecd ile bin secde eder -varsa- taşım,
Her cerîhamdan İlâhî, boşanıp kanlı yaşım,
Fışkırır ruh-ı mücerret gibi yerden na'şım;
O zaman yükselerek arşa değer belki başım.

Dalgalan sen de şafaklar gibi ey şanlı hilâl!
Olsun artık dökülen kanlarımın hepsi helâl.
Ebediyyen sana yok, ırkıma yok izmihlâl;
Hakkıdır hür yaşamış bayrağımın hürriyyet;
Hakkıdır Hakk'a tapan milletimin istiklâl!

Mehmet Âkif Ersoy

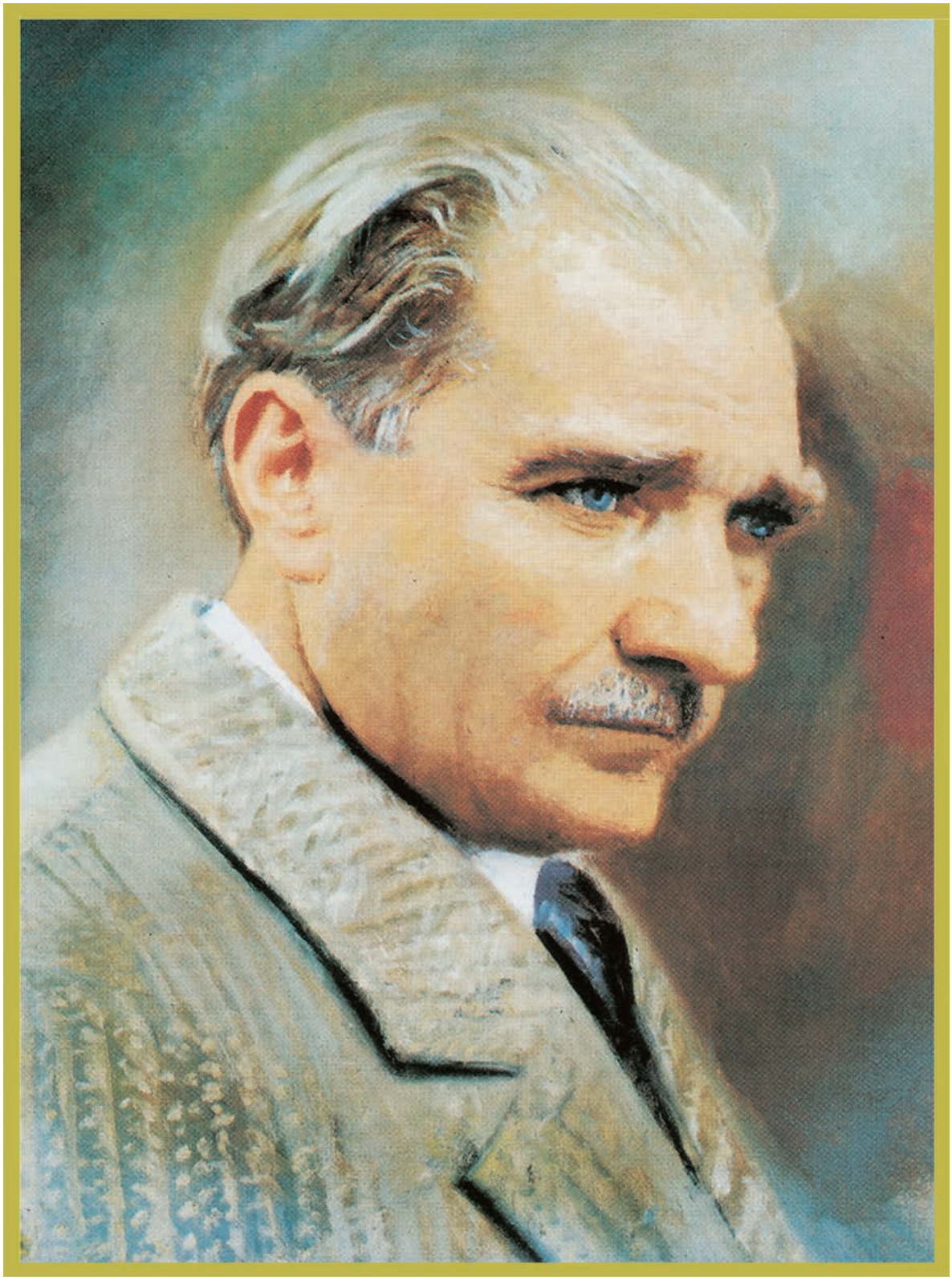
GENÇLİĞE HİTABE

Ey Türk gençliği! Birinci vazifen, Türk istiklâlini, Türk Cumhuriyetini, ilelebet muhafaza ve müdafaa etmektir.

Mevcudiyetinin ve istikbalinin yegâne temeli budur. Bu temel, senin en kıymetli hazinendir. İstikbalde dahi, seni bu hazineden mahrum etmek isteyecek dâhilî ve hâricî bedhahların olacaktır. Bir gün, istiklâl ve cumhuriyeti müdafaa mecburiyetine düşersen, vazifeye atılmak için, içinde bulunacağın vaziyetin imkân ve şeraitini düşünmeyeceksin! Bu imkân ve şerait, çok namüsait bir mahiyette tezahür edebilir. İstiklâl ve cumhuriyetine kastedecek düşmanlar, bütün dünyada emsali görülmemiş bir galibiyetin mümessili olabilirler. Cebren ve hile ile aziz vatanın bütün kaleleri zapt edilmiş, bütün tersanelerine girilmiş, bütün orduları dağıtılmış ve memleketin her köşesi bilfiil işgal edilmiş olabilir. Bütün bu şeraitten daha elîm ve daha vahim olmak üzere, memleketin dâhilinde iktidara sahip olanlar gaflet ve dalâlet ve hattâ hıyanet içinde bulunabilirler. Hattâ bu iktidar sahipleri şahsî menfaatlerini, müstevlîlerin siyasî emelleriyle tevhit edebilirler. Millet, fakr u zaruret içinde harap ve bîtap düşmüş olabilir.

Ey Türk istikbalinin evlâdı! İşte, bu ahval ve şerait içinde dahi vazifen, Türk istiklâl ve cumhuriyetini kurtarmaktır. Muhtaç olduğun kudret, damarlarındaki asil kanda mevcuttur.

Mustafa Kemal Atatürk



MUSTAFA KEMAL ATATÜRK

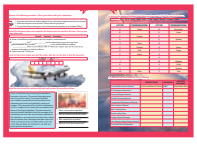
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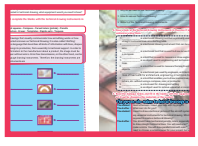
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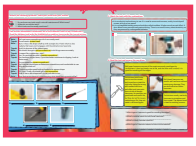
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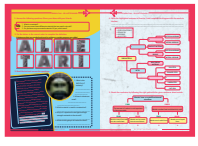


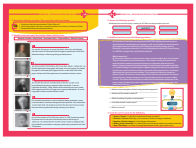
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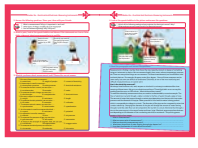


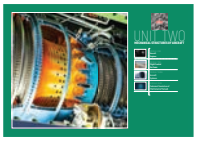
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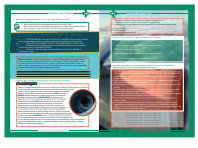


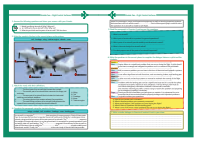
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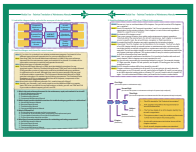
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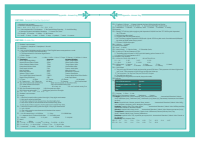
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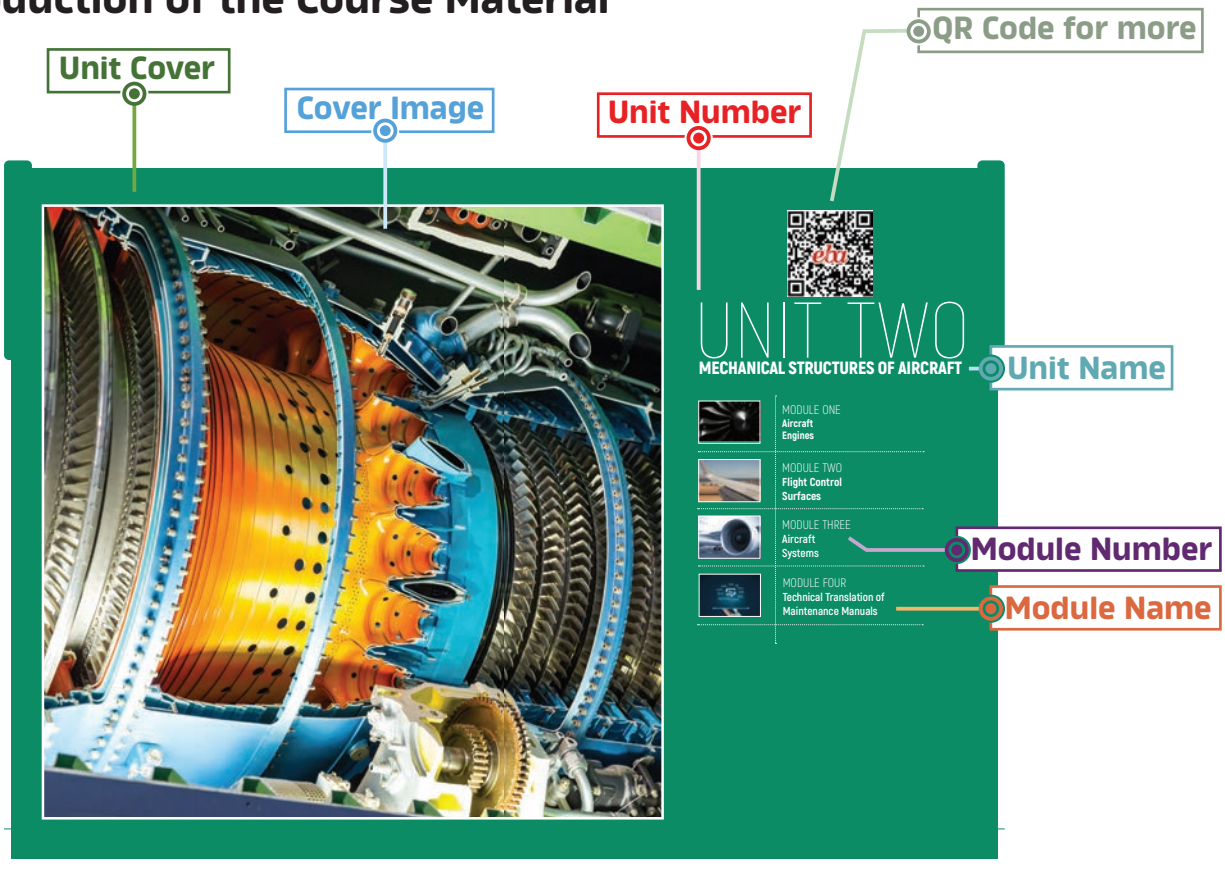
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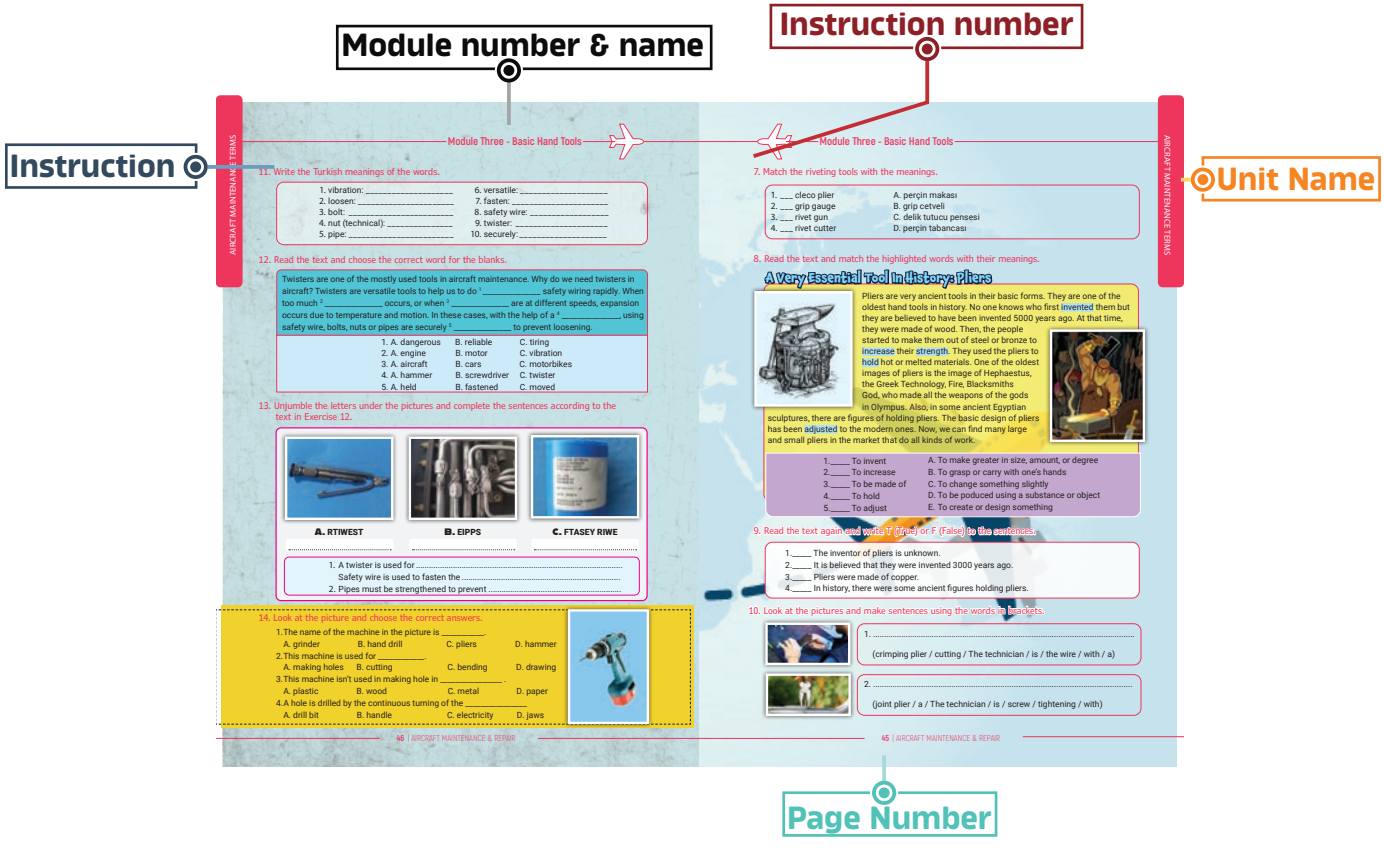


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Introduction of the Course Material





Board game



caused by a failed [10] adhesive. It is caused by mechanical action, chemical-electrochemical reaction, thermal action or cycling.
[11] **Dent:** A dent is a section of the material that has been pushed inward, with regard to its usual contour. The material's cross-sectional area remains the same, and the [12] edges of the affected area are smooth. It is caused by mechanical action.
[13] **Gouge:** It is an area of any size that has been damaged, resulting in a change in its cross-sectional area. This kind of damage is usually caused by contact with something sharp, which creates a continuous [14] groove in the material that is either sharp or smooth in shape. It is caused by mechanical action.
[15] **Mark:** A mark is damage of any size that consists primarily of visible scratches, [16] nicks, chips, burrs, or gouges. The damage must be treated as a whole area rather than as a collection of small scratches or gouges. It is caused by mechanical action.
[17] **Scratch:** A scratch is a [18] surface-level damage to a material, usually caused by a sharp object, that results in a change in the cross-sectional area. It is caused by mechanical action.

için kullanılan terimdir. Mekanik bir etki, kimyasal-elektrokimyasal reaksiyon, termal etki veya döngüden kaynaklanır.

[11] .....: Malzemenin normal konturuna göre içe doğru itilmiş bir bölümüdür. Malzemenin kesit alanı aynı kalır ve etkilenen alanın [12] ..... pürüzsüzdür. Mekanik bir etkiden kaynaklanır.
[13] .....: Kesit alanında bir değişikliğe neden olan, hasar görmüş herhangi bir boyuttaki bir alandır. Bu tür bir hasara genellikle keskin bir şeyle temas neden olur, bu da malzemede keskin veya pürüzsüz bir şekle sahip sürekli bir [14] ..... oluşturur. Buna mekanik bir etki neden olur.
[15] .....: öncelikle görünür çizikler,
[16] ....., talaşlar, çapaklar veya oyuklardan oluşan herhangi bir boyuttaki hasardır. Hasar, küçük çizikler veya oyuklar topluluğu olarak değil, bütün bir alan olarak ele alınmalıdır. Buna mekanik bir etki neden olur.
[17] ..... genellikle keskin bir nesnenin neden olduğu ve kesit alanında bir değişikliğe neden olan bir malzemeye
[18] ..... zarar verir. Buna mekanik bir etki neden olur.

Self-assessment

SELF-ASSESSMENT			
I can	☺	😐	☹
read, write and use the terms related to aircraft engines.			
translate the text related to aircraft engines.			
read, write and explain the components of aircraft engines.			
explain the working principle of aircraft engines.			
read, write and explain the terms related to flight control surfaces.			
explain how the flight control surfaces work.			
translate the terms and sentences related to flight control surfaces.			
use English terms and definitions related to aircraft systems in accordance with grammatical rules.			
read, write and explain terms related to aircraft systems in a foreign language.			
use terms related to aircraft systems in English.			
translate foreign language texts about aircraft systems.			
say the types of aircraft manuals and why they are used for.			
read, write and explain aircraft manuals.			
read, write and understand ATA Chapters.			
identify different parts of a sentence.			
translate the texts in aircraft maintenance manuals.			





UNIT ONE

AIRCRAFT MAINTENANCE TERMS



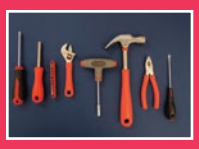
PPE
Personal Protective Equipment



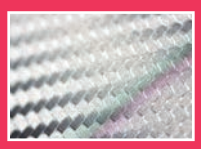
MODULE ONE
Units of Measurement



MODULE TWO
Technical Drawing



MODULE THREE
Basic Hand Tools



MODULE FOUR
Aircraft Materials



MODULE FIVE
Electrical and Electronic Terms



MODULE SIX
Electrical and Electronic Measuring Instruments

1. Answer the following questions. Share your ideas with your friends.

Talk

1. Do you think it is hard to be an aircraft maintenance technician? Why? Why not?
2. What are safety precautions for aircraft maintenance?
3. What do you think PPE stands for?

2. Circle the correct options.

P	P	E
1. Physical	1. Protective	1. Ergonomy
2. Personal	2. Protection	2. Eligibility
3. Psychological	3. Platform	3. Equipment

3. Match the pictures with the directions.

1 

2 

3 

4 

5 

6 

7 

PROTECTION

8 

A. ..... Wear your helmet to prevent head collisions.
B. ..... Wear your safety glasses to protect your face from flyaway particles.
C. ..... Wear protective boots to protect your feet from objects that can be dropped.
D. ..... Remove jewellery before getting started on maintenance work.
E. ..... Wear your dust mask not to inhale dust.
F. ..... Wear ear plugs to prevent hearing loss.
G. ..... Wear safety gloves to protect your hands from hot, cold or chemical objects.
H. ..... Wear your VIS clothes to protect your body against fire, sharp objects.

4. Write the correct title in the box for the paragraphs.

- Control the tools
- Avoid smoking
- Manage physical and mental situation
- Be careful about dressing
- Communicate with the operator

_____

1. Talk to the flight crew to avoid accidents. It is forbidden to enter the flight line without the permission of the controller.

_____

2. Keep your hair tied back and avoid loose clothes and jewelry. It is not a good idea to lean on or put your hands on an engine.

_____

3. Do not smoke around maintenance areas where chemicals and fuel are flammable.

_____

4. If the technician is not in the condition to perform the job, s/he can be in danger because of the stress or overworking, which causes a lack of concentration.

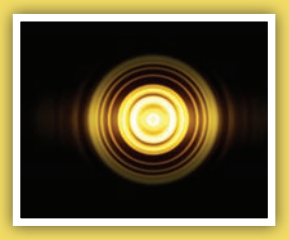
_____

5. The condition of the tools must be checked regularly. If the expected lifespan of the tools passes, they can easily get broken and lead to injury.

5. Choose the correct words that colours symbolize.



A. Caution / Danger



B. Caution / Safety



C. Safety / Bio-Hazard



D. Danger / Bio-Hazard

6. Read the sentences about the main safety precautions and fill in the blanks with the verbs.

have - wear - stop - avoid - parked - touch - access - wash

1. Make sure that all engine regions are as clear as possible to _____ damaging the engine, aircraft, or anyone in the area.
2. Check that you _____ the proper firefighting equipment on hand.
3. When you are near the running engine, you must _____ ear protection.
4. The engine fuel and oil are both toxic. If you spray oil or petrol on your skin, _____ it off.
5. Do not try to _____ the fan by hand.
6. The aircraft must be _____ in a specified and clear area for engine run-up.
7. The ignition system uses high energy, so you must let it discharge. Do not _____ the ignition system components for at least one minute after the power supply is switched off.
8. You cannot _____ the engine when it is running above minimal idle. You must not be in the entry corridor.

1. Answer the following questions. Share your ideas with your friends.

Talk

1. Have you ever been on a plane before? If yes, share your experiences with your friends.
2. What are the parts of an aircraft? Which ones do you know?
3. Do you think that screwing on a car is the same as screwing on an airplane? Why?

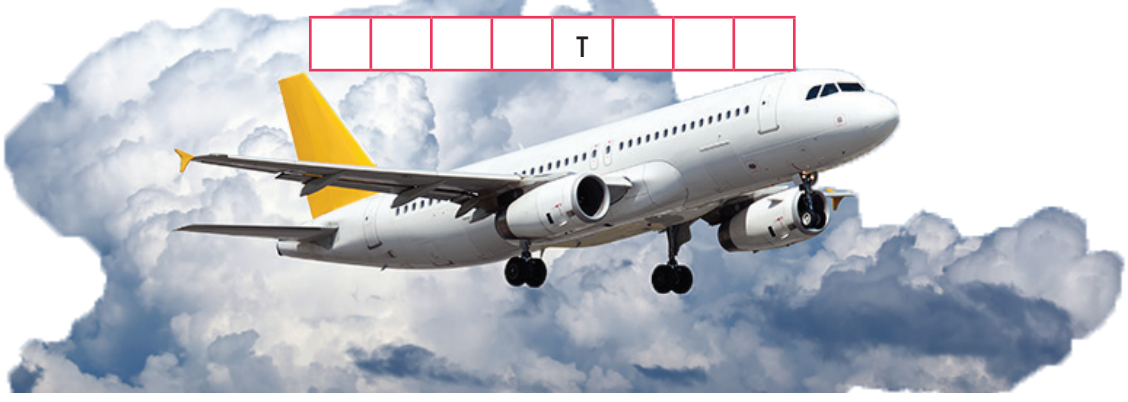
2. Read the dialogue and complete the blanks with the words in the box. One will be used more than once.

Aircraft	Airplane	Aeroplane

A: What is the difference between an aircraft, airplane, and aeroplane?
B: [1] _____ and [2] _____ are the same thing, so you can use them interchangeably. But the term [3] _____ is the preferred British spelling. [4] _____ refers to any vehicle, with or without an engine, that can fly, such as an airplane, a helicopter or a hot air balloon.
A: I got it very well. Thank you.

3. Look at the picture and put the letters into the correct box to find the keyword.

V N A I A O I



4. Read the text about the aviation alphabet and answer the questions.

A speacial language is used to communicate in the world of aviation, and it is called the Aviation Alphabet. This language arose from the need for safety. The aviation alphabet was created to prevent pilots and controllers from mishearing each other and potentially causing an accident. The International Civil Aviation Organization, or ICAO, created a list of codes that correspond to the letters of the English alphabet. The main reason for using the aviation alphabet is that the message to be transmitted over the radio can be clearly understood. This alphabet is so important for aviators that it allows them to transmit their messages and radio calls without mistakes to Air Traffic Controllers (ATC) and other traffic in the area where they are flying. For example, to say ESB, you must say Echo-Sierra-Bravo.



1. What is the aviation alphabet?
   .....
2. Why do aviators use this alphabet?
   .....
3. Who created this alphabet?
   .....
4. What do E and B correspond to?
   .....

5. Look at the Aviation Alphabet table and complete it with the codes in the box.

Kilo - Juliet - Bravo - Papa - India - Victor - Delta - Uniform - Romeo - Lima

LETTER	AVIATION ALPHABET	LETTER	AVIATION ALPHABET
A	Alpha	N	November
B		O	Oscar
C	Charlie	P	
D		Q	Quebec
E	Echo	R	
F	Foxtrot	S	Sierra
G	Golf	T	Tango
H	Hotel	U	
I		V	
J		W	Whiskey
K		X	X-Ray
L		Y	Yankee
M	Mike	Z	Zulu

6. Complete the table as in the example.

	TRANSLATION	ACRONYM	AVIATION ALPHABET
Aircraft Maintenance Manual	Hava Aracı Bakım El Kitabı	AMM	Alpha-Mike-Mike
Air Transport Association			
Structural Repair Manual			
Trouble Shooting Manual			
Component Maintenance Manual			
Fault Isolation Manual			
Main Landing Gear			
Nose Landing Gear			
Foreign Object Damage			
Full Authority Digital Engine Control			
Illustrated Parts Breakdown / Catalog			

7. Complete the missing parts in the table.

NUMBERS			
1 one	11 eleven	21 twenty-one	40 forty
2 two	12 _____	22 _____	50 fifty
3 _____	13 thirteen	23 twenty-three	60 _____
4 four	14 fourteen	24 twenty-four	___ seventy
5 five	15 _____	25 twenty-five	80 eighty
6 six	16 sixteen	26 _____	90 ninety
7 seven	17 seventeen	27 twenty-seven	___ one hundred / a hundred
8 _____	18 eighteen	28 twenty-eight	1000 one thousand / a thousand
9 nine	19 _____	29 twenty-nine	
10 ten	20 twenty	30 thirty	

8. Look at the example and write the numbers in words.

e.g. 6190 six thousand one hundred and ninety

a. 523 : .....
b. 2690 : .....
c. 312 : .....
d. 999 : .....
e. 71 : .....
f. 96 : .....
g. 125 : .....



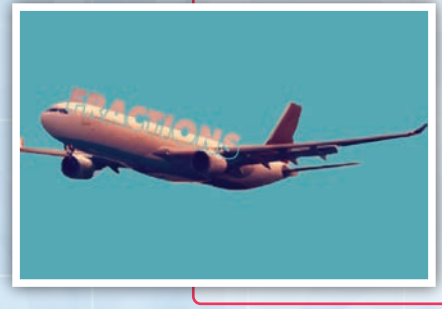
9. Look at the table and write the numbers in words in the last column.

DECIMALS/FRACTIONS	
0.5	(zero) Point five
1.2	One point two
11.86	Eleven point eight six
35.25	Thirty-five point two five
1/2	(a) half
1/4	(a) quarter
2/3	Two-thirds
5/6	Five-sixths

⋆ **To read fractions, the first part is read as a cardinal number like one, two, three etc, but the second part is usually read as an ordinal number like third(s), fourth(s), fifth(s), etc.**

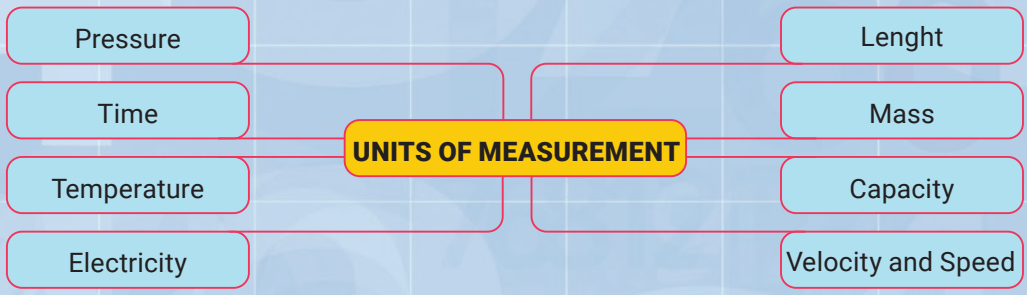
1. 428 ..... 2. 4.28 ..... 3. 42.8 ..... 4. 0.428 .....

10. Study the table above again and match the numbers with their written forms.



1. 1/3	A. ..... Point zero five
2. 3/4	B. ..... Twenty-two point seven eight
3. 5.2678	C. ..... Five point two six seven eight
4. 0.05	D. ..... (a) third
5. 22.78	E. ..... Three quarters, three fourths
6. 14/7	F. ..... One point one two five
7. 1.125	G. ..... Fourteen sevenths

11. Look at the diagram and say which units of measurement you will study and which one/s you already know.



12. Read the paragraph and write which unit of measurement you will study.

The Units of .....
The term 'length' refers to the size of an object or the distance between two points. The length of a wing span, for example, tells us how long the wing span is. We can measure the length of an object in two ways. One is the Metric System and the other is the Imperial System. The Imperial System is commonly used in the language of aviation. The system includes inches, feet, yards, miles, etc.



13. Look at the table and complete the sentence column as in the example.

THE IMPERIAL SYSTEM			
Units	**Symbol**	**Conversions**	**Sentence**
Inch	in		
Foot (plural feet)	ft	1 foot=12 inch 1 foot=30.48 centimetre	One foot is equal to twelve inches. 1. .....
Yards	yd	1 yard=3 feet	2. .....
Miles	mi	1 mile=5280 feet 1 mile=1760 yards	3. ..... 4. .....
Nautical Mile	nmi	1 nautical mile=1150 mile	5. .....

The metric system includes kilometre, hectometre, decametre, metre, decimetre, centimetre, and millimetre. Meter is the base unit. **Meter** is the American spelling and **metre** is the Commonwealth spelling, so it is preferred everywhere. The metric system is a decimal system because it is based on multiples of ten.

Millimetre(mm) 1 mm = 0.001 m	Centimetre(cm) 1 cm=0.01 m	Decimetre(dm) 1 dm=0.1 m	Metre(m) 1 m
Decametre(dam) 1 dam=10 m	Hectometre(hm) 1 hm=100 m	Kilometre(km) 1 km=1000 m	

14. Look at the table and complete the missing parts as in the example.

CONVERSIONS			
e.g. 1 in	=	2.54 cm	One inch is 2 point fifty-four centimetres.
1 ft	=	30.48 cm	**1.** .....
2.	=	.....	One yard is equal to zero point nine thousand one hundred forty-four metres.
1 mi	=	1609 m	**3.** .....
4.	=	.....	One mile is equal to one point six hundred nine kilometre.

15. Search and find the answers to the following questions.

1. How long is the wingspan of a Boeing 747?
   .....
2. How many feet are there in twelve inches?
   .....
3. How many feet are there in one metre?
   .....
4. What is the highest altitude an aeroplane can fly?
   .....
5. How long are 1944 metres in yards?
   .....



16. Fill in the blanks with the numbers in the box but write the numbers in numerical.



eighty thousand - sixty thousand - fifty-one thousand - a hundred thousand - nine thousand

Reporter : What is the maximum altitude an aeroplane can fly?
Captain Pilot : The highest commercial plane altitude was [1] ..... feet by Concorde. The highest military air-breathing engine airplane was the SR-71— about [2]..... feet. Today's highest airplane reaches 45,000 feet. The highest business jet flying today reaches [3] ..... feet.
Reporter : At what altitude do an aircraft's wings lose effectiveness?
Captain Pilot : It mostly depends on the wing and how effectively it can manage the flow of air over itself. The SR-71 routinely flew at altitudes of over [4] ..... feet, but it had a unique wing.
Reporter : What would happen if a plane flew above 100,000 feet?
Captain Pilot : Today, no commercial or business airplane can fly above 100,000 feet. Special rocket-powered planes can fly over [5] ..... feet to collect data, but they are specially designed for this purpose.
Reporter : Thank you for all the information you shared with us.

pound stone ounce

17. Read the explanation and write the title of the unit you will study.

The Units of .....
In the imperial system, mass is measured in ounces (abbreviated 'oz'), pounds / libres (lb), and stones (st). These are listed in increasing order of size, and the relationship between these units is shown below:
1 pound equals 16 ounces. 1 stone is equal to 14 pounds.

18. Look at the table and write the symbols of the units according to the explanation above.

IMPERIAL UNITS	SYMBOL	CONVERSIONS
Ounces		1 oz= 0.0625 lb
Pounds or Libres		11 lb=16 oz 1 lb = 0.45 kg
Stones		1 st =14 lb

19. Read the explanation and look at the table and then convert the units given.

The units of mass in the metric system have the same prefixes as the units of length. The basic unit of mass in the metric system is the gram.

Milligram (mg) 1 mg=0.001 g	**Centigram (cg)** 1 cg=0.01 g	**Decigram (dg)** 1 dg=0.1 g	**Gram (g)** 1g
Decagram (dag) 1 dag=10 g	**Hectogram (hg)** 1 hg=100 g	**Kilogram (kg)** 1 kg=1000 g	

1. 100 g = ... kg
2. 10 kg = ... lb
3. 40,000 g = ... kg
4. 10 lb = ... kg
5. 100 oz = ... lb
6. 3 st = ... lb

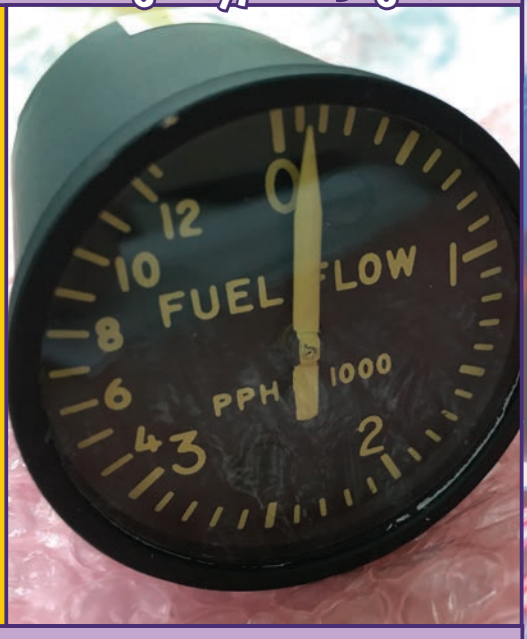
20. Read the sentences and write the conversions of units in numbers as in the example.

1. One ounce is equal to twenty-eight points thirty-five grams.
   1. 1 oz = 28.35 g
2. A one-half ounce is equal to fourteen grams.
   .....
3. One pound equals zero point forty-five kilograms.
   .....
4. What is the equivalent of 50 grams in ounces? It is equal to one point seven ounces.
   .....
5. What is the equivalent of one kilogram in pounds? One kilogram equals two point two pounds.
   .....

21. Read the text and correct the highlighted misspelled words in the text.

How much fuel does an airplane use during a typical flight ?

If you are not particularly into the mechanics of aviation, you have never thought about how much fuel an airplane [1] conzumes for a flight when you get on the plane. Most people concern about landing [2] savely at their [3] destications, only. But a plane like the Boeing 747 uses approximately one gallon of fuel, that is almost 4 litres, every second during a straight flight. Yes, every second they [4] bunr one gallon of fuel. According to Boeing's website, the 747 burns approximately 5 gallons of fuel per mile, (12 litres per kilometer). Of course, many factors affect the consumption of fuel during flights like speed, [5] altitute, the load of the aircraft and [6] friktion. An aircraft maintenance technician checks the fuel quantity indicator that shows the level of fuel in the tank and fills the tank of the airplane during after-flight maintenance.



1. ..... **2.** ..... **3.** .....
4. ..... **5.** ..... **6.** .....

22. Read the text in Exercise 21 and answer the questions.

1. How much fuel does a Boeing 747 burn on average for each mile?
   .....
2. What factors affect the fuel consumption of an aircraft?
   .....
3. What is the fuel quantity indicator?
   .....
4. When do airplanes refuel their tank?
   .....

23. Complete the sentences with the highlighted words in Exercise 21. One word will be used twice.

1. How does a pilot know which route to take to reach his ..... ?
2. Your captain is speaking. We are cruising at a/an ..... of 41,000 feet.
3. Do aircraft at higher altitudes ..... less fuel for a given volume of air because they ..... less oxygen?
4. ..... between the rubber and the road surface causes tires to wear down.
5. If you want to ..... less food, you should drink a tall glass of water right before you sit down to eat.
6. I must inform you that we are alive and we have returned home ..... .

24. Read the explanation and write the title of the unit you will study.

The Units of .....
The litre (international spelling) or liter (American English spelling) is the primary unit of measurement in the units of capacity. In other words, it is the standard unit of measuring liquids. But in the United States, pints, quarts and gallons are used. Gallons are used to express the amount of fuel almost all over the world.



IMPERIAL SYSTEM		
UNITS	**SYMBOLS**	**CONVERSIONS**
Pint	pt	1 pt = 0. 47 L
Quart	qt	1 qt = 0.95 L = 2 pint
Gallon	gal	1 gal = 3.79 L = 8 pint = 4 quart

METRIC SYSTEM			
Millilitre (mL) 1 mg=0.001 L	**Centilitre (cL)** 1 cl=0.01 L	**Decilitre (dL)** 1 dl=0.1 L	**Litre (L)** 1 L
Decalitre (daL) 1 dal=10 L	**Hectolitre (hL)** 1 hl=100 L	**Kilolitre (kL)** 1 kl=1000 L	

25. Translate the sentences into Turkish.

1. The Boeing 747-400 has a capacity of 216,840 litres, while the 737-400 has a capacity of 26,170 litres.
   .....
2. How many gallons do three hundred litres make?
   .....
3. 50 gallons of fuel equals 189 litres of fuel.
   .....
4. The capacity of an F16 military aircraft is 3500 litres. It contains 1250 litres of fuel. How much more fuel is required to fill it?
   .....
5. Twenty-five quarts is equal to twenty-three point six litres.
   .....

26. Complete the sentences with 'speed and velocity'.

What is the difference between speed and velocity?

1. ..... is the rate at which an object is travelling.
2. ..... is how fast something moves and in what direction.

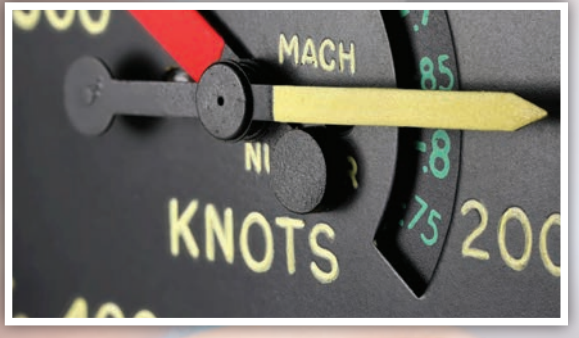
27. Read the paragraph and write which unit of measurement you will study.

The Units of .....
The velocity of an object is commonly defined as the rate of displacement that a particle or an object experiences over time. The formula of the velocity is that displacement is usually expressed in metres, and time is expressed in seconds. As a result, velocity is measured in metres per second (m/s) or kilometres per hour (km/hr).

$$\text{Velocity (V)} = \frac{\text{Displacement}}{\text{Time Taken}}$$



28. Complete the sentences with 'mach and knot'.



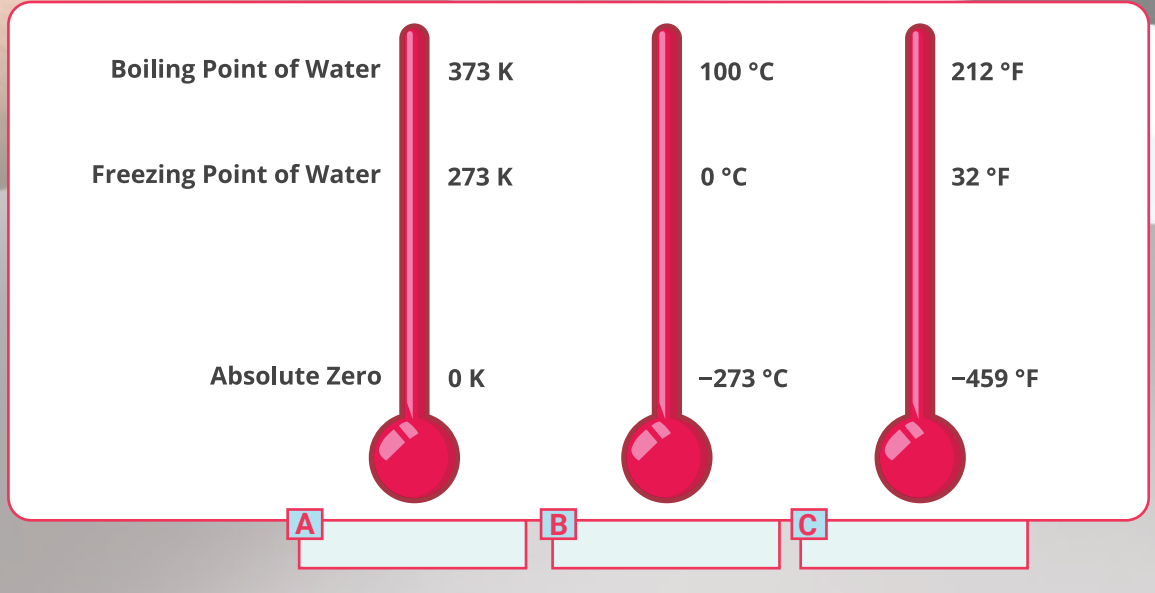
A ..... is a unit of speed that equals one nautical mile per hour.
..... indicates the speed of sound in the surrounding medium.

1 knot= 1.85 km/h
1 mach= 1226 km/h (at sea level)
1 mach= 340 m/s

29. Look at the picture and write the name of the scales in the box.

The Units of Temperature

Celsius Scale - Fahrenheit Scale - Kelvin Scale



30. Answer the questions according to the scales in Exercise 29.

1. At what temperature does water boil and freeze in Kelvin?
   .....
2. At what temperature does water boil and freeze in Celcius?
   .....
3. At what temperature does water boil and freeze in Fahrenheit?
   .....

31. Study the explanation and look at the table. Then, summarise what you understand with a few sentences.

The three most widely used temperature scales are Celsius, Fahrenheit, and Kelvin, each with its own specific applications. They are shown as Fahrenheit (°F), Celsius (°C), and Kelvin (K). In scientific work, the Kelvin scale is preferred, though the Celsius scale is also widely used. We can easily convert a temperature measurement in any of the three scales to another scale using the simple formulas below.

UNITS	FORMULA
From Celsius to Fahrenheit	°F= °C x 1.8+32
From Fahrenheit to Celsius	°C=(°F-32)/1.8
From Celsius to Kelvin	K=°C+273
From Kelvin to Celsius	°C=K-273

E.g. If the temperature of a room is 20°C, how do you convert this temperature into Fahrenheit and Kelvin?

°F=20x1.8=36 36+32= 68 Fahrenheit
K=20+273= 293 Kelvin

32. Look at the example above and answer the questions.

1. The maximum temperature in Muğla was 42.4°C on one day in June. Convert it to Fahrenheit and Kelvin degrees.

2. Convert Fahrenheit to Celsius.

1. 62 °F ..... °C
2. 114 °F ..... °C
3. 95 °F ..... °C
4. 250 °F ..... °C

3. Convert Celsius to Fahrenheit.

1. 18 °C ..... °F
2. -3 °C ..... °F
3. 38 °C ..... °F
4. 0 °C ..... °F

33. Complete the table with the units of time as in the example.

Millennium - Decade - Week - Year - Hour - Second
Month - Day - ~~Minute~~ - Century - Millisecond

UNITS OF TIME	WHAT AM I?
1.	I am one-thousandth of a second.
2.	There are 60 of me per minute.
3. Minute	I am the big hand on the clock.
4.	There are 24 of me per day and also the small hand on a clock shows me.
5.	I am Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, and Sunday.
6.	I am made up of 7 days.
7.	I am 4 weeks or 30 days long
8.	I am made up of 12 months, 52 weeks, or 365 days.
9.	I mean 10 years.
10.	I am 100 years long.
11.	I am 1000 years long.

34. Read the text and answer the questions.

DO THE TIRES OF AN AIRCRAFT EXPLODE?

The importance of landing gear, that is, tires, is great for a safe and comfortable landing and take-off of an aircraft. A typical aircraft tire can carry a load of 38 tons and meet the ground 500 times without undergoing any changes. The pressure of aircraft tires is about 6 times the pressure of a car tires. The higher the pressure is, the more stable the tire will be. Tires of an aircraft are filled with nitrogen instead of oxygen and this prevents tire bursts. The tire pressure of an aircraft is about 200 -220 psi and the tires of an F-16 are pumped to 320 psi. All in all, airplane tires do not blow up on landing because they are inflated! When the plane wheel first touches the ground, it does not turn; it drifts because it tries to balance the speed of the plane and the tire, so they emit smoke.

1. How much pressure do airplane tires have?
   .....
2. According to the text, what are the features of aircraft tires?
   .....
3. Why don't the tires of an aircraft blow up?
   .....
4. What happens when the tires first meet the ground on landing?
   .....
5. How do the tires balance the speed of the plane?
   .....

35. Read the explanations and write what unit you will study.

The Units of .....

- Pascal or Pa is the unit of pressure in the International System of Units (SI). It is a measure of the pressure applied by a force of one newton on an area of one square metre. One hundred thousand pa equals one bar.
- Bar (bar) is a metric unit of pressure but it is not part of the International System of Units (SI). It is defined as being exactly equal to 100,000 Pa (100 kPa), or slightly less than the current average atmospheric pressure on Earth at sea level. The bar is widely used in industry and meteorology.
- PSI, or pounds per square inch, is an imperial unit of pressure. It is a measure of force in an area per square inch. As a result, 1 PSI is defined as one pound of force applied per square inch. Fourteen point two psi equals one bar.

36. Read the explanations again and complete the missing parts of the table.

TYPE OF THE UNIT	UNIT OF MEASUREMENT	SYMBOL	CONVERSION
Imperial Units			14.5 psi =1 bar
International Units			100,000 pa =1 bar
Metric Units			1 bar=100,000 pa 1 bar =14.2 psi

37. Read the dialogue about electrical parameters and fill in the blanks with 'ohm, ampere and volt'.

The Teacher : Good morning class, today we are going to talk about electric current. Can anyone tell me what electric current is?

Student 1 : Electric current is the flow of electric through a wire or circuit.

The Teacher : That's right, electric current is the flow of electric through a wire or circuit. Now, what is the base unit for electric current in the International System of Units?

Student 2 : The unit for electric current is the [1.] _____.

The Teacher : Correct. Now, what is the tendency for a substance to oppose the flow of electrons?

Student 3 : Resistance!

The Teacher : That's right. And what is the unit of electrical resistance in the International System of Units?

Student 4 : [2.] _____.

The Teacher : You got it! Alright, what measures potential differences between two places in an electrical field, which is also called electromotive force?

Student 5 : Voltage.

The Teacher : That's correct. And how is the voltage measured?

Student 5 : In [3.] _____ in the International System of Units (SI).

The Teacher : Excellent! You all are doing a great job. Voltage is measured in volts. Keep up the good work!

38. Read the dialogue again in Exercise 37 and complete the table with ***current***, ***voltage*** and ***resistance***.

ELECTRICAL PARAMETERS	UNITS OF ELECTRICITY	SYMBOL
	Volt	V
	Ohm	Ω
	Ampere (Amp)	A

39. Complete the table with the units of measurement you have learnt so far.

	Length	Mass	Capacity	Velocity	Temperature	Time	Pressure	Electricity
Imperial Units								
International Standard / Metric Units								

40. Match the questions with their answers.

1. How many amps does a TV draw per hour?
2. How long is a week?
3. How long is a kilometer?
4. How high is Mount Everest?
5. How heavy is a tonne?
6. How heavy is an ant?
7. How cold is the coldest temperature on Earth?
8. How long can helicopters fly on a full tank?
9. How much fuel does a helicopter take?
10. How fast do commercial planes fly?



A. ___ A tonne is 1000 kg.
B. ___ An ant weighs 5 mg.
C. ___ It is -89 °C.
D. ___ They can fly to a distance of roughly 250 miles.
E. ___ They fly approximately 880–926 km/h (475–500 knots).
F. ___ The average smart TV uses 1.0 amps per hour.
G. ___ It is 8.872 km high.
H. ___ Small piston-powered helicopters consume 6-16 gallons of fuel per hour.
I. ___ A week is 7 days long.
J. ___ It is 1000 metres long.

41. Read the questions and choose the correct answers.



1. What are the common units of length in the Imperial System?
   A. centimetre (cm), metre (m), kilometre (km)
   B. inches (in), feet (ft), yards (yd) and miles (mi)
   C. ounces (oz), libre / pound (lb), stones (st)

2. How much does 100 pounds weigh in kilograms?
   A. 45.3 kg B. 205 kg C. 122.7 kg

3. Convert 700 feet to metre.
   A. 1177 m B. 342 m C. 213 m

4. Which of the following units measures something different?
   A. litre B. galloon C. knot

5. Convert 50 mach to kilometre per hour (km/h).
   A. 61.252 km/h B. 119.268 km/h C. 99.856 km/h

6. What is the unit of speed which is equal to one nautical mile per hour, that is exactly 1.852 km/h?
   A. mach B. knot C. pascal

7. Which of the following is not a unit of pressure?
   A. pa B. psi C. ft

8. How many minutes is half an hour?
   A. 60 B. 30 C. 15

1. Answer the following questions. Share your ideas with your friends.

Talk

1. What is the shape of a refrigerator? Think of objects that look like geometric shapes.
2. Do you think lines or symbols can talk? How?
3. If you were interested in technical drawing, what equipment would you need to have?

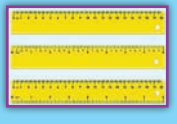
2. Read the text and complete the blanks with the technical drawing instruments in the box.

Rulers - Set squares - Compass - Curved rulers (pistole) - Pencils
Protractors - Eraser - Templates - Rapido sets - T-square

The act of creating drawings that visually communicate how something works or how something is constructed is known as Technical Drawing. It is also called 'drafting'. Technical drawing is a language that describes all kinds of information with lines, shapes and symbols, from design to production, from assembly to technical support. In order to provide sufficient information to the manufacturer about a product, the image must be transferred to the paper without errors. Error-free transmission, on the other hand, can be possible with fixed-gauge drawing instruments. Therefore, the drawing instruments are standardized. The instruments are


1. .....


2. .....


3. .....


4. .....


5. .....


6. .....


7. .....


8. .....


9. .....


10. .....

3. Read the text in Exercise 2 again and answer the following questions.

1. What is technical drawing?
   _____
2. Why do we need to use technical drawing?
   _____
3. How do we use technical drawing?
   _____
4. Write 5 of the technical drawing instruments.
   _____

4. Look at the technical drawing instruments in Exercise 2 again and complete the sentences using them.

1. _____ is a technical drawing tool that is primarily used as a guide for drawing straight horizontal lines on a drafting table.
2. _____ is a technical drawing instrument that can be used for making circles or arcs.
3. _____ is a technical tool that is used to draw curves that cannot be drawn with a compass.
4. _____ is a tool that is used to measure or draw angles in degrees.
5. _____ is an object used in engineering and technical drawing to draw parallel lines.
6. _____ is a tool that is used to measure the length and width of different objects.
7. _____ is a technical pen used by engineers, architects, or drafters to create lines of fixed width for architectural, engineering, or technical drawings.
8. _____ is a tool that enables you to draw precise lines, geometric shapes, letters, etc. without using a compass, ruler, or protractor.
9. _____ is a tool used for drawing and writing.
10. _____ is an object used to remove unwanted or incorrect lines in the drawing.

5. Read the dialogue and fill in the blanks with the equipment in Exercise 4. Then, act it out by changing the materials or the project.

The person who makes technical drawings is called a drafter.

The student :	Good afternoon. I need your help with my project.
The drafter :	What can I do for you?
The student :	I need to draw a technical picture of the aircraft system, but I don't have any essential instruments for technical drawing. Which materials are required to create a technical drawing?
The drafter :	You should have mechanical pencils, rulers, especially a/an [1] _____ to draw straight horizontal lines. You will need a/an [2] _____ to make a circle. You will draw parallel lines with a/an [3] _____ . You need to choose a suitable paper for your project, but we can talk about it later.
The student :	Thank you for your help. Can I ask for your help again when I have difficulty drawing?
The drafter :	Anytime! I am always ready to help.

6. Below are the papers used in Technical Drawing. Read the situations and write what type of paper the student needs from the box. Then, match the papers with the pictures.

Graph Paper- Drawing Paper - Tracing Paper - Blueprint Paper- Copying Paper

I want to practise lettering, draw sketches and graphs. Which paper should I use?
_____ **1**

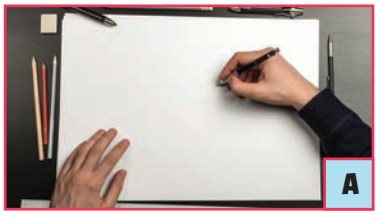
I want to make copy of my drawings or plans using a light-sensitive paper that turns blue when exposed to light. Which paper should I use?
_____ **2**

I need a white, heavy, good quality of paper for my technical drawings. Which paper should I use?
_____ **3**

I want to transfer an image from original paper to another paper. Which paper should I use?
_____ **4**

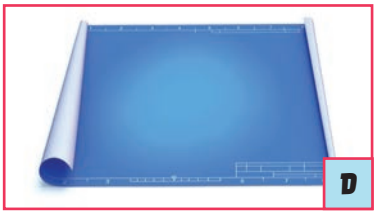


I want to print my technical drawings from computer. Which paper should I use?
_____ **5**


A

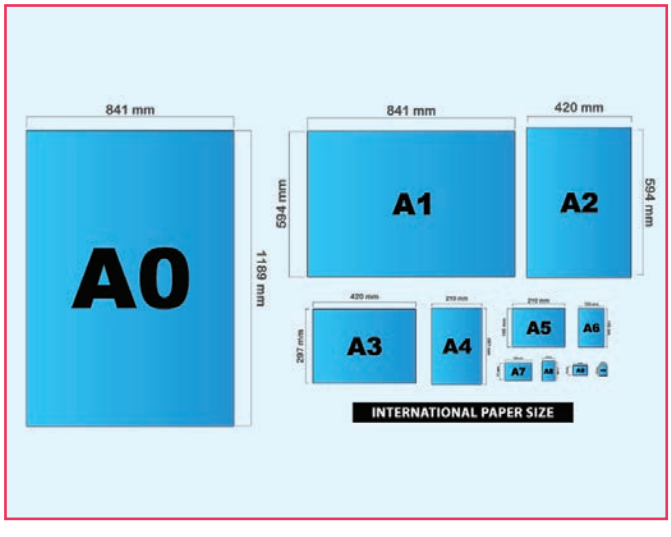

B


C


D


E

7. Look at the picture and the table, ask questions to each other about the dimensions of the paper and answer them as in the example.



e.g. Student A: What are the dimensions of A4 paper or what size is A4 paper?
Student B: The dimensions of A4 paper are two hundred and ninety-seven times two hundred and ten. (In the spoken speech, 297 x 210 is read as two ninety-seven by two ten.)

PAPER	WIDTH (MM)	HEIGHT (MM)
A0	1189	841
A1	841	594
A2	594	420
A3	420	297
A4	297	210
A5	210	148

8. Read the text and write a title for it.

.....

ISO 216 is an international standard for paper sizes, and it is used almost all around the world, including our country. The A series is the most popular series of the ISO standard. The most widely used paper size is the A4 format. The smaller the number, the larger the paper, which means A0 is the largest paper size of all. Each size gives a mathematical formula of two of the smaller sizes and half of the larger size. That is to say, if you fold an A0 in half along its longer side, you get two A1 sheets. If you fold the two A1 sheets along their longer sides, you will get four A2 sheets. The ISO 216 international paper size standard defines the dimensions of the B series paper sizes, too. But they are not as common as the A series. The B series is usually used for books and magazines. The C series, on the other hand, is known as envelope-type paper sizes. Both the B and C series are used in posters, books, envelopes and passports, etc.

9. Read the text again and write T (True) or F (False) to the sentences.

1. _____ ISO 216 is an international standard for paper sizes.
2. _____ The A4 format paper is not as commonly used as the A3 format.
3. _____ By folding one sheet of A3 along its longer sides, you get 4 sheets of A4 paper.
4. _____ C series is mostly used in envelopes, passports, and posters.

10. Look at the table and complete the column on left with the correct paper types.

A4 / A0 - A1 / A1 - A2 / B4 - A3 / A2 - A3 / A5

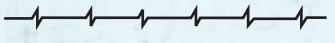
PAPER TYPE (SIZE)	AREAS OF USAGE
	Technical drawings and posters
	Flip charts
	Drawings, diagrams, large tables
	Handbooks
A6	Greeting cards
B5, A5, B6, A6	Books
	Envelopes for A4 letter paper: unfolded (C4), folded once (C5), folded twice (C6)
	Newspapers
B8, A8	Playing cards

11. Read the text and complete the table with the description of the lines in the box as in the example.

Continuous Thin Freehand Line - Thin Chain Line with Thick Ends - Chain Thick Line
Dashed Thin Line - Chain Thin Line - Continuous Thick Line - Continuous Thin Line
Continuous Thin Zig-zag Line - ~~Dashed Thick Line~~

TYPES OF LINES

Technical drawing is a form of communication. On technical drawings, different types of lines represent different things. They serve as the most important elements because technical drawing is done through lines to describe what you want. The technical drawing's lines and thickness have been standardised in accordance with TS 88-20.

TYPE OF LINE	DESCRIPTION	APPLICATION	THICKNESS
	1.	Used for visible outlines, edges, and general details.	0.7 mm
	2.	Used for dimensioning, projection, leader lines, hatching and short centre lines.	0.35 mm
	3.	Used for showing the limit to an interrupted view when an axis is not present. It represents breaks or cuts.	0.35 mm
	4.	Used for indicating limits of partial or interrupted views and sections if the limit is not an axis.	0.35 mm
	5. Dashed Thick Line	Used for hidden outlines and edges.	0.7 mm
	6.	Used for drawing hidden outlines and edges.	0.35 mm
	7.	Used for indicating the lines or surfaces to which a special requirement is applied.	0.7 mm
	8.	Used for drawing centre lines, and lines of symmetry.	0.35 mm
	9.	Used for drawing lines on cutting planes.	0.7-0.35 mm

12. Look at the text and the table in Exercise 11 and answer the following questions.

1. Which line(s) are used to show hidden parts? _____
2. Which line is used for dimensioning? _____
3. Which line(s) are used when there is a restriction in the view? _____
4. Which line is used for cutting planes? _____

13. Complete the missing lines by drawing them with a ruler from the marked places and then, write the name of the lines.

e.g. Continuous Thick Line



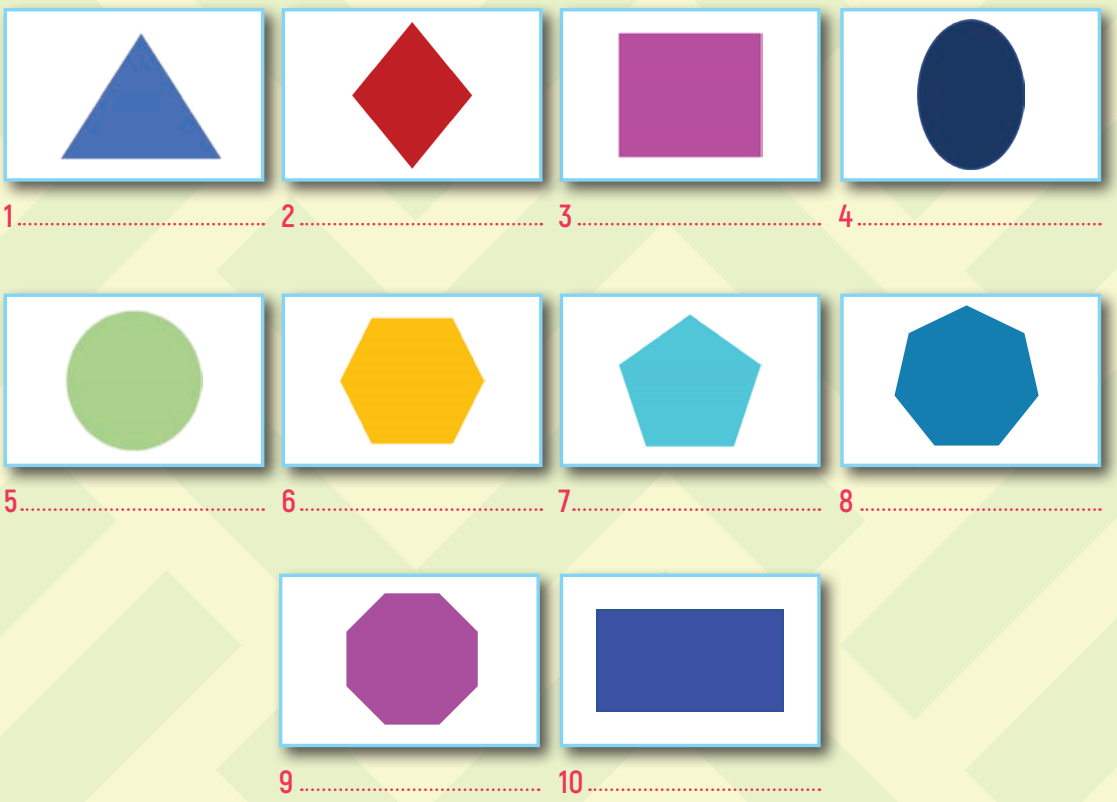
14. Read the text about geometric shapes and write T (True) or F (False) to the sentences.

Have you ever thought about why a triangle is named a triangle? Many geometric shapes are named according to the number of sides they have. Triangles have three sides and what does 'tri-' mean? It means three in Latin and Greek. Some prefixes give clues about the meaning of the words. Let's have a look at the words starting with -tri. Triarchy means government by three persons or triathlon means consisting of three sports like swimming, bicycling and running. Another shape is quadrilaterals. They have four sides and four angles. The prefix 'quad-' means four in Latin. Do you know pentagons? They are also geometric shapes. Pentagons are made up of five sides and five angles. The prefix 'penta-' refers to the number five in Latin. A pentagram is a star with five points. Which geometric shape has six sides and six angles? It is a hexagon. The prefix 'hex-' means six in Greek. Last but not least, there are octagons. They have eight sides and eight angles. And the prefix 'oct-' means eight. An octopus has eight tentacles.

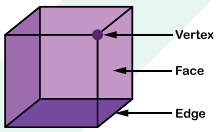
1. _____ Some prefixes give ideas about the meaning of the words they are added to.
2. _____ Some shapes are named according to the number of their sides.
3. _____ The prefix tri- means three times.
4. _____ The prefix quad- is not English.
5. _____ A pentagram is a star with six points.
6. _____ Prefixes are added at the end of words.

15. Look at the 2D geometric shapes and write their names from the box.

square - heptagon - circle - oval - rectangle - rhombus - pentagon - hexagon - triangle - octagon



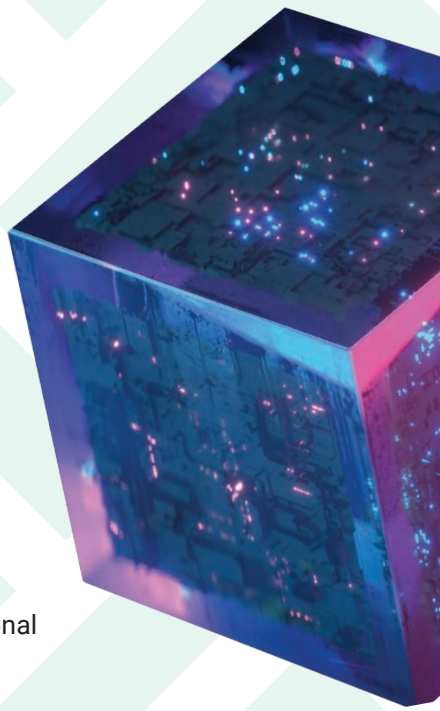
16. Look at the example and complete the table with the properties (faces, vertices and edges) of 3D geometric shapes.

	e.g. A cube has 6 faces. A cube has 8 vertices. A cube has 12 edges.

	TRIANGULAR PRISM	CYLINDER	HEXAGONAL PRISM	RECTANGULAR PRISM	CONE
Image					
Vertices					
Edges					
Faces					

17. Read the properties of 2D and 3D geometric shapes and write what they are.

1. _____ : It has four sides that are all equal.
2. _____ : It is a perfectly round shape.
3. _____ : It has six rectangular faces, 12 edges and 8 vertices.
4. _____ : It has 8 faces, 18 edges and 12 vertices.
5. _____ : It has four sides and four vertices. Its opposite sides are parallel.
6. _____ : It has 5 faces, 9 edges and 6 vertices.
7. _____ : It has 7 sides and 7 vertices.
8. _____ : It is a 2-dimensional shape. It has no vertices and no sides. It looks like an egg.
9. _____ : It has 5 sides and 5 vertices.
10. _____ : It has two faces, 1 edge and one vertex.



18. What are the examples of geometric shapes in real life? Complete the paragraph by giving examples of geometric shapes in real life.

Geometric shapes can be found everywhere. Wherever you look, nearly everything is made up of both two-dimensional (2D) and three-dimensional (3D) geometric shapes. A fighter jet has triangle wings. A snowflake is a hexagon.

.....

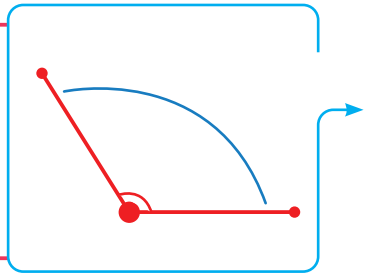
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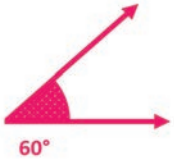
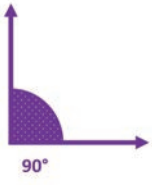
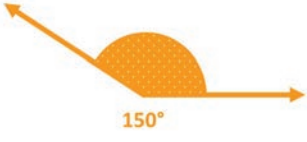
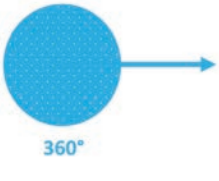
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.....

19. Look at the table and write the descriptions below into the correct part.

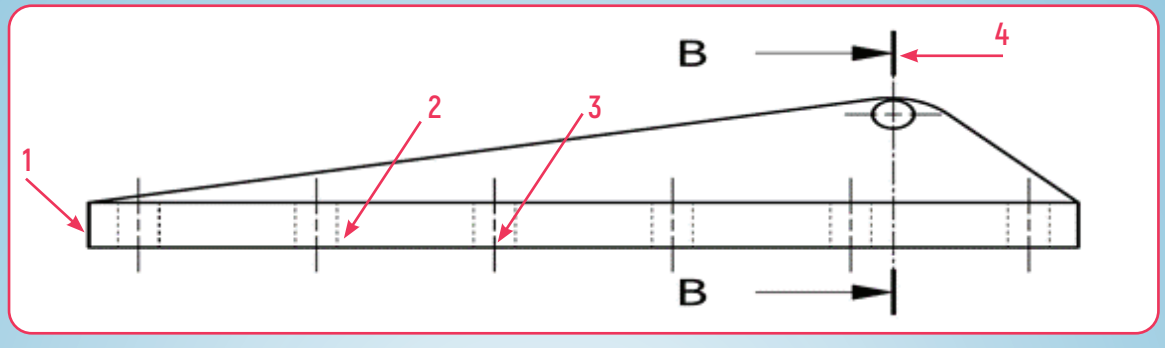
1. An angle that is exactly 180 °.
2. An angle that is greater than 180° and less than 360°.
3. An angle that is less than 90°.
4. An angle that is exactly 360°.
5. An angle that is greater than 90° and less than 180°.
6. An angle that is exactly 90°.



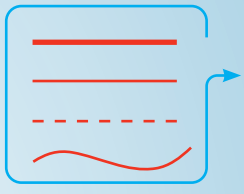
TYPE OF ANGLE	EXAMPLE	DESCRIPTION
Acute Angle		
Right Angle		
Obtuse Angle		
Straight Angle		
Reflex Angle		
Full Angle		

20. Look at the drawings of a landing gear and write the number of lines next to their names under the drawing. One is extra. Put (X) for the extra. Then, check your answers with your friends.

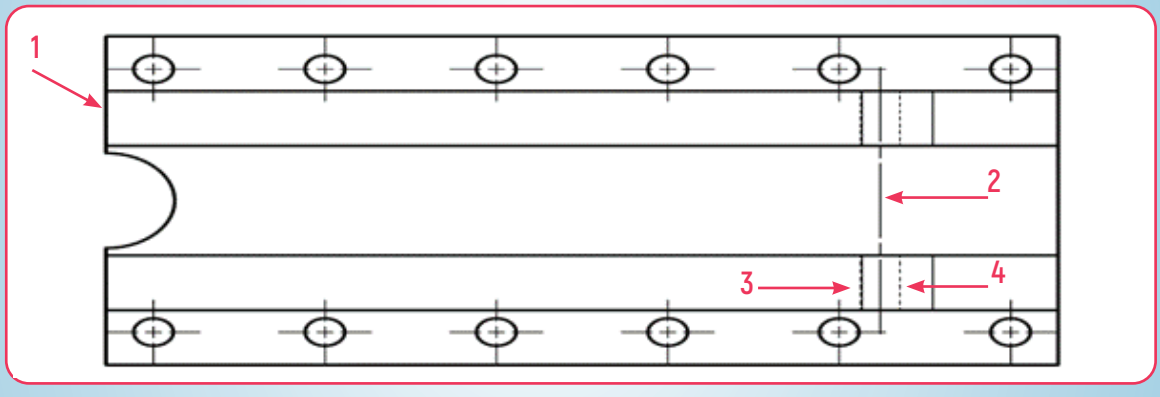
A



A. _____ Continuous Thick Line
B. _____ Chain Thin Line with Thick Ends
C. _____ Chain Thin Line
D. _____ Dashed Thick Line
E. _____ Dashed Thin Line



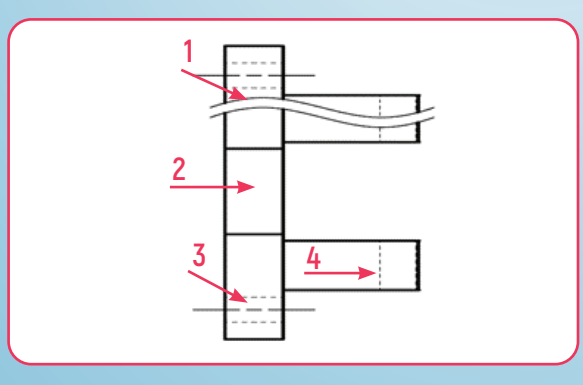
B





A. _____ Continuous Thin Line
B. _____ Continuous Thick Line
C. _____ Chain Thick Line
D. _____ Chain Thin Line
E. _____ Dashed Thin Line

21. Write the types of lines used in the drawing.



1._____

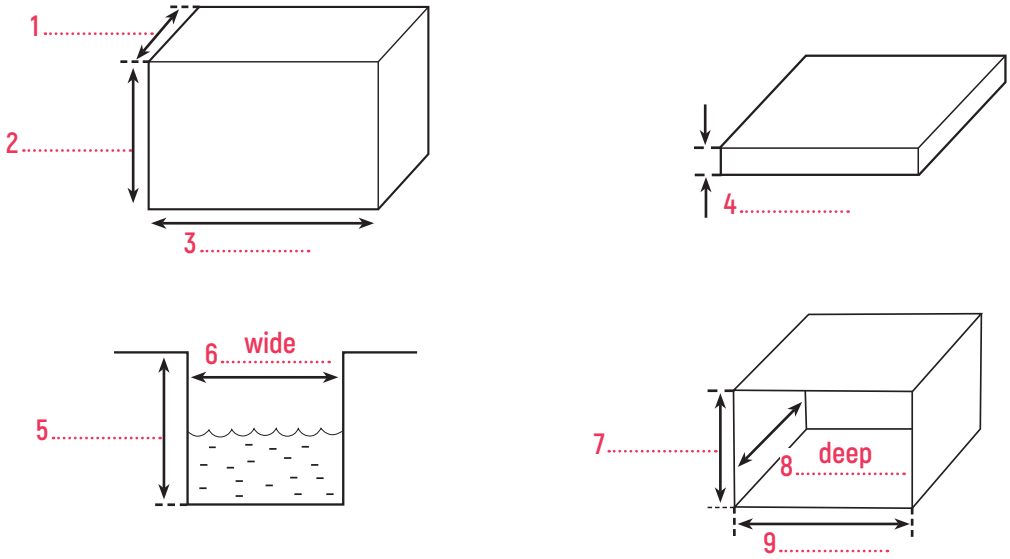
2._____

3._____

4._____

22. Look at the pictures and write the words in the box in the correct places.

width - length - thickness - high - height - deep - wide



23. Complete the table with the correct parts of speech.

ADJECTIVES	NOUNS	VERBS
high	**3.**	heighten
long	length	**6.**
1.	depth	**7.**
thick	**4.**	**8.**
2.	**5.**	widen

24. Match the sentences that have the same meaning.

Dimension can be described in various ways in English using nouns, adjectives, and verbs.

1. The length of the horizontal stabilizer is 47 ft 1 in.
2. The thickness of the fuselage skins is 2.5 mm.
3. The width of fuselage is 6.20 metres (20 ft. 4 in).
4. The depth of the wing fuel tank is 90 cm.

a. ___ The fuselage is 6.20 metres (20 ft. 4 in) wide.
b. ___ The horizontal stabilizer is 47 ft 1 in long.
c. ___ The fuselage skins are 2.5 mm thick.
d. ___ The wing fuel tank is 90 cm deep.

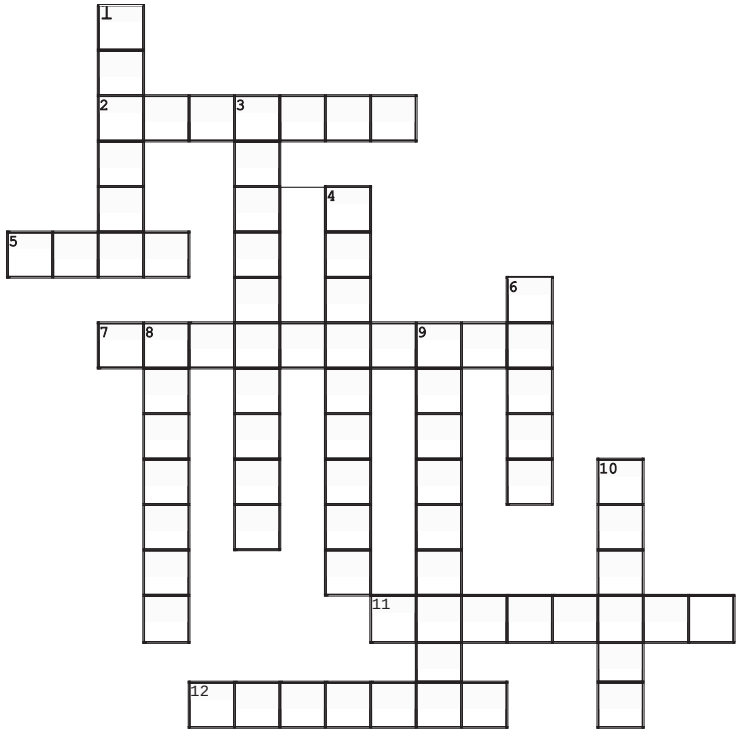


25. Complete the questions with 'How + adjective' as in the example. The answers will help you.

1. How heavy _____ is the aircraft in tons? It is 59 tons.
2. _____ is one pillar of the helicopter? It is 3 m long.
3. _____ is the Atlantic Ocean? The depth of the Atlantic Ocean is 8.486 m.
4. _____ is Mount Nemrut? It is 2.134 m.
5. _____ gates does Istanbul Airport (IST) have? It has 41 boarding gates.

26. Complete the crossword puzzle.

TECHNICAL DRAWING



ACROSS

2. You use ..... paper to copy an image from original paper to another one.
5. How ..... is the Nile River?
7. You measure or draw angles using a/an ..... .
11. A/an ..... is a seven-sided geometric shape.
12. You draw circles using a/an ..... .

DOWN

1. A/an ..... angle is greater than 90° and less than 180°.
3. You draw ..... line to indicate the surfaces to which a special requirement is applied.
4. A/an ..... prism has 8 faces, 18 edges, and 12 vertices.
6. If you want to practise lettering, use ..... paper.
8. A/an ..... is geometric shape and looks like a diamond.
9. The millimetre is the appropriate unit for measuring the ..... of the book.
10. ..... is the noun form of long.

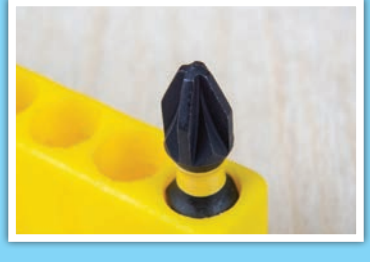
1. Answer the following questions. Share your ideas with your friends.

Talk

1. Do you know any tools used in aircraft maintenance? Which ones?
2. Where do we use the tools?
3. Which tools are the mostly used ones?

2. Two aircraft maintenance technicians are in the hardware store to buy screwdrivers. Read the dialogue and write the highlighted screwdriver types under the correct picture.

Bulut :	Let's get some screwdrivers which we mostly need.
Toprak:	Do we need a slotted head?
Bulut :	Sure. It has a flat shape shaft tip with a single slot. That's why it is also called a flat head, and it engages with the slotted screw head only.
Toprak:	And it is also one of the oldest types.
Bulut :	We should also get a philips screwdriver to do things more accurately.
Toprak:	It looks like a cross sign, right?
Bulut :	Yes. Do you think we need a pozidriv screwdriver?
Toprak:	Yes, because, as you know, it provides better resistance to slipping. Look at these ones!
Bulut :	Do you mean the square screwdrivers?
Toprak:	Yes, they are also known as Robertson screwdrivers and comfortable to use.
Bulut :	Why do you think so?
Toprak:	The tool provides good locking thanks to its square shape.
Bulut :	Oh, I see. Finally, we should get a torx screwdriver.
Toprak:	Sure. It has a star shape and it is very reliable to use.
Bulut :	Now that we are done with the shopping, what about having some coffee?



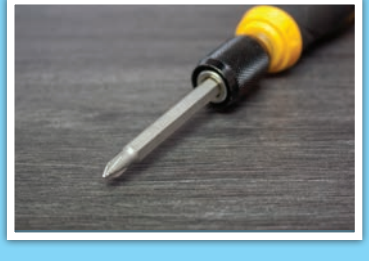
1. .....



2. .....



3. .....



4. .....



5. .....

3. Match the tools with the explanations.

a. An electric screwdriver is easy to use. It is used to screw and unscrew, mainly to set drywall screws at high or low speed.
b. A rechargeable battery-powered screwdriver is also called cordless. It helps save time and effort. It also allows more accurate and precise driving. There is no need to worry about electricity as they are powered by rechargeable batteries.

1 

2 

4. Read the text and answer the questions.



Ball-peen hammers are one of the most commonly used types by technicians. It has two heads; one is flat, and the other one is round. It is good for rounding off the edges.



Technicians want to be sure to use the correct tool to perform a task the right way. Using the wrong tool wastes their time and effort and even puts them at risk of danger. Hammers, for example, are good tools and used a lot, but they do not fit in every maintenance. So, they are made in different types.



Soft-faced hammers (mallet) are used in soft surfaces without causing any damage. They are also called as rubber hammers.

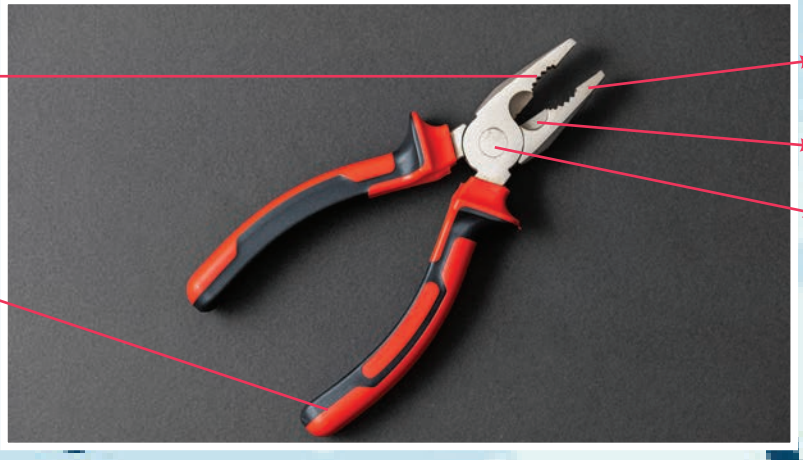


Technicians mostly use body hammers to straighten and form metal. The square head is best for working corners.

1. Which type of hammer is good for rounding the edges?
   .....
2. What is another name for soft-faced hammers?
   .....
3. What is a body hammer used for?
   .....
4. Which type of hammer causes no harm to the material?
   .....

5. Write the parts of the plier.

cutters - pipe grips - fulcrum - handles - jaws



6. Read the definitions and write the correct type of pliers from the box.

Parrot Plier - Joint Plier - Bent Nose Plier - Needle Nose Plier
Crimping Plier - Locking Plier - Flush Cut Plier - Duckbill Plier



1. .....: Also called long-nosed pliers, these pliers are very multiskilled. They can be used for shaping, cutting, and bending wires.



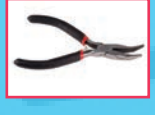
2. .....: These pliers allow wires to be trimmed flush or nearly flush to a solder joint. It is also called 'flush cutter' to separate it from the symmetrical pliers.



3. .....: They are very similar to adjustable wrenches and are also called water pump pliers. They help you lock on a certain width and can do a lot of things that a wrench can do.



4. .....: These pliers are named after the parrot as the jaw shape resembles the beak of a parrot. These are used to cut wires or to pull out the nails securely.



5. .....: These are another type of needle nose. Their jaws are angled and this allows them to grip the surfaces. These pliers are very good at shaping wires.



6. .....: As the name suggests, these pliers have jaws that are made to lock. This means that they are really good at gripping bolts.



7. .....: These pliers are also known as flat-nose pliers. Their jaws look like a duck with a flat shape, and they are good at twisting metal or wires. They are also used for straightening.



8. .....: These pliers are used to crush small metal pieces and wires to create a crimp. So, they don't short-circuit.

7. Match the riveting tools with the meanings.

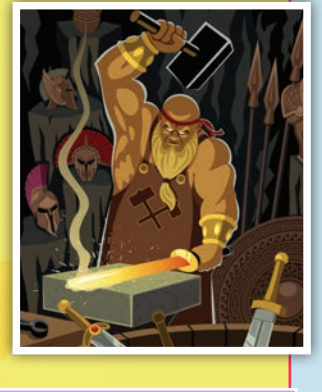
1. ___ cleco plier	A. perçin makası
2. ___ grip gauge	B. grip cetveli
3. ___ rivet gun	C. delik tutucu pensesi
4. ___ rivet cutter	D. perçin tabancası

8. Read the text and match the highlighted words with their meanings.

A Very Essential Tool In History: Pliers



Pliers are very ancient tools in their basic forms. They are one of the oldest hand tools in history. No one knows who first invented them but they are believed to have been invented 5000 years ago. At that time, they were made of wood. Then, the people started to make them out of steel or bronze to increase their strength. They used the pliers to hold hot or melted materials. One of the oldest images of pliers is the image of Hephaestus, the Greek Technology, Fire, Blacksmiths God, who made all the weapons of the gods in Olympus. Also, in some ancient Egyptian sculptures, there are figures of holding pliers. The basic design of pliers has been adjusted to the modern ones. Now, we can find many large and small pliers in the market that do all kinds of work.



1._____ To invent	A. To make greater in size, amount, or degree
2._____ To increase	B. To grasp or carry with one's hands
3._____ To be made of	C. To change something slightly
4._____ To hold	D. To be poduced using a substance or object
5._____ To adjust	E. To create or design something

9. Read the text again and write T (True) or F (False) to the sentences.

1._____ The inventor of pliers is unknown.
2._____ It is believed that they were invented 3000 years ago.
3._____ Pliers were made of copper.
4._____ In history, there were some ancient figures holding pliers.

10. Look at the pictures and make sentences using the words in brackets.



1. .....

(crimping plier / cutting / The technician / is / the wire / with / a)



2. .....

(joint plier / a / The technician / is / screw / tightening / with)

11. Write the Turkish meanings of the words.

1. vibration: _____
2. loosen: _____
3. bolt: _____
4. nut (technical): _____
5. pipe: _____
6. versatile: _____
7. fasten: _____
8. safety wire: _____
9. twister: _____
10. securely: _____

12. Read the text and choose the correct word for the blanks.

Twisters are one of the mostly used tools in aircraft maintenance. Why do we need twisters in aircraft? Twisters are versatile tools to help us to do [1] _____ safety wiring rapidly. When too much [2] _____ occurs, or when [3] _____ are at different speeds, expansion occurs due to temperature and motion. In these cases, with the help of a [4] _____, using safety wire, bolts, nuts or pipes are securely [5] _____ to prevent loosening.

1.	A. dangerous	B. reliable	C. tiring
2.	A. engine	B. motor	C. vibration
3.	A. aircraft	B. cars	C. motorbikes
4.	A. hammer	B. screwdriver	C. twister
5.	A. held	B. fastened	C. moved

13. Unjumble the letters under the pictures and complete the sentences according to the text in Exercise 12.



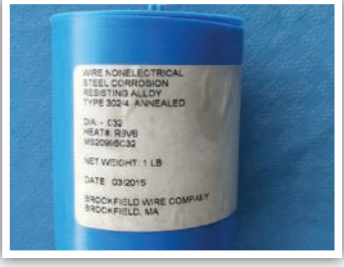
A. RTIWEST

.....



B. EIPPS

.....



C. FTASEY RIWE

.....

1. A twister is used for .....
   Safety wire is used to fasten the .....
2. Pipes must be strengthened to prevent .....

14. Look at the picture and choose the correct answers.



1. The name of the machine in the picture is _____.
   A. grinder B. hand drill C. pliers D. hammer
2. This machine is used for _____.
   A. making holes B. cutting C. bending D. drawing
3. This machine isn't used in making hole in _____ .
   A. plastic B. wood C. metal D. paper
4. A hole is drilled by the continuous turning of the _____
   A. drill bit B. handle C. electricity D. jaws

15. Look at the pictures, find 6 words from the puzzle that are related to the tool in the pictures and write them.





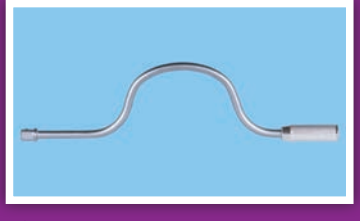


R	X	O	P	E	B	E	O	P	A	R	S	N	L
Z	W	E	F	Z	J	P	V	D	E	C	A	Q	L
R	Q	C	Z	A	Z	B	V	J	R	L	O	L	I
D	Z	N	G	P	U	F	X	E	K	K	M	D	R
E	R	V	R	J	F	X	W	Z	U	Z	S	W	D
Y	W	I	D	L	L	I	R	D	D	N	A	H	C
O	T	K	L	B	J	B	W	L	A	K	F	J	I
G	U	H	T	L	N	T	Q	L	H	L	L	F	R
L	T	Y	H	M	B	Y	E	U	Y	Q	P	H	T
N	E	C	O	W	V	I	E	F	X	F	Z	D	C
P	D	A	L	Y	W	F	T	O	O	S	S	N	E
Q	S	D	E	I	N	D	R	I	L	L	R	W	L
Q	W	A	J	F	Y	K	S	X	H	I	N	M	E
M	S	A	T	Z	V	Y	U	Q	T	G	H	Y	O

1. .....
2. .....
3. .....
4. .....
5. .....
6. .....

16. Read the dialogue between two students and write the tools they are talking about under the pictures. There are two extra pictures.

Irmak : Do you know where we use this tool?
Emrah: Do you mean the flat chisel?
Irmak : Yes.
Emrah: Well, as far as I know, it is used to get a flat and smooth surface.
Irmak : Besides, if we strike it with a hammer, we can cut the material, can't we?
Emrah: I think so.
Irmak : Oh, I know the other one on the left. It is called a file.
Emrah: Is it? What is it used for?
Irmak : To form or smooth surfaces, especially those of metal.
Emrah: So, what is the difference between these two?
Irmak : I think you can use a file for rounding the corners and also deburring of workpiece.
Emrah: Well, what is this called?
Irmak : It is called a ratchet and socket combination. It lets you turn a nut or bolt without changing its location.
Emrah: It seems that they are used efficiently to tighten or loosen the fastener and you do not need to reposition the tool.
Irmak : Finally, I can say that I have never seen that tool before. Do you have any ideas?
Emrah: I think I do. That is called a speed brace. It is specifically designed for roof bracing application in low-wind speed conditions.
Irmak : That's cool. Let's see what the teacher will say about all these.



1. .....



2. .....



3. .....



4. .....



5. .....



6. .....

17. Choose the correct tools for the sentences.

1. If you want to make holes in a material, you should use a _____
   a. chisel b. drilling machine
2. A _____ is used to clean the waste on the material.
   a. file b. hammer
3. You should use a _____ for roof bracing.
   a. speed brace b. flat chisel

4. A ..... is used to cut wire or to pull out the nails securely.
   a. parrot plier b. crimping plier
5. ..... are the parts of a plier.
   a. Hammers b. Jaws
6. ..... do not damage to the surfaces.
   a. Body hammers b. Soft-faced hammers
7. Fulcrum and grips are the parts of a .....
   a. screwdriver b. plier
8. You do not need to worry about electricity when you use a/an .....
   a. electric drill b. rechargeable drill
9. You should use a ..... to secure the bolts or nuts with safety wire.
   a. ratchet b. twister
10. Another name for a slotted head screwdriver is .....
    a. flat head b. philips screwdriver

18. Choose the correct tools according to the pictures.

1.



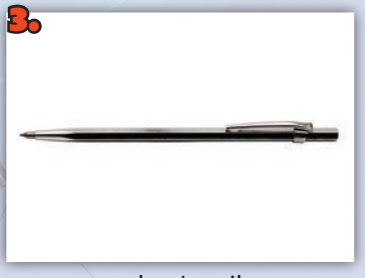
inspection mirror / flash light

2.



aviation snips / spanner

3.



sander / scriber

19. Circle the correct word combination for the definitions. Then, write the definitions of two other wrench types given.

1. **Open-end Wrench / Offset Box Wrench:** These wrenches have open ends at both sides with straight-sided slots that fit over the part being tightened and are made in various sizes. These wrenches are useful when dealing with nuts and bolts that are difficult to access. They are much easier in turning such nuts and bolts.

2. **Offset Box Wrench / Combination Wrench:** They get their name from being completely enclosed. Unlike the open-end wrenches, these completely encircle the head of the fastener. These wrenches avoid the rounding-off at the edges that may occur with the use of open-ended wrenches.

3. **Open-end Wrench / Combination Wrench:** As the name suggests, it is a combination of both an open-ended wrench as well as a box-ended wrench. This wrench has a closed loop at one end, while it is open-ended at the other. These can be used to unfasten nuts and bolts with the box end, and then separate them quickly using the open-end.

4. **Dogbone Wrench :** .....
   .....

5. **Cone Wrench:** .....
   .....

1. Answer the following questions. Share your ideas with your friends.

Talk

1. What is a material?
2. Can you name three different materials that are used in aircraft?
3. Do you know any non-metal materials? If yes, which ones?

2. Put the letters in the correct order to complete the definition.

Substances that are needed and used to achieve a certain purpose are called _____



3. Read the text and answer the questions.

Raw materials must be subjected to certain processes to be turned into finished and semi-finished products. All of these processes and the tools used are called industry. For example, steel used in gear construction, cement used in building construction, and aluminum used in aircraft fuselage are all materials. It is important to choose light and high-strength materials in order to ensure the reduction of aircraft weight and improvement of passenger safety in the manufacture and maintenance of aircraft fuselage and parts. The materials used in the aircraft industry are collected in two groups mainly as metal and non-metallic materials.



1. What is the definition of industry?

_____

_____

_____

2. Where is aluminum used?

_____

_____

3. Which material is used in construction?

_____

4. Why is it important to use light and high-strength materials in the aircraft?

_____

5. What are the groups of materials called?

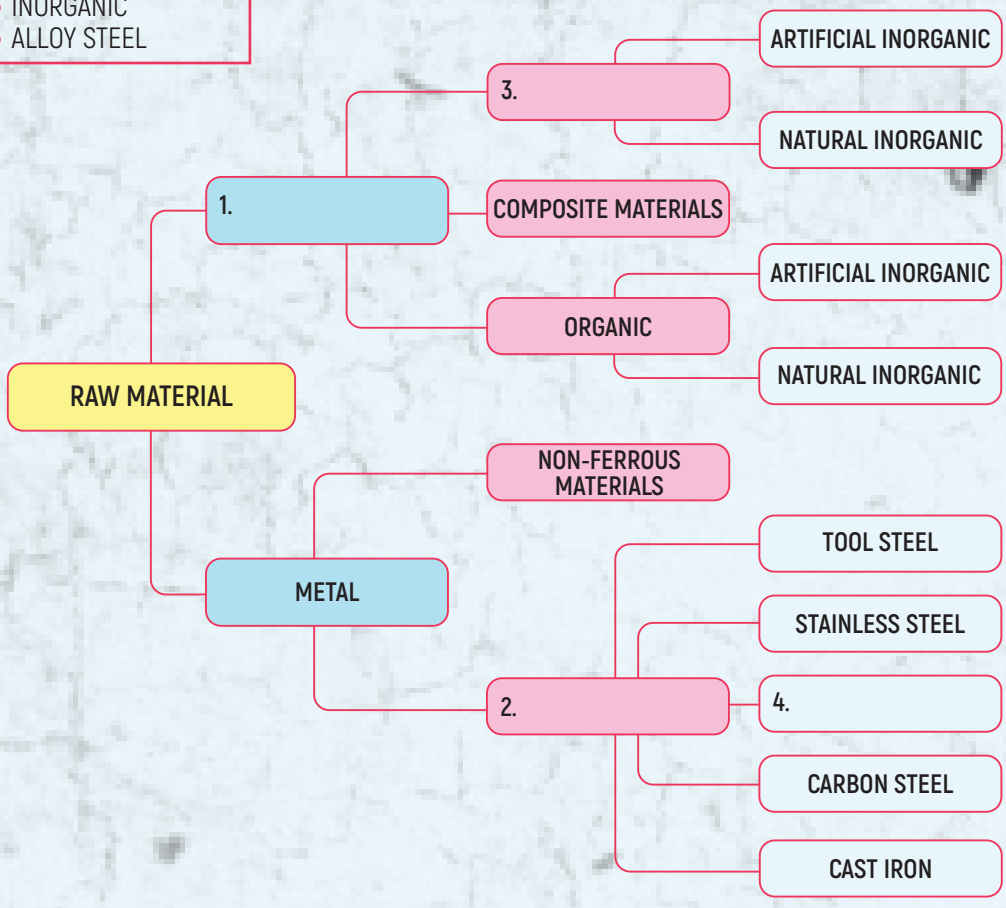
_____

4. Write the highlighted sentence in Exercise 3 and complete the diagram with the words in the box.

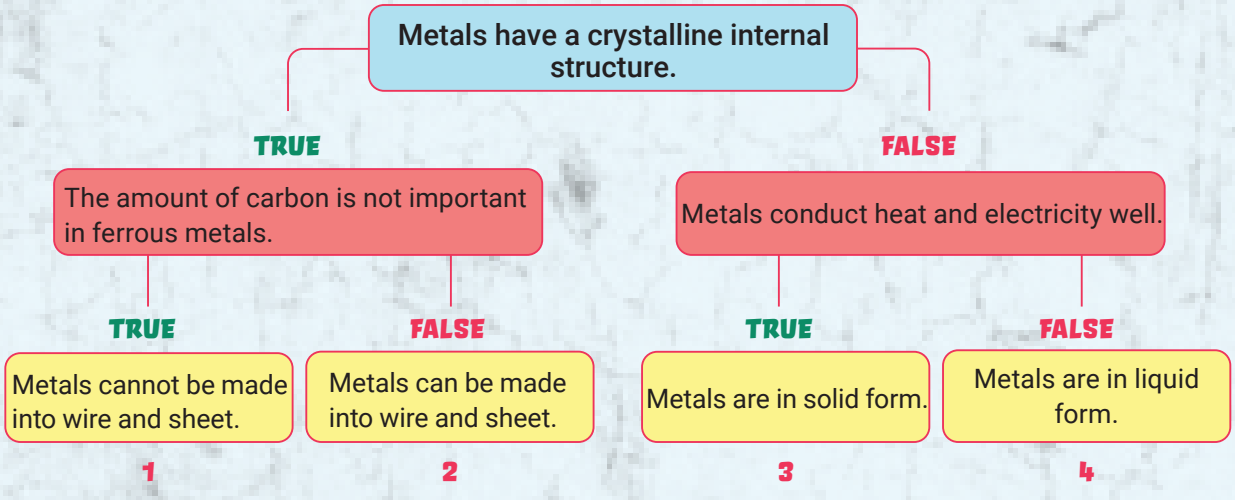
_____

_____

- FERROUS MATERIALS
- NON-METAL
- INORGANIC
- ALLOY STEEL



5. Reach the conclusion by following the right path with the given sentences.



6. Read the text and fill in the blanks with the words in the box.

solid - reflect - electricity - high - crystalline

All metals found in nature are mineral materials. They have some common features. First of all, they have a [1] _____ internal structure. They have a very strong tendency to crystallize. Second, metals conduct heat and [2] _____ well and do not pass light but [3] _____ it. Third, they can be made into wire and sheet. This feature is called ductility. Fourth, they are in [4] _____ forms except for the element, mercury. Finally, they have [5] _____ durability, which is very important in the aircraft industry.

7. a. Match the highlighted words in the text with their definitions.

1. to reflect
2. to crystallize
3. ductility
4. mercury

A. ___ A heavy silvery-white metal which is normally liquid
B. ___ The capacity of a material to be flexible
C. ___ To throw back (heat, light, or sound) without absorbing it
D. ___ To cause to form crystals

b. Write the words in Exercise 7a under the correct pictures.









1. ..... 2. ..... 3. ..... 4. .....

8. Look at the diagram in Exercise 4 and write the names of the ferrous materials.

1. _____
2. _____
3. _____
4. _____
5. _____

9. Read the text and write what the numbers indicate as in the example.

According to the Society of Automotive Engineering (SAE) standards, each SAE code consists of 4 or 5 numbers. The first of these numbers indicates the type of steel, the second shows the percentage of minerals that make up the alloy, and the last two or three digits are the percentage of carbon in the alloy. For example, in the SAE standard 4150 serial numbers, the number 4 means molybdenum is the main mineral mixed, the number 1 indicates the percentage amount of molybdenum, and the number 50 indicates that there is 0.50% carbon in this steel alloy.

TYPE OF STEEL	CLASSIFICATION
Carbon	1000 range
Nickel	2000 range
Nickel-chromium steels	3000 range
Molybdenum	4000 range
Chrome	5000 range
Chrome vanadium steel	6000 range
Tungsten	7000 range
Silicon manganese	9000 range

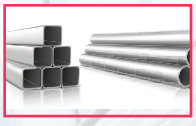
e.g. 5220 main mineral: chrome 2%, 0.20% carbon

1. 6350 _____
2. 2250 _____
3. 4340 _____
4. 2475 _____

10. Write the Turkish meanings of the words.

1. Carbon:
2. Nickel:
3. Nickel-chromium steels:
4. Molybdenum:
5. Chrome:
6. Chrome vanadium steel:
7. Tungsten:
8. Silicon manganese:

11. Read the text about ferrous materials and do the exercises below.



More than 90% of the metallic metals used by human beings are ferrous, which means they have a lot of iron in them. Ferrous metals are generally cheaper as they are easier to recycle and thus more plentiful. They are different based on the amount of carbon in the alloy composition.

The majority of ferrous materials are carbon steels. Carbon steel is a malleable and iron-based material. Steel containing 0.10-0.30% carbon is called low-carbon steel and it is mostly used in secondary structural parts and clamps. Steel containing 0.30-0.50% carbon is called medium-carbon steel and it is used in rod ends and light forgings. Steel containing 0.50-1.05% carbon is called high-carbon steel and it has limited use in aircraft.



Stainless steel may be rolled, drawn, bent, or formed into any shape. They are difficult to weld. Stainless steel can be used for almost any part of an aircraft. Some of its common applications are the fabrication of exhaust collectors, stacks and manifolds, structural and machined parts, springs, castings, tie rods, and control cables.



Steels that contain some amounts of alloying elements such as manganese, copper, silicon, sulfur, and phosphorus are known as alloy steels. They are commonly used to make fuselage, wing skins, aircraft structure and cowls in an aircraft.



Tool steels are used for mechanical parts to reduce size or weight. These steels are also called 'high-alloy steels' that are melted in small heats in electric furnaces and produced with careful attention to homogeneity. They are widely used for airplane parts such as principal cargo-support lugs, catapult hooks, airframe structures, and elevon hinges.

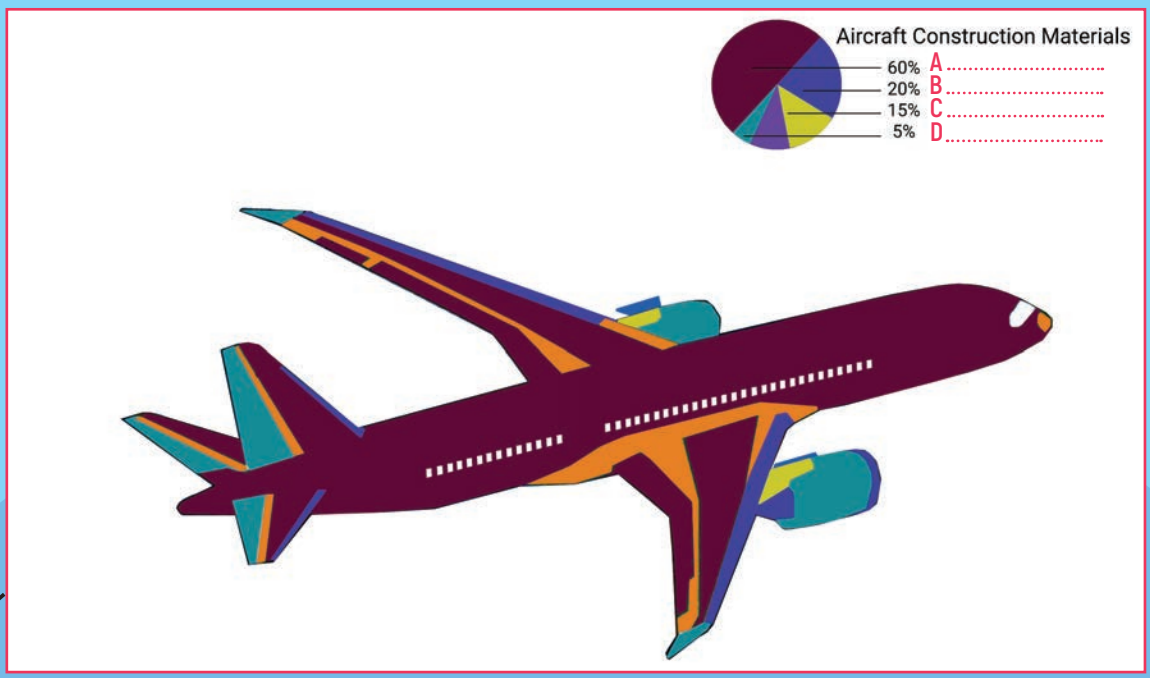


Cast iron contains 2.06 - 4% carbon and has low ductility compared to steel. Due to its being hard, it is not suitable for forming other than casting. It is generally used in the construction of engine blocks and machine bodies.

1. Ferrous materials have a lot of ..... in them. **aluminum / iron**
2. The most used type of steel is ..... . **carbon / tool**
3. Steel containing 0.10-0.30% carbon is called ..... . **medium-carbon steel / low-carbon steel**
4. ..... can be formed into any shape. **stainless steel / alloy steel**
5. Stainless steel can be used in any part of the aircraft. **True / False**
6. Alloy steel is used to make ..... . **engine blocks / wing skins**
7. Tool steels are also called ..... . **high-alloy steels / low-alloy steels**
8. Cast iron has low ..... . **hardness / ductility**

12. Look at the picture and write the materials in the box to the pie chart.

steel - other - aluminum alloy - composite - titanium



13. Read the dialogue and complete the chart.

Mr Şentürk: Today, we are going to learn about non-ferrous materials. They are in the metal materials group and do not contain iron or contain a negligible amount of iron. Firstly, if I tell you aluminum alloy is one of them, what do you consider?

Barış : It is light in weight.

Mr Şentürk: That's right, Barış. It has tensile strength, as well. The typical alloying elements are copper, magnesium, silicon, or nickel. Aluminum alloy is the most used metarial in aircraft construction today. What about the properties?

Ali : It is best known for low density, corrosion resistance and electrical conductivity.

Mr Şentürk: What else can we name for the other non-ferrous materials?

Ahmet : Can we say titanium?

Mr Şentürk: Sure. Another widely used material is titanium. Despite being a bit expensive, it is highly durable. It is categorized as alpha, alpha-beta and beta. They have an advantage of retaining strength at moderate service temperatures. Another one is copper. Is there anybody here who has an idea about copper?

Miraç : It has excellent electrical conductivity.

Mr Şentürk: Thank you for the information, Miraç. That's right. This feature makes it the leading material for electrical wiring. It eases the forming and joining, as well. However, they have low strength at elevated temperatures.

Gözde : Can we name nickel as a non-ferrous material?

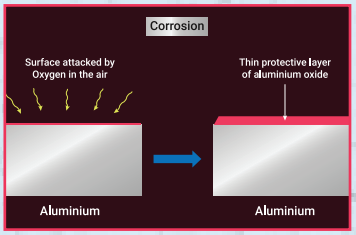
Mr Şentürk: Of course, Gözde, thank you. It has an elevated temperature strength and specific corrosion resistance, which are good properties. As for the advantages, it has good electrical, magnetic, and magnetostrictive power.

NON-FERROUS MATERIALS	PROPERTIES	ADVANTAGES
ALUMINUM ALLOY	1.	light in weight, tensile strength
2.	expensive, highly durable	retaining strength at moderate service temperatures
COPPER	3.	easing forming and joining
NICKEL	elevated temperature strength, specific corrosion resistance	4.

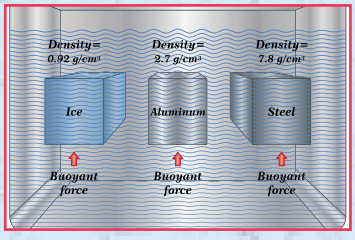
14. Match the highlighted words in Exercise 13 with their meanings.

1.	a. the degree to which a specified material conducts electricity
2.	b. able to attract materials or objects containing iron or steel
3.	c. able to last and be used for a long time without being damaged
4.	d. too small in amount to be important
5.	e. be able to be stretched
6.	f. a natural process that converts a refined metal into a more chemically stable oxide
7.	g. higher or greater than normal
8.	h. the quantity of something per unit volume, unit area, or unit length

15. Write which feature each picture shows according to Exercise 14.



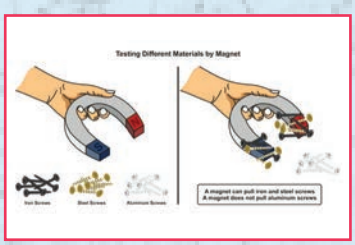
1 .....



2 .....



3 .....



4 .....

16. Write the words in the box into the correct categories.

NON-METAL MATERIALS

NATURAL ORGANIC MATERIALS	ARTIFICIAL ORGANIC MATERIALS
1. _____	1. _____
2. _____	2. _____
3. _____	3. _____
4. _____	4. _____
5. _____	

- CORK
- LEATHER
- PLASTIC
- RUBBER
- POLIESTER
- OIL
- WOOD
- TEFLON
- POLYETHYLENE

17. Read the text about non-metal materials and put a tick (√) according to the given information in the chart.

Non-metals are the elements in groups 14-16 of the periodic table. Unlike metals, non-metal elements are very brittle, and cannot be rolled into wires or pounded into sheets. The solid non-metals are neither shiny, malleable nor ductile. Besides, they are not good at conducting electricity and heat. They do not have metallic luster and do not reflect light. These materials can be found in nature and also can be gases at room temperature. There are natural inorganic materials such as clay, salt and minerals and artificial inorganic materials such as cement, lime, ceramic and glass. There is no living component in their formation.

	METAL MATERIALS	NON-METAL MATERIALS
1. Conducting electricity		
2. Being brittle		
3. Being able to be gases		
4. Being malleable		
5. Being ductile		
6. Having metallic luster		
7. Reflecting light		
8. Being able to be found in nature		
9. Being shiny		
10. Conducting heat		
11. Having organic and inorganic types		

18. Read the text in Exercise 17 again and complete the chart.

INORGANIC MATERIALS

NATURAL INORGANIC MATERIALS	ARTIFICIAL INORGANIC MATERIALS
1. _____	1. _____
2. _____	2. _____
3. _____	3. _____
	4. _____

19. Write the Turkish meanings of the words.

1. Conduct: _____
2. Reflect: _____
3. Clay: _____
4. Rubber: _____
5. Cement: _____
6. Cork: _____



20. Translate the sentences into Turkish.

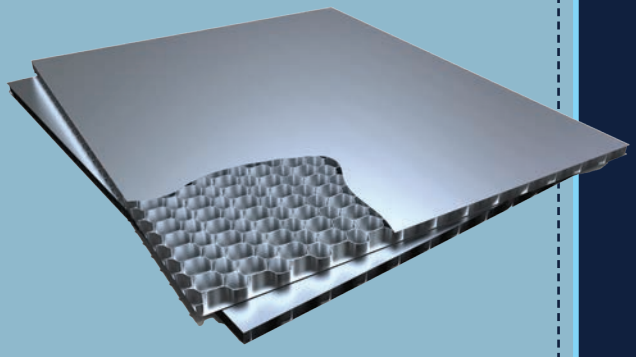
1. Non-metal materials are not good at conducting electricity and heat.
   _____
2. Non-ferrous materials do not contain iron or contain a negligible amount of iron.
   _____
3. Aluminum is best known for its low density, corrosion resistance and electrical conductivity.
   _____
4. Copper has excellent electrical conductivity.
   _____
5. Despite being a bit expensive, titanium is highly durable.
   _____
6. Stainless steel may be rolled, drawn, bent, or formed into any shape.
   _____
7. Ferrous materials have a lot of iron in them.
   _____
8. Tool steels are widely used for airplane parts such as principal cargo-support lugs, catapult hooks, airframe structures, and elevon hinges.
   _____



21. Read the paragraphs about the advantages of composite materials and match them with the correct titles.

A. .....

The greatest advantage of composites may be their high strength-to-weight ratio. Although carbon fibre weighs about 25% more than steel and 70% more than aluminium, it is much stronger and harder than both materials per unit of weight. Multilayer Composite Laminates absorb more energy than traditional single-layer steel. As a result, vehicle weight can be reduced by up to 60% while improving crash safety. The combination of composites has a positive impact on both consumers and manufacturers.



B. .....

A composite structure can last a very long time. They are preferred material by the engineers for being resistant to environmental effects, keeping their shape no matter how hard the condition is, and having more bearing strength than most of the metals. That's the reason why the composite buildings built possibly more than 50 years ago are still in use today.

C. .....

With composites, you have some design choices that are hard to make with conventional materials. For example, part consolidation is possible; a composite part can replace an entire metal part assembly. You can replicate any finish by changing surface texture. Plus, in the long term, these benefits reduce maintenance costs and manufacturing time.

D. .....

In the past, composites had to be fabricated by engineers using a complex lay-up process, which was time consuming and restricted the design geometry. Digital Composite Manufacturing (DCM) has totally changed that! With this patented manufacturing method, engineers can create composite parts much faster and more efficiently than ever before. They can also create locally or globally customized composite parts in three dimensions to create the perfect strength, density and flexibility for their project.

E. _____

Because thermoset composites can be correctly moulded, there is little waste and so, it costs significantly lower to produce composite materials than metal ones.

- Easy to produce
- New design alternatives
- Having a high strength-to-weight ratio
- Low cost in production
- Being durable

22. Write the Turkish meanings of the words.

1. strength-to-weight ratio: .....
2. absorb: .....
3. oxidize: .....
4. stability: .....
5. consolidation: .....
6. assembly: .....
7. time-saving: .....
8. waste: .....

23. Read the text and match the paragraphs with the pictures.

1. ____ The first airplane known in history is the Flyer 1 which was designed and built by Wright Brothers. It made its first flight in 1903. The device was made of wood, steel and fabric. Its flight controls were made of steel wires. However, because of the materials' instability, the airplane had some manoeuvrability problems in addition to the other problems related to weather conditions.

2. ____ When the Second World War broke out, people needed to carry the troops and weapons with better devices which had more manoeuvrability and greater speed. So, they started a more detailed research on the structure of the airplanes. That was when the metal structures with aluminum began to be used. But that time, they required greater consumption and increased the aircraft's total weight. Some designers came up with some solutions which enabled them to modify the structure of the aircraft according to the need.

3. ____ After the war, researches became widespread and engineers started to study on the materials which were much lighter in weight and had more flexibility and resistance. Then, composite materials were invented. Thanks to composite materials like metal sandwiches, better performance at a minimum cost has been attained. Today, more than 50% of the materials of an aircraft are made of composite materials, which improve strength, increase durability and decrease cost.

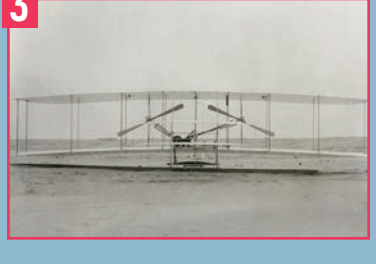
1



2



3



24. Put the materials below in order of their use in history.

aluminum - wood - steel - composite

1. ....., ...
2. .....
3. .....

1. Answer the following questions. Share your ideas with your friends.

Talk

1. Would you like to be an electrician? Why? Why not?
2. Who do you think is the most important inventor in the history of electricity? Why?
3. What would life be like without electricity?

2. Read the texts and match the inventors with the texts.

Benjamin Franklin - Nicola Tesla - Alessandro Volta - Thomas Edison - Michael Faraday



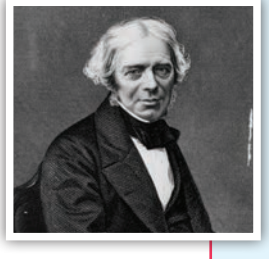
1 .....

He was the first person to prove that static electricity and lightning were the same. He discovered this through an experiment in which he attached a key to a kite string during a thunderstorm.



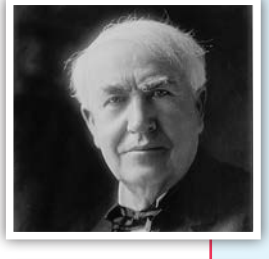
2 .....

He discovered the first battery, which was also called a 'voltaic pile'. He did the experiment using paper, salt water, zinc and copper. He soaked the paper in salt water; put copper and zinc on the other side of the paper. At the end of the experiment, he created an electric current.



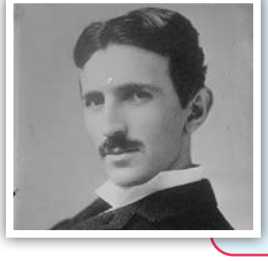
3 .....

He was the first person to realize that an electric current could be produced by passing a magnet inside a wired coil. It was an important discovery. Today, almost all the electricity we use is made with magnets and coils of copper wire in giant power plants. His most important invention was the electric motor.



4 .....

He invented many devices, such as electric power generation, mass communication, sound recording and motion pictures. He invented the modern light bulb. He designed and built the first electric power plant that was able to produce electricity and carry it to homes.



5 .....

He was the inventor of the AC power motor. In 1893, he demonstrated AC power with its coil and it was the key event in the history of electricity. He created the first modern power station at Niagara Falls. He founded his own electric company, made many inventions and had 700 patents.

3. Answer the following question.

What does the word 'electricity' remind you of? Write as many words as you can.

	ELECTRICITY	

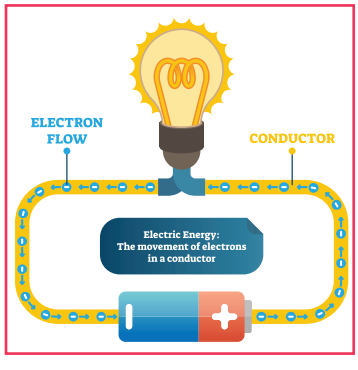
4. Read the text and answer the following questions.

All of the electric and electronic equipment we use, from lighting and heating homes and workplaces, operating devices, machines, audio-visual systems to communication and transportation run on electricity. All of these are powered by energy sources. Electricity is everywhere around us. It is one of the greatest inventions in human history. It is difficult to imagine the world without electricity.

What is electricity?

All the matter around us is made of atoms. Atoms are the smallest parts of an element. They are composed of nuclei and electrons. The nucleus is made up of protons and neutrons and the number of protons and neutrons is balanced. Neutrons have no electric charge, protons have positive charges (+) and electrons have negative charges (-). A positive charge of a proton equals a negative charge of an electron. In every atom, tiny electrons revolve around a nucleus, as our earth orbits around the sun. Sometimes electrons move from one atom to another. This movement of electrons creates an electric current. This electric current powers all our devices and machines. For electric current to move, it needs a closed circuit. The path taken by electric current is called a circuit. This means devices like fans or bulbs must be connected to both ends of the power source, the battery, by wires. If the circuit is broken, charges cannot move, and machines will not run.

1. What are some examples of electrically powered equipment?
   _____
2. What are all the matters made of?
   _____
3. What is made up of protons and neutrons?
   _____
4. How does electric current occur?
   _____
5. What is a circuit?
   _____



5. Circle the correct words for the definitions.

1. **Current / Circuit:** It is the flow of electrons through a material.
2. **Electrons / Protons:** Electricity is the movement of them through a conductor.
3. **Negative / Positive charge:** It is the charge on the proton.
4. **Battery / Static electricity:** It is a device that uses chemical reactions to produce electricity.
5. **Atom / Electricity:** It is a form of energy like potential, kinetic, light, chemical, etc.

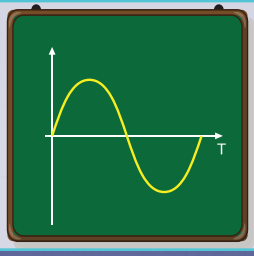
6. Answer the following questions. Search and share your ideas with your friends.

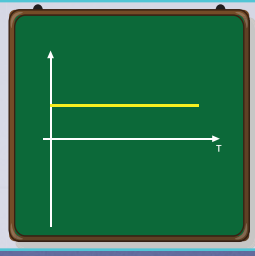
Talk

1. What does the word "current" remind you of? Tell at least three words.
2. How many types of current are there? Explain a type of current.

7. Write the current types in the box under the correct pictures.

Direct Current (DC) - Alternating Current (AC)





1 .....

2 .....

8. Complete the dialogue below with the given words in the box.

back/forth - direction - power - current - alternating current - devices - direct current - voltage - power stations - aircraft - AC-DC

Teacher: Last week we learnt [1] _____ types, AC and DC. Let's review the subject. What do [2] _____ and [3] _____ stand for?

Bilge : As I remember, DC stands for [4] _____ _____ and AC stands for [5] _____ _____

Teacher: That's right. What are the differences between AC and DC?

Emre : In DC, the electric current flows only in one [6] _____ in a circuit. In AC, the direction of the electric current in a circuit is constantly reversed [7] _____ and _____.



Teacher: Well done. Now, Eser, can you tell us how DC [8] _____ is generated and where the DC power is used?

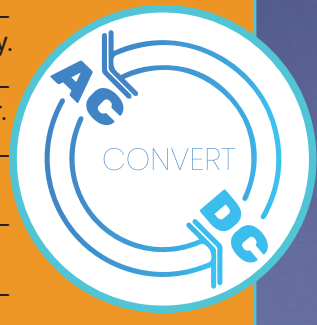
Eser : Of course, madam. The DC power is widely generated by solar cells, batteries, thermocouples. It is commonly used in low [9] _____ charging batteries, [10] _____ , cars, trains and other low current applications.

Teacher: Wonderful. And this is my last question. How is the AC power generated and where is the AC power used, Mehtap?

Mehtap : It is generated in [11] _____ _____ and used in our homes, household appliances, various machines and many other [12] _____. It is widely used as it is easier and cheaper to generate and can be transferred over long distances without much energy loss.

9. Translate the following sentences into Turkish.

1. AC can be transferred across long distances without much energy loss.
   _____
2. DC is not used to transfer energy across long distances as it loses energy.
   _____
3. The design of an AC generator is more simple than that of a DC generator.
   _____
4. AC motors used in AC generators are easy to maintain and smell-free.
   _____
5. DC generators are more durable than AC generators.
   _____
6. DC generators are useful in supplying electricity to large motors.
   _____



10. Answer the following questions. Share your ideas with your friends.

Talk

1. What do the conductor and insulator mean to you?
2. Why do you think conductors are widely made out of copper?
3. Which material do you think is widely used as an insulator; rubber or glass? Why?

11. Read the definitions, guess and try to complete the table by puttting a tick under the headings to indicate whether the material is a conductor, or an insulator or a semi-conductor.

Conductors are the materials that allow electric current to flow through them. Copper and iron are examples of conductors.

Insulators are materials that don't allow electric current to flow through them. Glass and paper are examples of insulators.

Semi-conductors are the materials that allow little electric current to flow through them. Germanium and silicon are examples of semi-conductors.

MATERIAL	CONDUCTOR	INSULATOR	SEMI-CONDUCTOR
Copper			
Rubber			
Plastic			
Silver			
Paper			
Silicon			
Gold			
Aluminium			
Ceramic			
Glass			
Mercury			
Iron			
Platinum			
Air			
Wood			
Germanium			
Gallium Arsenide			

12. Translate the following sentences into Turkish.

1. Conductors don't store energy when kept in a magnetic field.
   _____
2. Insulators store energy when kept in a magnetic field.
   _____
3. The thermal conductivity (heat allowance) of a conductor is very high.
   _____
4. The thermal conductivity of an insulator is very low.
   _____
5. Semi-conductors are more conductive than non-metals and less conductive than metals.
   _____

13. Answer the following questions. Share your ideas with your friends.

Talk

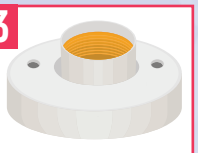
1. What equipment do we need to use electricity in our daily lives? Tell the class three pieces of equipment.
2. What is the name of the equipment that supplies electricity?
3. Which device is used to stop the flow of electricity in case of danger?

14. Write the correct words under the electric equipment.

power source/battery - socket/outlet - light switch - circuit breaker
electric distribution panel - bulb socket/holder- light bulb - plug - cable

1 

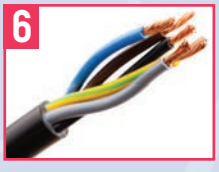
2 

3 

4 

5 

....

6 

7 

8 

9 

....

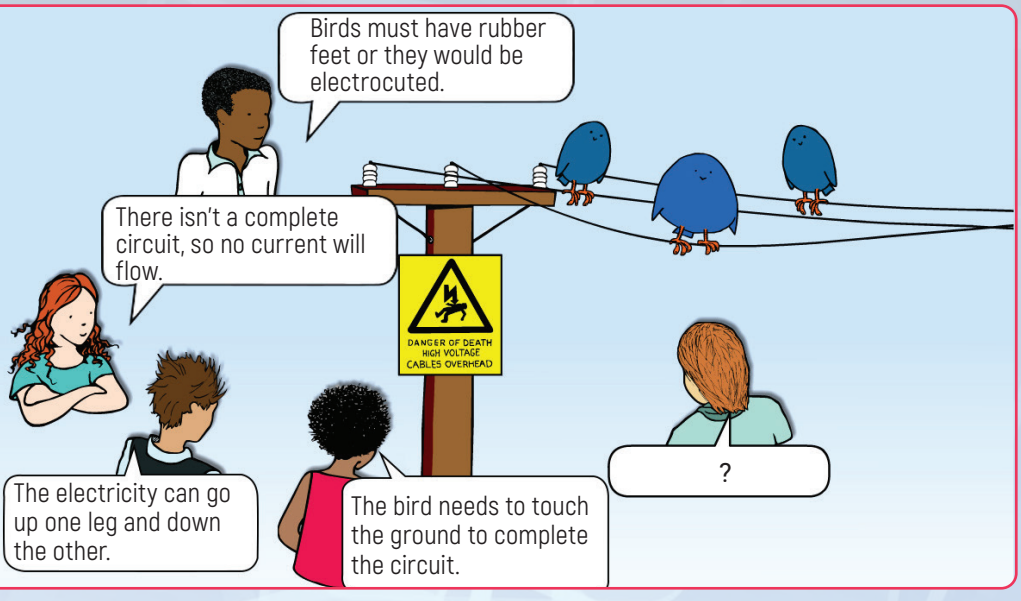
15. Match the equipment in Exercise 14 with their definitions. Three items are extra.

1. _____ : An electrical component that interrupts the flow of electrical current when it exceeds a certain amount
2. _____ : Part of an electrical device with two or three metal pins which fit into holes of an electric socket connecting the appliances to the electricity supply
3. _____ : An electrical component that converts electricity into light
4. _____ : An insulated wire made from conductor material that is used to transmit electricity from one place to another
5. _____ : An electrical component that stores chemical energy and converts it into electrical energy
6. _____ : An electrical component that can connect or disconnect the conducting path to a bulb

16. Answer the following questions. Share your ideas with your friends.

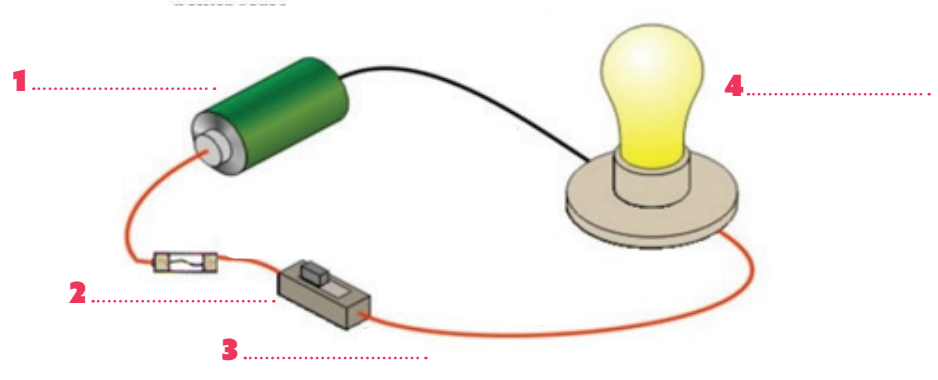
Talk

1. What does "electric circuit" mean?
2. What does "source mean" in an electric circuit?
3. What do you think about the speeches in the picture below? Whose idea is correct?



17. Read the paragraph and label the components of the circuit in the picture below.

A circuit is a complete path through which electricity (current) flows. A complete electrical circuit is required to make electricity practical. Electrons must flow from a power source and return to the power source again. By connecting the negatively and positively charged ends of a power source to a conductor, electrical potential difference occurs. So a complete circuit is a path or loop that allows current (electricity) to flow through. To make this circuit work, we need some essential components. These components are **a power source** (a battery, generator, etc.), **a protection device** (fuse or circuit breaker), **a control device** (switch, relay, etc.), **load device** (lamp, motor, etc.) and a conductor (a return path, wiring to ground). Open, closed, short, series and parallel are some types of circuits.

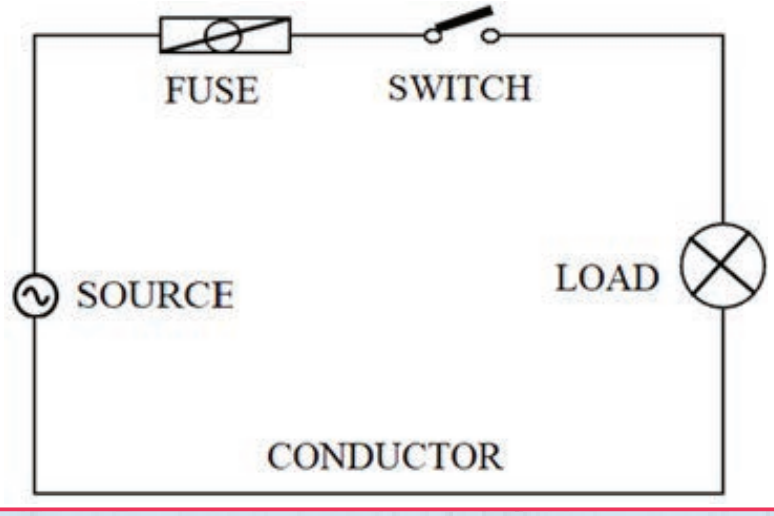


18. Match the circuit components to complete the sentences.

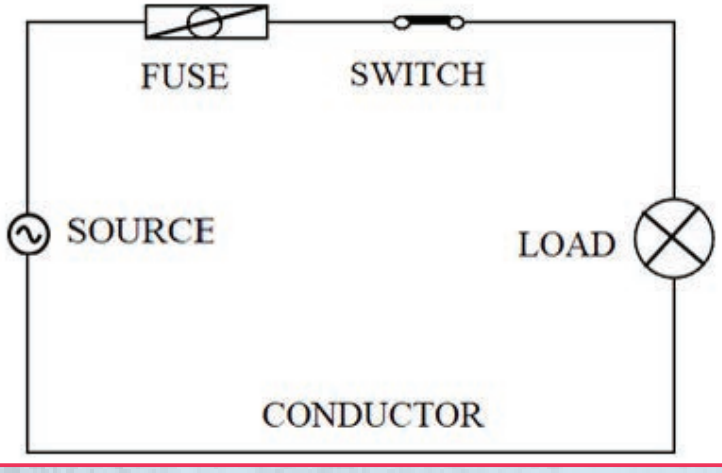
1. A protection device	A. _____ is needed to supply the flow of electrons (current).
2. A load device/receptor	B. _____ prevents damage to the circuit in the event of a short.
3. A power source	C. _____ allows us to control the circuit by turning it on or off.
4. A conductor	D. _____ converts the electricity into other types of energy.
5. A control device	E. _____ provides an electric path to and from power source.

19. Read the information about circuits. Search for information on series-parallel circuits and share it with your class.

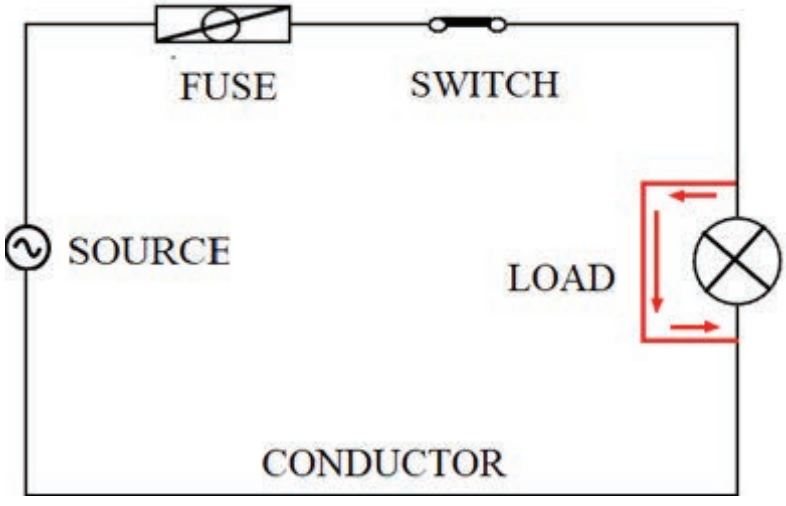
A. Open Circuit: This is a type of circuit which has no return path for the current to flow in it. That means it is not completed. A circuit with an open switch or blown fuse is an example of an open circuit. The light bulb won't glow as there is no flowing current in it.



B. Closed Circuit: This is another type of circuit which has a return path for current to flow in. That means it is a completed circuit. It has a closed switch where the light bulb is connected to the power source(battery). The light bulb will glow as the current flows through it.



C. Short Circuit: This is the third type of circuit which has a return path for current to flow through it and has a resistance equal to zero. It is completed or closed, but not connected to the load. In this type of circuit, there is a closed switch without a load connection to the voltage, so the fuse will blow or the circuit breaker will trip. This can give damage to the appliances or cause serious injuries.

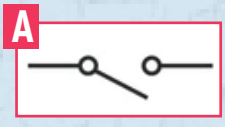


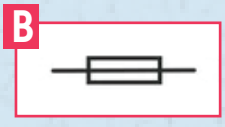
20. Read the information about circuits and write T (True) or F (False) to the sentences.

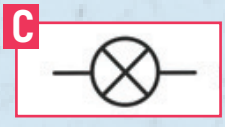
1. _____ An open circuit is a completed circuit where the light glows.
2. _____ A closed circuit has a return path, so the current flows in and the light glows.
3. _____ A short circuit is completed, but there is no connection to the load, so the light doesn't glow.
4. _____ In short circuit, the value of resistance is equal to ten.
5. _____ A problem in a short circuit can damage the appliances.

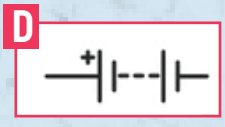
21. Write the letter of the symbols and the number of the definition under the correct heading to complete the chart.

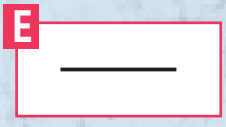
NAME OF THE COMPONENT	BATTERY	SWITCH	FUSE	CONDUCTOR	LOAD/ RECEPTOR
Definition					
Symbol					

A 

B 

C 

D 

E 

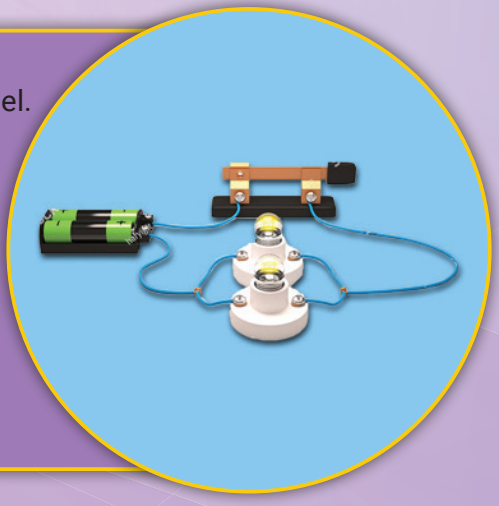
1. It opens and closes the circuit.
2. It is the source of energy that supplies electric energy to the circuit.
3. Cables with wires inside that conduct electricity.
4. It changes the electric energy into other types of energy.
5. It protects the circuit against over-current or short-circuit current.

22. Use the words in the boxes to complete the paragraphs A and B.

lamps - branches - circuit - components - flow

A. Parallel circuit:

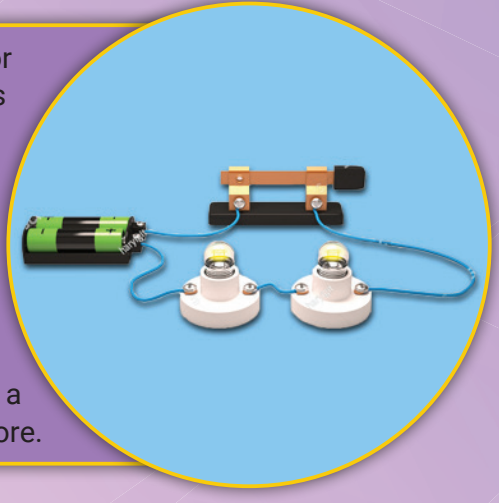
This is the type in which all the electrical [1] _____ are connected side by side in parallel. That is, different components are connected on different [2] _____ of the conductor (wire). There is more than one path for electricity (current) to [3] _____. If one part of the circuit is broken (a blown light bulb) the rest of the [4] _____ keep working, because the current continues to flow from other paths (branches). If more lamps are put into a parallel circuit, the [5] _____ stay bright.

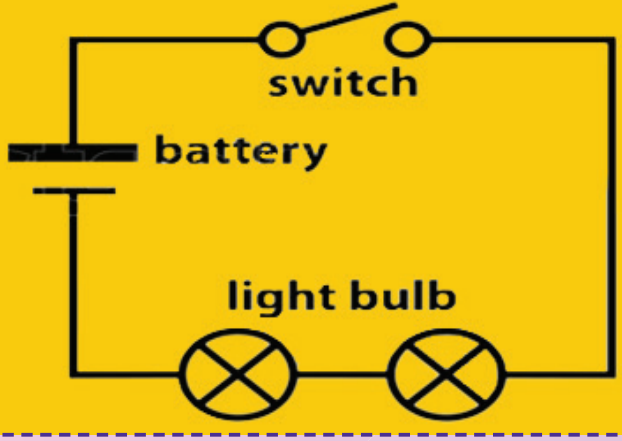


current - stops - contains - series - another

B. Series circuit:

This type of circuit [1] _____ only one path for electricity (current) to flow through. Components of a series circuit are connected end to end one after [2] _____ so the current must go through each component to get back to the power source. If a part of [3] _____ circuit broken (such as blown light bulb) or a component is disconnected in any place, the [4] _____ doesn't flow and the whole circuit [5] _____ working. If more lamps are put into a series circuit, the lamps will be dimmer than before.





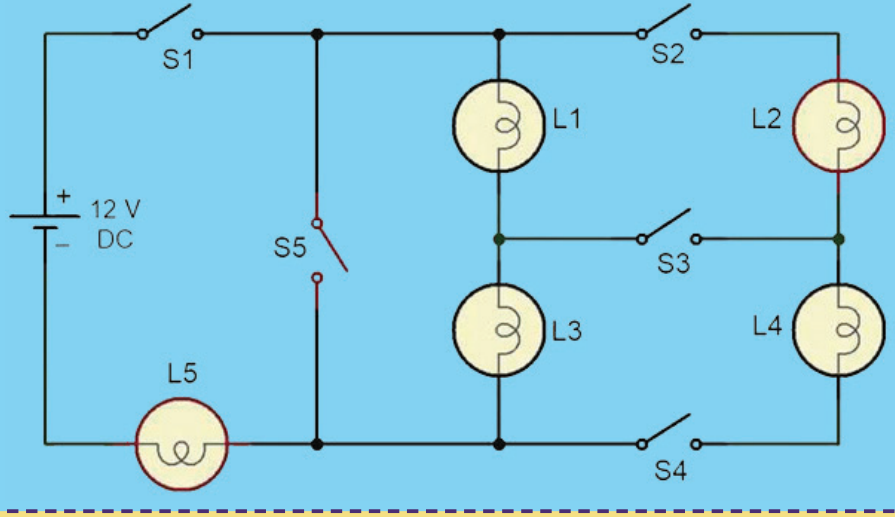
23. Translate the following sentences into Turkish.

1. The components of a parallel circuit are connected side by side.
   .....
2. There is more than one path for current to flow in a parallel circuit.
   .....
3. If a part of a parallel circuit is broken, the entire circuit keeps working.
   .....
4. There is one path for current to flow in a series circuit.
   .....
5. If a part of series circuit is broken, the entire circuit stops working.
   .....

24. Write the differences between series and parallel circuits.

SERIES CIRCUIT	PARALLEL CIRCUIT

25. Look at the circuit and answer the questions below.



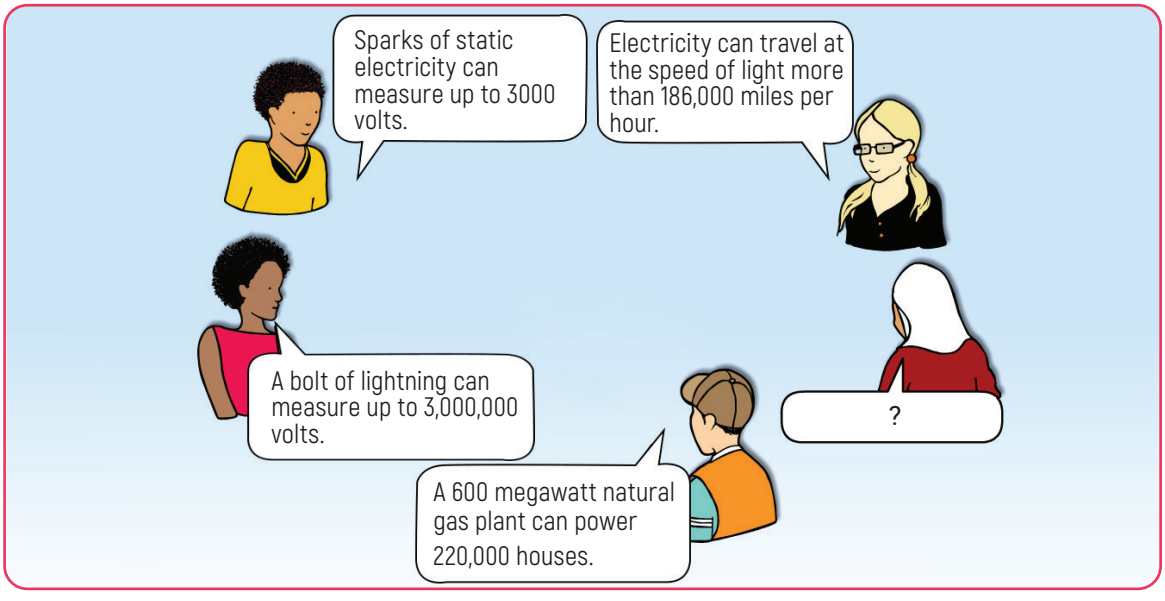
1. To light only L5 lamp, which switches / keys should we turn off?
   .....
2. To make L2, L3 and L5 lamps a series circuit, which switches / keys should we turn off?
   .....
3. If we turn off all switches / keys, which lights will go out ?
   .....
4. To make L1 and L2 lights a parallel circuit, which switches / keys need to be turned off?
   .....
5. If we turn off only S5 switch, which lamps will glow?
   .....

1. Answer the following questions. Share your ideas with your friends.

Talk

1. What is measurement? Why is it important in our lives?
2. What types of things are difficult to be measured?
3. Can we measure lightning? Why? Why not?

2. Work in pairs, look at the speech bubbles and discuss if the statements are true or false. Add a statement about measurement facts in real life.



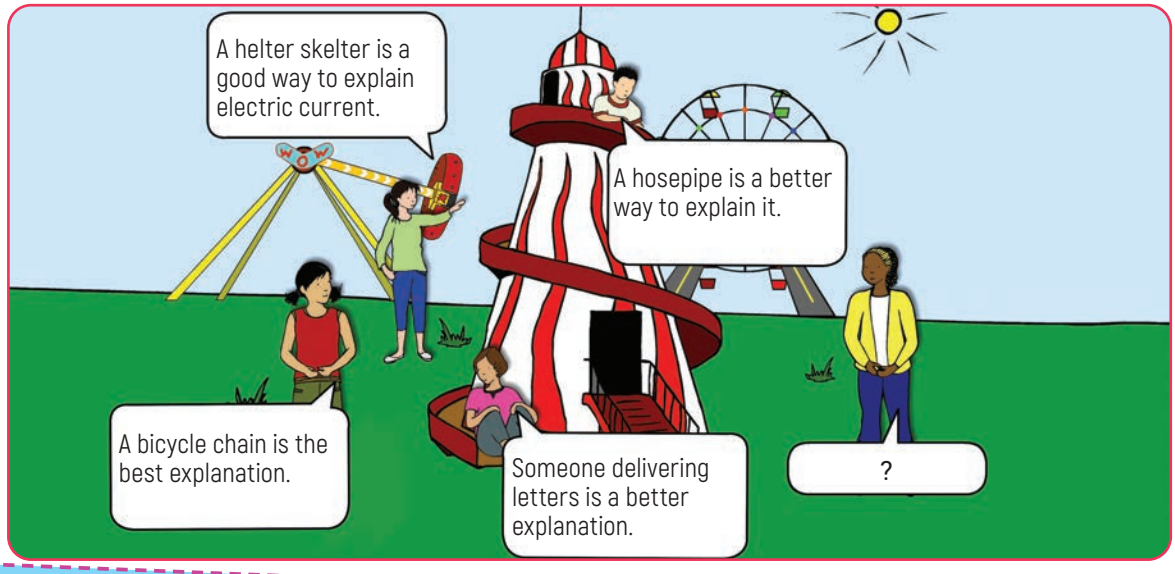
3. What do you know about measurement tools? Choose the correct answers.

1. We use a thermometer to measure...
   A. water heat B. weight of people C. current of electricity
2. A barometer is used to measure....
   A. atmospheric pressure B. water pressure C. electrical resistance
3. To measure electric current, we use a/an .....
   A. accelerometer B. ammeter C. meter
4. To measure electric charge, we use a/an .....
   A. electrometer B. evaoporimeter C. electronic tuner
5. We use a calliper to measure .....
   A. weight B. resistance C. length
6. To measure electric potential, we use a/an .....
   A. tilt meter B. ammeter C. voltmeter
7. To measure seismic waves, we use a/an .....
   A. spectrometer B. seismometer C. speedometer
8. An ohmmeter is used to measure electrical.....
   A. current B. resistance C. potential
9. An altimeter is used to measure....
   A. altitude B. time C. air pressure
10. To measure the pressure of gas, we use a/an...
    A. galvanometer B. heliometer C. manometer
11. To measure the strength of magnetic field, we use a/an....
    A. manometer B.magnetometer C. megger meter
12. To measure electrical power, we use a/an.....
    A. viscometer B. wattmeter C. into meter

4. Look at the speech bubbles in the picture and answer the questions.

Talk

1. Which of the following analogies best explains the electrical current? Why?
2. What analogy can you come up with for electrical current?



5. Read the paragraphs and answer the questions.

Measurement is finding a number that shows the size, capacity, amount or degree of something using an instrument or device. We can measure length, time, mass, volume, temperature, pressure, etc.There are many other things we can measure. For these measurements, we use different units and tools/devices. For example, kilogram, metre, litre, degree... Some of these measures can be seen easily, but some are difficult to understand. Electricity is one of the most confusing and difficult measurements as we cannot see it.

How is the electricity measured?

We always hear the terms volt, watt, ampere or ohm but it is not easy to understand the clear meaning of these terms. We go to an electrician and buy a 75-watt light bulb or we can say this washing machine runs on 220 volt etc. What do these terms mean?

To make the electricity measurement clear, we need an understandable, concrete example. The flow of electrons (current) through a cable is similar to the flow of water through a pipe or hose. The amount of water that passes through a certain pipe depends on two factors which are water pressure and the diameter of the pipe. Water pressure is how hard the water is being pushed which is comparable to voltage in a circuit. The diameter of the pipe can be compared to wires that conduct electricity. Changing the diameter of the pipe will change the amount of water flowing through it and this water flow can be compared to the current in a circuit. Electrons flow through a wire in the same way as in the case of water and hose / pipe. Electrical voltage pushes electrons and depending on the diameter of the conducting wire and/or resistance this pushing power creates a high or low current.

1. What is measurement? .....
2. What are some units of measurement? .....
3. What are electricity measurement units? .....
4. What is the other word for electrical power? .....
5. How does the diameter of a wire affect the current? .....

6. Read the paragraph and study the table. Then, do the resistance conversions below the table.

There are four basic physical quantities in electricity. They are resistance, voltage, current and power.

Resistance (R)
Resistance is the property of materials that slow or stop the flow of electrons. The resistance of a conductor wire depends on the metal that the wire is made of. The diameter of the wire is also important when it comes to the flow of electrons (current). If we make an analogy to water flow in pipes, when the pipe is thinner and the resistance is bigger and the water flow is smaller. Thus, we can conclude that when the resistance gets increased in a circuit, the current gets decreased and vice versa.

RESISTANCE UNITS AND CONVERSIONS:		
Resistance units	Abbreviations	Multipliers
Mega Ohms	MΩ	10^6 Ω=1,000,000 Ω
Kilo Ohms	kΩ	10^3 Ω=1,000 Ω
Ohms	Ω	1 Ω
Milliohms	mΩ	10^{-3} Ω=0.001 Ω

1. 7500 Ω = ... kΩ → 7500 Ω = 7500 x 10^3 kΩ = 7.5 kΩ
2. 2.7 KΩ = ... Ω → 2.7 KΩ = ...
3. 18 KΩ = ... Ω → 18 KΩ = ...
4. 2.2 MΩ = ... kΩ → 2.2 MΩ = ...

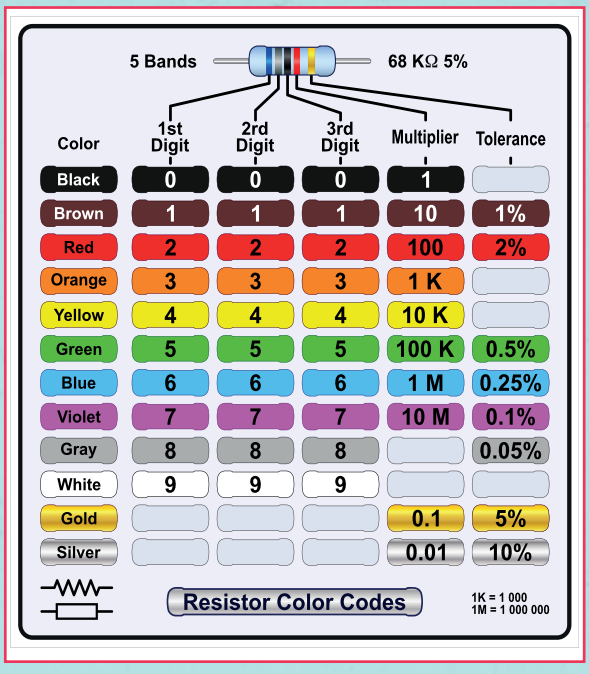
7. Read the paragraph on resistance colour coding and write the Turkish meaning of the words.

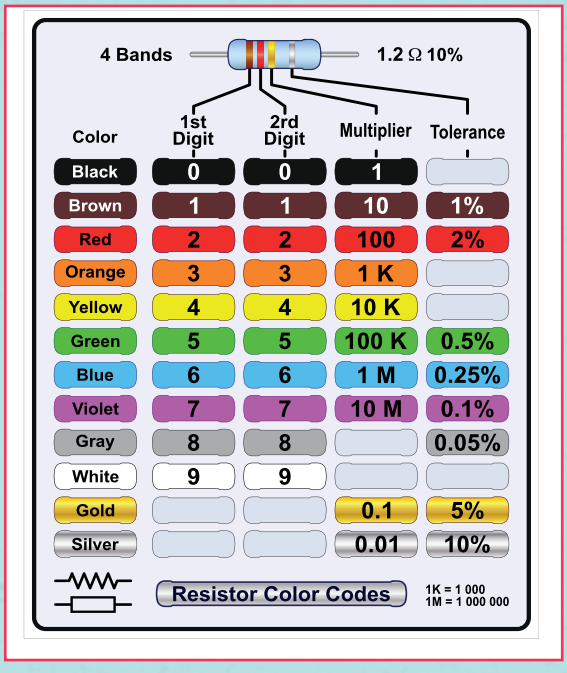
On fixed resistors, there are colour bands that aim to indicate the resistance value. The coloured bands on a resistor can tell everything you need to know about its value and tolerance. The order in which the colours are arranged is very important when it comes to reading the values. The number of coloured bands can change from resistor to resistor and each resistor with different numbered bands has its own unique combination. In a 4-band resistor, the first two bands refer to its value, the third band refers to a multiplier and the fourth band refers to its tolerance. In a 5-band resistor, the first three bands refer to its value and the last two bands refer to multiplier and tolerance. Tolerance is the percentage of the error in the resistance value. It is given as a percentage.

1. resistance value: .....
2. tolerance: .....
3. resistor: .....
4. multiplier: .....
5. colour band: .....
6. percentage :.....

8. Work in pairs, study the resistors' colour codes. Then, ask and answer questions about colours' value.

e.g. What is the multiplier of red colour? It is 100.





9. Read the information about a 4-band and 5-band resistors. Write the steps of a 6-band resistor.

How to read resistance codes.

Colour-coded bands are used to show resistance values. Each colour represents a number shown in the table.

In a 4-band resistor:

The first number gives the first digit.
The second number gives the second digit.
The third number indicates the number of zeros (multipliers).
The fourth number indicates the tolerance of the resistor.

In a 5-band resistor:

The first number gives the first digit.
The second number gives the second digit.
The third number gives the third digit.
The fourth number indicates the number of zeros (multipliers).
The fifth number indicates the tolerance of the resistor.

In a 6-band resistor:

10. Study the colour codes in Exercise 7. Then, complete the table by writing the colours and resistance values of the colour bands' resistors given.

RESISTORS	COLOURS CODES AND VALUES	RESISTANCE VALUES
	Brown - black - orange - gold 1 0 x1000 5%	10 KΩ ± 5%
	1.	
	2.	
	3.	
	4.	

11. Read the paragraph and match the highlighted words with their synonyms.

Measuring resistance

Measuring unit of the [1] resistance is called ohms (Ω). Ohms is the base [2] unit of resistance in an electrical system. An ohm can be defined as [3] transmitting a current of one ampere when subjected to a potential difference of one volt. It is measured with an AVOmeter, multimeter or ohmmeter.

A. ..... measure of opposition
B. ..... carrying
C. ..... measure, value

12. Circle the words to complete the instructions about resistance measuring steps with a multimeter.



1. **Read / Choose** the item/material whose resistance you want to measure.
2. **Plug / Take** the test leads into the test socket.
3. **Turn off / on** the multimeter and choose the best testing range.
4. **Insert / Touch** the multimeter leading to the ends of the component you are testing. Read and note the value.
5. **Turn off / on** the multimeter and unplug it.

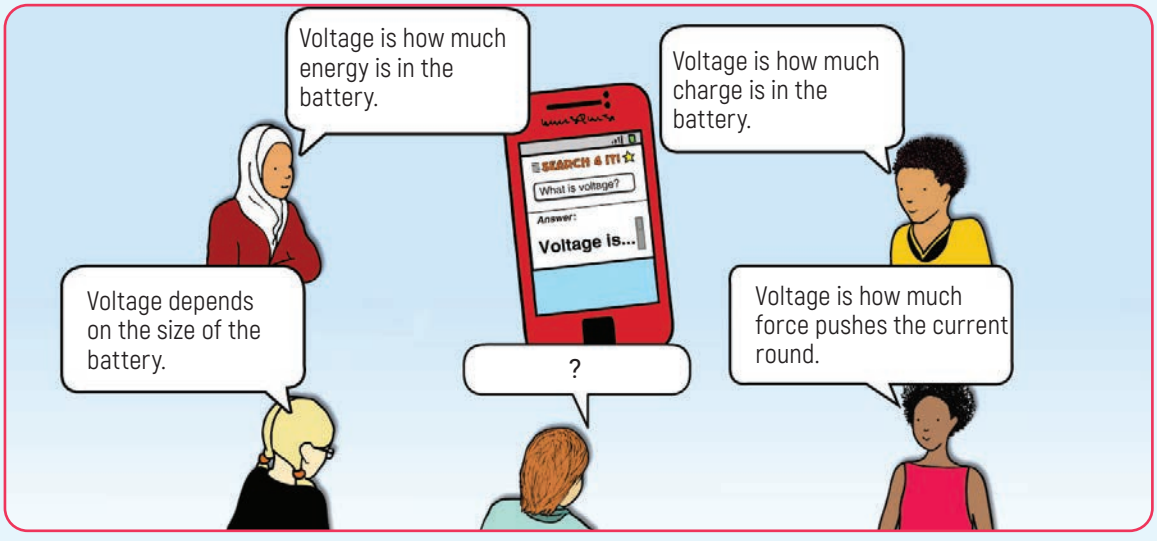
13. Answer the following questions.

1. What does the number on the multimeter display refer to?
   .....
2. What are the colours of the resistor whose resistance shows the number 2.2 kΩ?
   .....

14. Answer the following questions. Share your ideas with your friends.

Talk

1. What do you think the voltage is?
2. Read the speech bubbles and decide if each of the statement is true or false.



15. Read the paragraph and write T (True) or F (False) to the sentences.

Voltage is the amount of difference in electrical potential between two points in a circuit. That is, it is a measure of pressure applied to electrons to make them move in a circuit. The measurement unit of voltage is called volts (V). One volt is defined as the differences of electric potential between two points of a conductor carrying a constant current of one ampere, when the power dissipated between these points is equal to one watt. The potential difference is in an electrical circuit or voltage provided by energy sources (the batteries, generators etc.).

Let's describe it with a water analogy; a battery works like a water pump. The pump propels water through a pipe and increases pressure in the pipe. This pressure causes water to flow. In electricity, this electrical pressure is called voltage and measured in volts. When the numbers of volts increases, the current increases, too. A voltage of five volts can be written as 5 V.

1. ..... Symbol of voltage is (V).
2. ..... Volt is the unit of voltage.
3. ..... Batteries are energy sources.
4. ..... When the number of volts increases, the current decreases.
5. ..... A voltage of three volts can be written as 6 V.

16. Look at the voltage units and conversions table and do the conversions below the table.

VOLTAGE RATINGS	SYMBOL	MULTIPLIER	VOLTAGE VALUE
Kilo Volt	kV	10^3	1,000
Volt	V	1	1
Mili Volt	mV	10^{-3}	0.001

A. 15.5 kV = 15500 V B. 31.5 kV = ... V C. 380 V = ... mV

D. 600 V = ... kV E. 40 mV = ... V

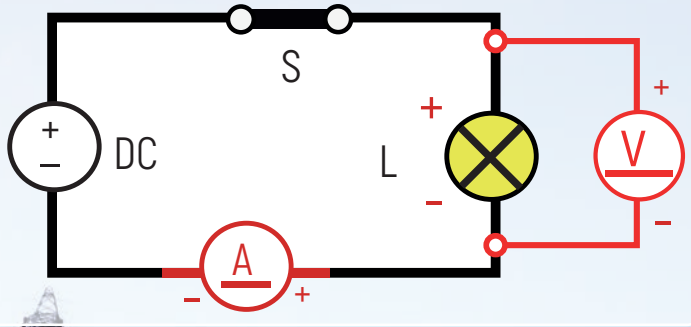
17. Complete the paragraph with the words in the box.

measure - electromotive - pressure - parallel

Measuring voltage

Voltage, also called [1] ..... force is shortly the [2] ..... that pushes electric current (electricity). A voltmeter is the basic electronic equipment used to [3] ..... the voltage between two points. Voltmeter is connected in [4] ..... to the circuit as its internal resistance is very high and connecting it in series would block the current flowing through the circuit. Both the multimeter and the AVOmeter have a voltmeter function and can be used to measure voltage.

18. Look at the circuit and write the words that the letters represent.



S : .....
L : .....
DC: .....
V : .....

19. Look at the picture and answer the questions.



1. What does the number on the multimeter's display refer to?
   .....
2. Which current is the device set to measure? AC or DC?
   .....
3. How are the multimeter probes plugged into the outlet to measure voltage? Parallel or series?
   .....

20. Write the correct voltage outputs in the box next to the table.

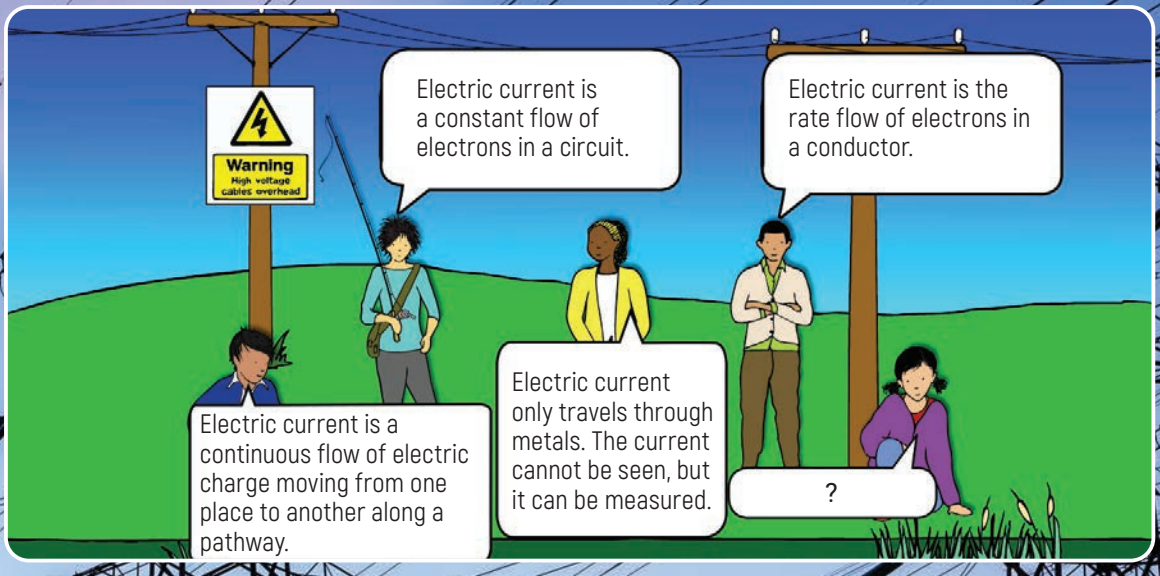
100 V - 5 V - 230 V - 120 V - 1.2 V

DEVICE/OBJECT	VOLTAGE
1. Single cell, rechargable battery	
2. Single cell, non-rechargable battery	1.5 V-1.56 V
3. USB	
4. Electrical vehicle battery	400 V
5. Multiengine aircrafts	28 V
6. Household outlet (Japan)	
7. Household outlet (North America)	
8. Household outlet (Europe, Asia, Africa, Australia)	
9. High- voltage electric power lines	110,000 V

21. Answer the following questions. Share your ideas with your friends.

Talk

1. Which of the following speeches in the picture describes the current well? Why?
2. What is your description of current?



22. Read the paragraph and match the highlighted words with their synonyms.

Current is the [1] quantity of electricity that is flowing through a wire at a specific time. In other words, the amount of electrons [2] flowing between two points having a difference in voltage is called current (I). It is measured in amperes or amps (A).

With the water [3] analogy; the amount of water passing through the pipe [4] increases when the diameter of pipe increases. Similarly, the amount of electrons flowing through wires(current) increases when the [5] diameter of the wires increases.

A. ..... - similarity - B. ..... - calibre - C. ..... - rise - D. ..... - amount - E. ..... - running

23. Look at the ampere units and conversions table and do the conversions below:

AMPERE/AMPS RATINGS	SYMBOL	MULTIPLIER	AMPERE VALUE
Kilo ampere	kA	10^3	1,000
Ampere	A	1	1
Mili ampere	mA	10^{-3}	0.001
Micro ampere	µA	10^{-6}	0.000001

0.8 kA = ... **0.8 kA = 0.8 x10^3** ..... = 800 A
250 A = ... = ... kA
0.025 A = ... = ... A
30 mA = ... = ... A

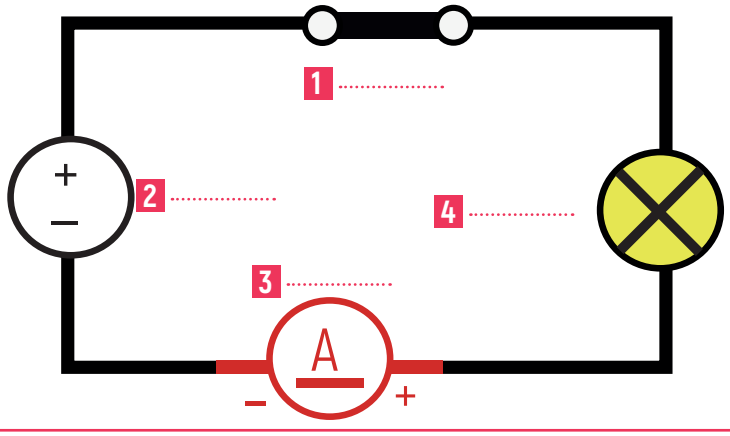
24. Complete the paragraph with the words given in the box.

connected - electricity - resistance - circuit

Current is the amount of [1] ..... flowing through a [2] ..... The instrument used to measure the rate of electron flow in a conductor is called ammeter. It is [3] ..... in series as its internal [4] ..... is very low and connecting it in parallel would cause a short circuit. Clamp meters, multimeters and AVOmeters have an ammeter function and can be used to measure current.

25. Write the words in the box in the correct places on the circuit.

ampere - lamp - direct current (DC) - switch



26. Look at the picture and answer the questions.



1. What does the number on the clamp meter's display refer to?
   .....
   .....
2. Which quantities can be measured with the clamp meter in the picture?
   .....
   .....
3. What current does the rotary switch on the clamp meter's display indicate?
   .....
   .....

27. Translate the following sentences into Turkish.

1. Use the rotary switch to set the clamp meter to measure current.
   .....
2. Make sure that the rotary switch is at the correct measurement range.
   .....
3. Open the jaws of the clamp and put them around the wire whose current is to be measured.
   .....
4. Read the number on the clamp meter's display.
   .....

28. Match the words with their definitions.

1. voltage	A. ..... the opposition to current flow in a electrical circuit
2. current	B. ..... the pressure that pushes electricity (potential differences).
3. resistance	C. ..... the flow of electrons through a circuit

29. Write the symbols of each quantities.

1. Voltage ..... 2. Resistance ..... 3. Current .....

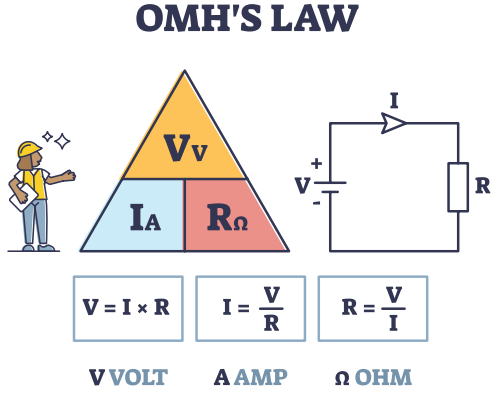
30. Complete the paragraph with the words in the box.

proportional - formulas - calculate - quantities

Ohm's law is used to [1] ..... the basic [2] ..... of voltage, current and resistance in electrical and electronic circuits. Ohm's law states that there is a relationship between voltage, current and resistance. The amount of the current flowing through a conductor between two points is directly [3] ..... to the voltage across the two points. When the voltage increases, the current increases and when resistance increases, current decreases and vice versa. The Ohm's law can be written in three [4] ..... (equations).

31. Look at the equations and solve the problems.

1. **Voltage = current x resistance - V= I x R**
2. **Current = voltage / resistance - I = V / R**
3. **Resistance = voltage / current - R= V / I**



1. In a circuit 0.4 A is flowing through the bulb. The voltage across the bulb is 12 V. What is the bulb resistance?
   .....
2. An electronic device has a resistance of 30 ohms and voltage of 12 volts. What is the current flowing through it?
   .....
3. An electronic device has a resistance of 10 ohms and current of 5 amperes. What is the voltage across the device?
   .....

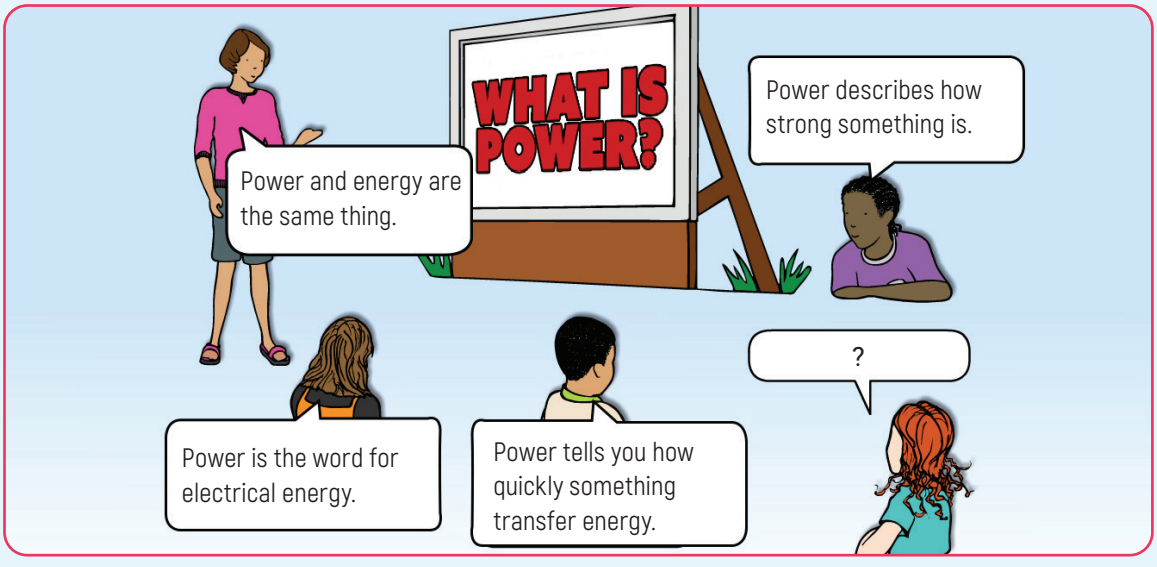
32. Complete the table using the information in Exercise 30 and picture of Ohm's law.

QUANTITIES	SYMBOLS	UNITS	ABBREVIATIONS
1. voltage			
2.		ohm	
3.			

33. Answer the following questions. Share your ideas with your friends.

Talk

1. What does power mean to you?
2. Which of the following character's idea do you agree with? Why?



34. Read the paragraph and complete the sentences with the highlighted words.

Power (P) is the rate of work done or energy transferred in a unit of time. In other words, the rate at which energy is converted into other forms such as heat, motion, etc. Electric power is also the rate at which electricity is produced and consumed. When we describe it with a water analogy, we can say that electric power is the combination of the water pressure and the rate of flow that results in the ability to do work. That is, electric power is the combination of voltage (water pressure) and current (rate of water flowing). It is the amount of electric current flowing because of an applied voltage. This amount of current is required to start a load for one second.

1. The sun's rays are ..... into electrical energy by solar panels.
2. How do you find the ..... of energy transfer?
3. Because of pollution, renewable energy sources are ..... to be used.
4. The ..... of two or more metals is called an alloy.
5. Take the ..... bank with you in case your phone's charge runs out off.

35. Look at the power units and conversions table and do the conversions below.

WATTS RATINGS	SYMBOL	MULTIPLIER	WATTS VALUE
Mega Watt	MW	10^6	1,000,000
Kilo Watt	KW	10^3	1,000
Watt	W	1	1
Milli Watt	mW	10^{-3}	0.001

1. 20 kW = 20/1,000 = 0.02MW
2. 0.0240 MW = ... = ... W
3. 100 W = ... = ... kW
4. 0.31 kW = ... = ... W
5. 0.04 W = ... = ... mW

36. Read the paragraph and complete the sentences below.

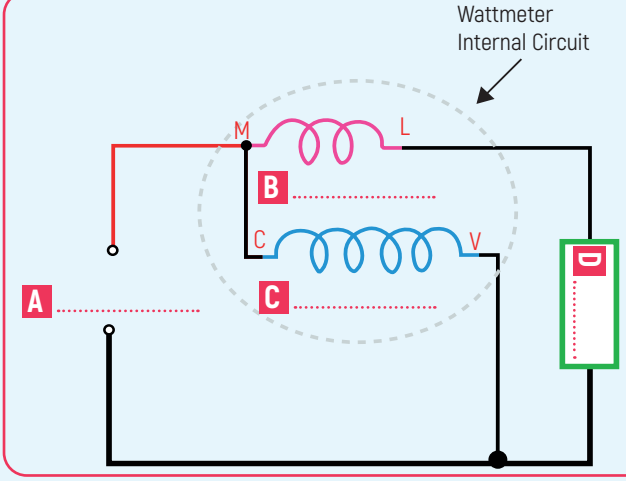
Power is the rate at which something uses energy and energy is the capacity to do work. The standard unit used to measure power is watt (W). A wattmeter is an instrument used to measure the electrical power in a circuit. The instrument has two coils; one current coil and one voltage coil. The current coil, which has M-L terminals, is connected in series with the load, like an ammeter. The voltage coil, which has C-V terminals, is connected in parallel with the load, like a voltmeter.

1. The rate of doing work is called .....
2. The standard unit to ..... the power is .....
3. To measure electric power in a/an ..... we use a .....
4. The current coil has ..... terminals.
5. Voltage coil is connected in ..... with the .....

37. Look at the circuit and match the terminals with their connections.

1. L terminal	A. ..... connects to the power supply.
2. C terminal	B. ..... connects to the load.
3. V terminal	C. ..... connects to the system neutral.
4. M terminal	D. ..... is shorted to the M terminal.

38. Write the words or phrases in the correct places on the circuit.



1. current coil
2. voltage coil
3. load
4. power supply

39. Look at the wattmeter picture and answer the questions.



1. What does the number on the wattmeter's display refer to?
   .....
   .....
   .....
2. What does the letter W on the wattmeter's display refer to?
   .....
   .....
   .....

40. Answer the following questions. Share your ideas with your friends.

Talk

1. What is an oscilloscope used for?
2. Do you have an oscilloscope in your school's atelier?

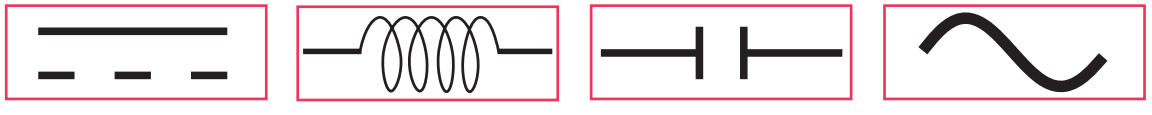
41. Read the paragraph and add three uses of oscilloscope.

Oscilloscope

An oscilloscope is an instrument used to measure and display electrical signals and how those signals change over time. It is used to quickly test, verify and fix electrical circuits. Controlling electronic graphs and detecting faults are also other uses of the oscilloscope. The oscilloscopes can detect and measure a variety of other signals. These are current, sound, capacitance, DC and AC voltage, frequency and inductance signals, etc. There are three basic settings needed to be adjusted to accommodate incoming signals; vertical, horizontal and trigger. The wave signals that are displayed on a graph give information about electrical quantities, such as:

1. Time and voltage values of a signal.
2. The frequency of the vibrating signal.
3. How much of a signal is alternating current (AC) or direct current(DC)
4. If a malfunctioning component is distorting the signal.
5. .....
6. .....
7. .....

42. Write the highlighted terms in Exercise 41 under the signals.



1 ..... 2 ..... 3 ..... 4 .....

43. Look at the picture and answer the questions.



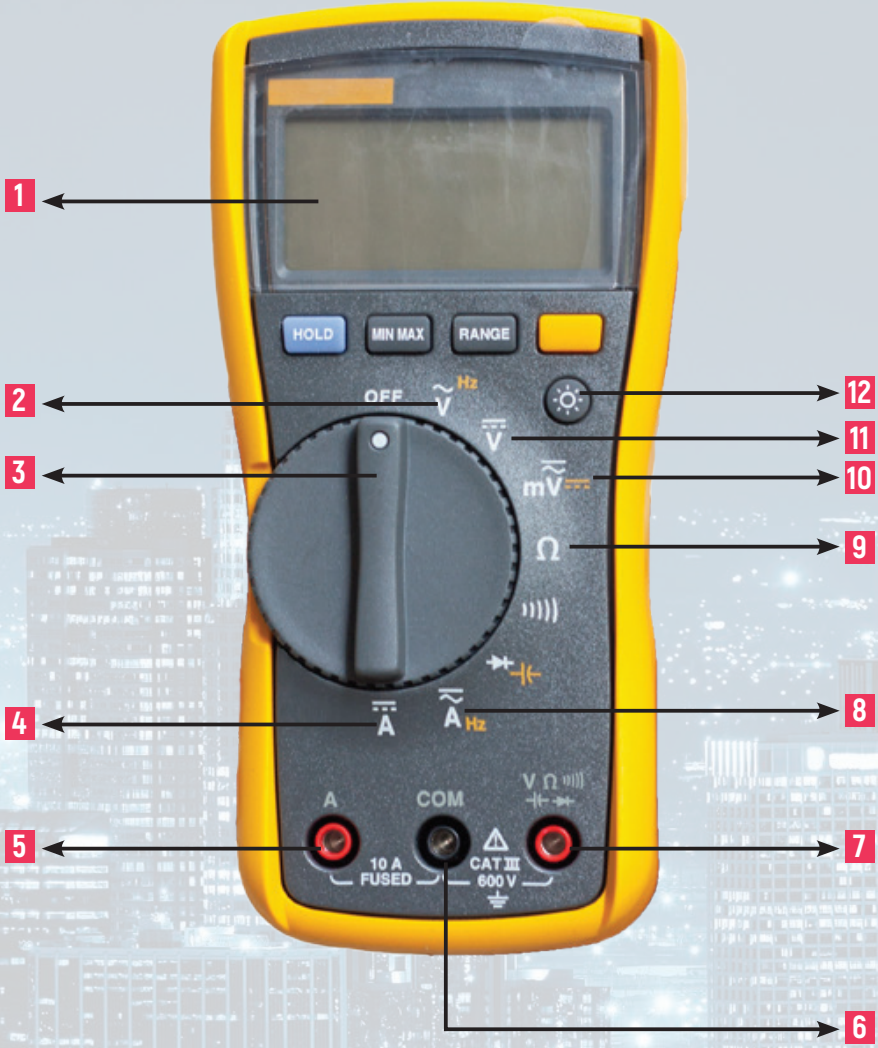
1. What does the A signal on digital oscilloscope's display refer to?
   .....
2. What does the B signal on digital oscilloscope's display refer to?
   .....

44. Look at the picture and circle the correct words to complete the sentences.



1. The woman in the picture is using an **ohmmeter / oscilloscope**.
2. She is **controlling / drawing** electronic circuit graph.
3. She is **designing / detecting** faults in an electronic circuit graph.

45. Look at the picture and match the numbers with the multimeter indications.



A. ..... Probe input for voltage, resistance and more
B. ..... Digital display/screen
C. ..... Common probe output
D. ..... Current probe input
E. ..... AC voltage
F. ..... AC current
G. ..... Resistance
H. ..... DC current
I. ..... AC / DC mV
J. ..... DC voltage
K. ..... Brightness button
L. ..... Rotary switch

46. Look at the symbols and complete the table.

SYMBOLS	INSTRUMENTS	DESCRIPTIONS	UNITS
1 			
2 			
3 			
4 			
5 			

47. Circle the correct words to complete the sentences.

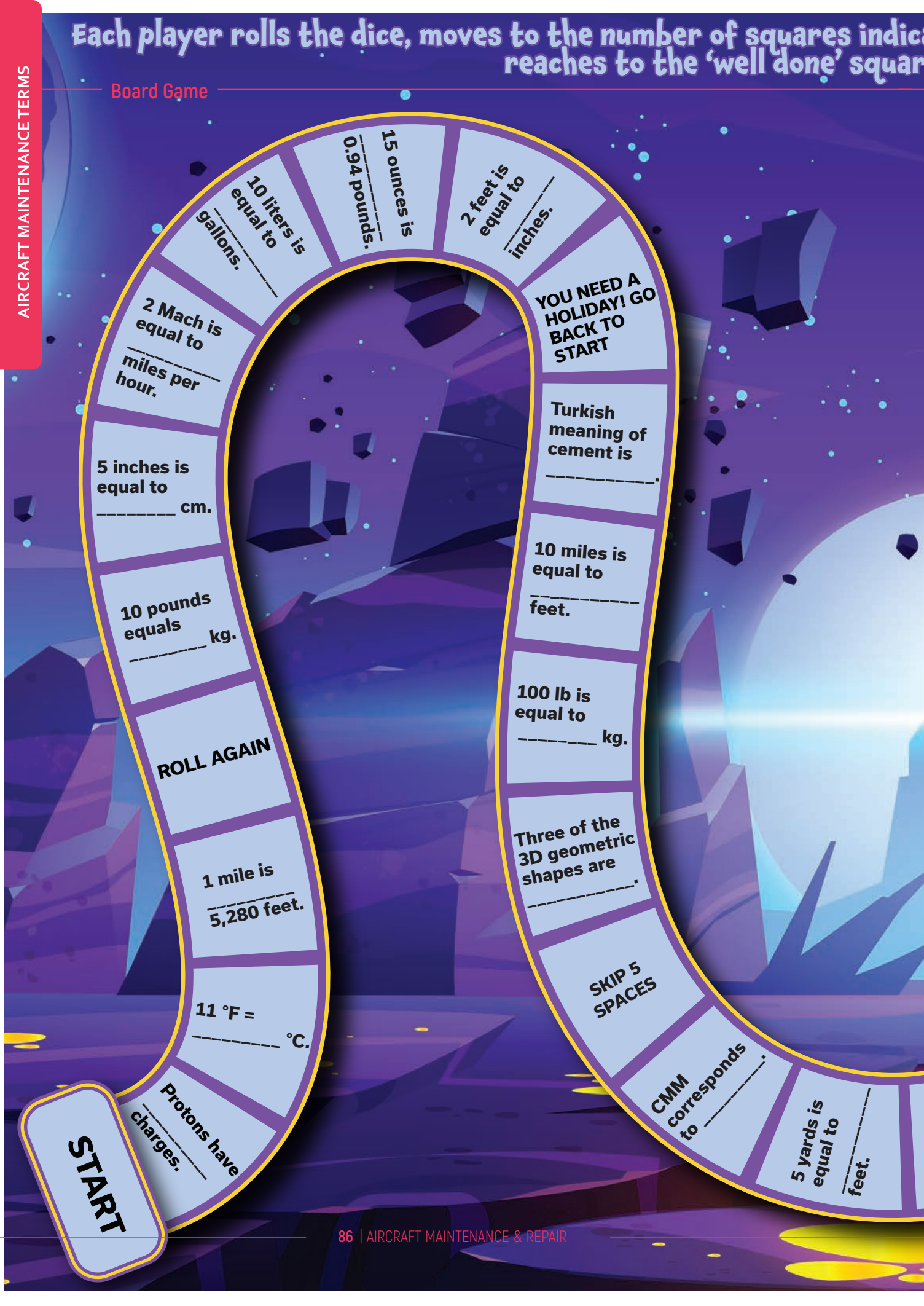
1. **A/an open/closed** circuit is a completed circuit.
2. **A short/closed** circuit is a completed circuit, but not connected to the load.
3. **A/an short/open** circuit is an uncompleted circuit.
4. **A/an voltmeter/ohmmeter** is equipment that is used to measure the voltage between two points.
5. **A/an wattmeter/ammeter** is equipment that is used to measure the current in a circuit.
6. **A/an clamp meter/oscilloscope** is equipment that is used to measure electrical signals and their change over time.
7. A voltmeter is connected to the circuit in **parallel/series**.
8. An ammeter is connected to the circuit in **series/parallel**.
9. **A/An ohm/circuit** is a measurement unit.
10. **A battery/multimeter** is measurement equipment.



SELF-ASSESSMENT			
I can			
understand and use the aviation alphabet.			
use cardinal numbers, decimals and fractions.			
read and write the units of measurement.			
convert the numbers from one unit to another.			
describe the types of technical drawing lines in English.			
describe technical drawing tools in English.			
explain basic geometric shapes in English.			
describe various dimensions in English.			
use English terms and definitions of simple hand tools and instruments in accordance with grammatical rules.			
read, write and explain basic hand tools terms in English.			
explain basic hand tools terms in English and use them in sentences.			
use materials and usage areas of English terms and definitions in accordance with the grammatical rules.			
read material terms in English			
build sentences of material terms in English.			
define the electrical-electronics terms in English.			
explain the types of electrical circuits in English.			
express electrical and electronic measurement units in English.			
express electrical and electronic measuring instruments and processes in English.			

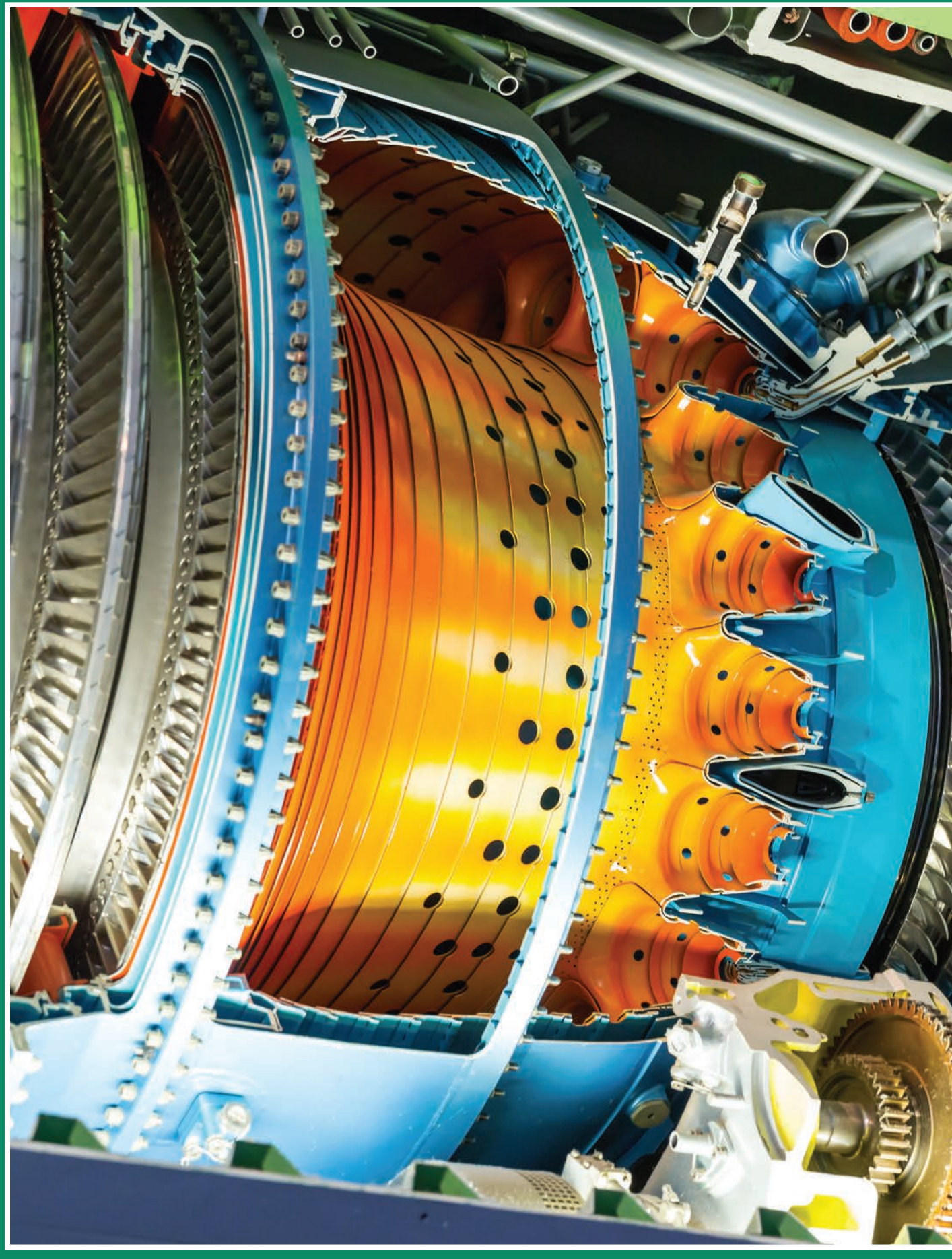
Each player rolls the dice, moves to the number of squares indica
reaches to the 'well done' squar

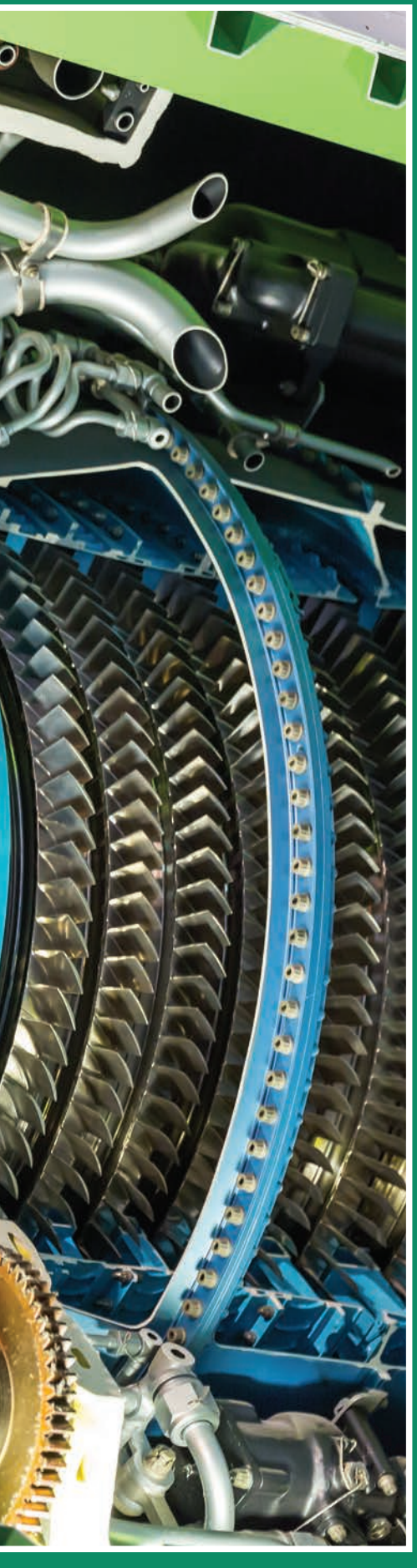
Board Game



licated, gives the answer and waits for his turn. The player that are is the winner. So, good luck!







UNIT TWO

MECHANICAL STRUCTURES OF AIRCRAFT



MODULE ONE
Aircraft Engines



MODULE TWO
Flight Control Surfaces



MODULE THREE
Aircraft Systems



MODULE FOUR
Technical Translation of Maintenance Manuals

1. Answer the following questions. Share your ideas with your friends.

Talk

1. What do you think is the most important part of an aircraft? Why?
2. What are the similarities and differences between car engines and aircraft engines?
3. Who intervenes in any malfunction of the aircraft during the flight?

2. Put the sentences about the history of aviation and aircraft engines in chronological order.

A. ..... The Wright Brothers, who were from the USA, invented the first successful airplane with a gasoline engine which allowed the rotation of two propellers in nineteen three.
B. ..... Frank Whittle submitted his first patent for a turbojet engine in nineteen thirty.
C. ..... The history of aviation began in the early seventeen eighties with the invention of hot-air balloons by the Montgolfier brothers.
D. ..... The British engineer George Cayley produced the world's first real glider in eighteen fifty- three.

3. Read Newton's third law of motion below and explain what you understand with examples.

Newton's third law: If object A exerts a force on object B, then object B must exert a force of equal magnitude and opposite direction back on object A. This law represents a certain symmetry in nature: forces always occur in pairs, and one body cannot exert a force on another without experiencing a force itself. Shortly, Newton's third law of motion **states that to every action, there is an equal and opposite reaction**.

.....

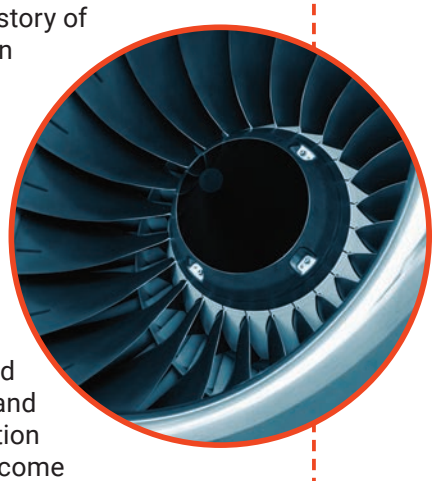
.....

.....

4. Read the text and match the highlighted words with their definitions.

Aircraft Engines

There is no doubt that the advantages of an aircraft are countless; for this reason, its invention can be considered one of the most important developments in the history of mankind. Aircraft engines are the crucial module and heart of aviation progress. They require a system that can provide thrust not only to generate enough speed for the wings to lift but also to overcome the weight of the aircraft for vertical takeoff. To maintain level flight, thrust must be provided that is equal to and in the opposite direction of the aircraft drag. What does that bring to mind? Of course, Newton's third law of action and reaction. All aircraft engines perform according to Newton's third law of motion. An aircraft engine is the propulsion system for an aircraft. Propulsion is defined as pushing or driving an object forward. A propulsion system produces thrust to push an object forward. Thrust is produced on aircraft through some application of Newton's third law of action and reaction. The engine accelerates a gas, or working fluid and the reaction to this acceleration produces a force on the engine. Aircraft engines come in many different types, but the most common ones are 'reciprocating', or so-called 'piston' engines and 'gas turbine' engines. Gas turbine engines have four types: turbojet, turbofan, turboprop, and turboshaft engines.



1. The moment when an aircraft leaves the ground and begins to fly: .....
2. To pull somebody/something along with effort and difficulty: .....
3. Standing or pointing straight up or at an angle of 90° to a horizontal surface or line: .....
4. To get faster: .....
5. A strong push: .....
6. To cause something to exist: .....

5. Read the text in Exercise 4 again and answer the questions.

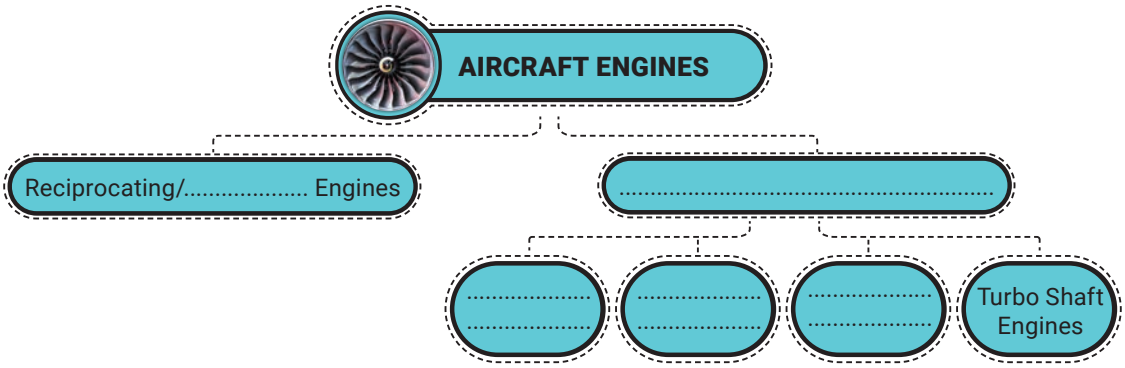
1. What is the role of aircraft engines in aviation progress?
   .....
2. What is the relationship between thrust and Newton's third law?
   .....
3. What is the propulsion system?
   .....
4. What is the basis for the principle of aircraft engines' operation?
   .....
5. How many types of engines are there? Write their names.
   .....

6. Read the requirements of aircraft engines and underline at least 8 adjectives describing them. You can also add your adjectives.

1. Aircraft engines must be reliable because they perform in a wide range of flight attitudes, severe weather conditions, pressure and speed. Any malfunction in aircraft engines may not lead to the same result as in a car engine, so reliability always comes before the design of the engine.
2. A light engine doesn't increase the aircraft's empty weight, it decreases its payload, as well, so aircraft engines must be lightweight.
3. Aircraft engines must be so powerful that they can overcome the weight and drag of the aircraft.
4. To reduce drag, they must be small and easily streamlined because large engines with a large surface area generate too much drag, waste fuel and reduce power output.
5. They must be repairable in order to reduce the cost of replacement. Minor repairs should be reasonably priced and accessible outside of specialised shops.
6. They must be fuel efficient in order to provide aircraft with the required range and manoeuvrability.
7. Aircraft engines should include two sets of anything, for example; an ignition system (spark plugs and magnetos) and fuel pumps. In the event of a malfunction of one, the other can be used and the flight can be completed without causing an entire engine to fail thanks to this. This makes them practical.

....
....
....
....
....
....

7. Look at the text in Exercise 4 and complete the missing parts of the diagram with the types of aircraft engines.

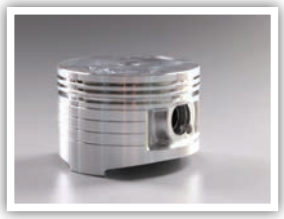


8. Look at the basic components of a reciprocating engine and write the words in the box under the correct pictures.

Crankshaft - Connecting rod - Cylinder - Intake / Exhaust valve - Crankcase - Spark plug - Piston



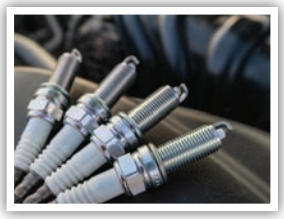
1. .....



2. .....



3. .....



4. .....



5. .....



6. .....

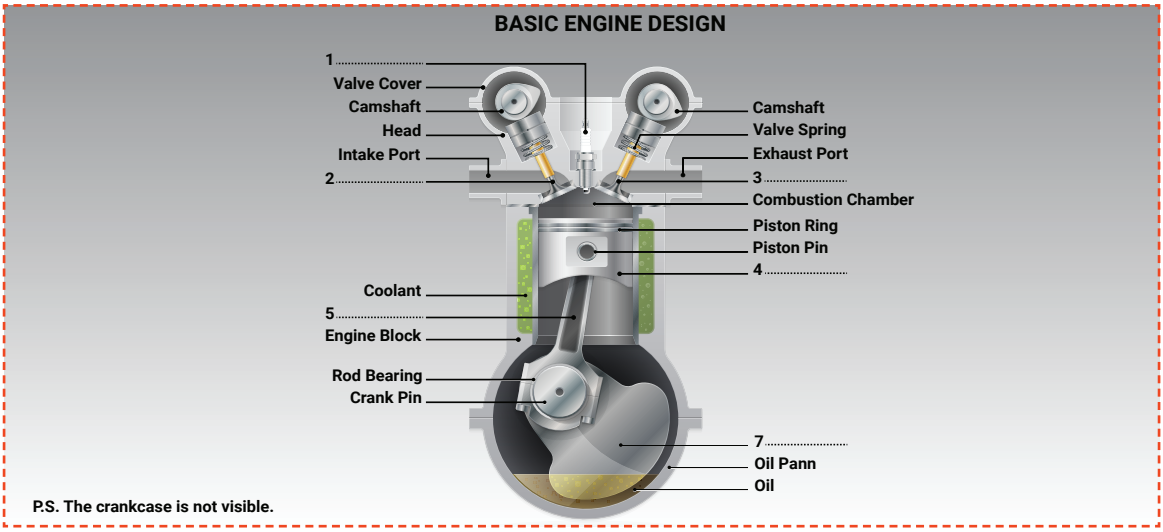


7. .....

9. Read the description of the components and complete the sentences with the components above.

1. A/an ..... is used to let the exhaust gases out.
2. A/an ..... that moves within the cylinder forms one of the walls of the combustion chamber. It has rings which seal the gases in the cylinder, preventing power loss around the sides of the piston.
3. A/an ..... forms a link between the piston and crankshaft.
4. A/an ..... forms a part of the chamber in which the fuel is compressed and burned.
5. A/an ..... and connecting rod convert the piston's straight line motion into a rotary turning motion. It also absorbs and transfers power or works from all of the cylinders to the propeller.
6. A/an ..... is the housing that surrounds the crankshaft and all of the other engine parts together.
7. A/an ..... is the spark of electricity that ignites the combustion required to start the vehicle.
8. A/an ..... is used to let the fuel or air into the cylinder.

10. Label the picture with the components of an aircraft engine.



11. Read the text and put the sentences in the correct order.

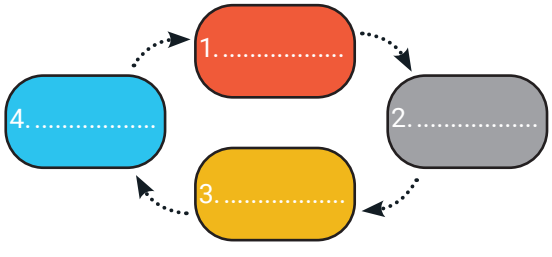
Piston / Reciprocating Engines

An aircraft piston engine, also known as a reciprocating engine, is an internal combustion engine, which means combustion takes place internally in a chamber within the engine cylinder. It converts pressure into rotational motion using one or more reciprocating pistons. The engine burns a mixture of fuel and air within a combustion chamber. The compression chamber is equipped with a piston that moves within it. The air-fuel mixture provides the energy for the piston's movement. Aircraft piston engines operate on the same principle as the engines in most automobiles. The basic operating principle of piston engines is that the intake valve in an engine draws air into a chamber, which is also called a cylinder. The air is compressed by a moving piston inside the chamber. When it is compressed sufficiently, fuel is sprayed into the compressed air through another inlet. Finally, the compressed fuel-air mixture is ignited by a spark plug, which causes the mixture to explode violently. This explosion creates power, and the power is used to move the piston back and take out the exhaust gases from the compression chamber. Then the process begins again. This happens hundreds of times per minute. AVGAS is the most commonly used fuel in aircraft piston engines.

- ☐ A. The mixture explodes violently.
- ☐ B. And the power comes out to move the piston back and remove the exhaust gases.
- ☐ C. A moving piston compresses the air in the cylinder (chamber).
- ☐ D. A spark plug ignites the compressed fuel-air mixture.
- ☐ E. First, an intake valve lets air into the cylinder (chamber).
- ☐ F. Gasoline is sprayed into the compressed air.

12. Unjumble the 4 steps of pistone engines' operation principle and then put the words in the diagram on the right in the correct order.

WPERO	UHSTXEA
a.	b. .....
IETAKN	IOCESOPRNMS
c.	d. .....



13. Match the words with their definitions.

Power plant - Ambient - Compressor - Nozzle - Inlet - Ignite
Propel - Combustion - Propulsion - Turbine

1. .....: The part of a machine through which liquid or gas enters
2. .....: The process of burning
3. .....: A (part of a) machine that presses gas or air into less space
4. .....: A part in a jet engine that accelerates the exhaust gases from the combustion chamber to a high velocity
5. .....: A type of machine through which liquid or gas flows and turns a special wheel with blades in order to produce power
6. .....: To (cause to) start burning or explode
7. .....: (especially of environmental conditions) Existing in the surrounding area
8. .....: A force that pushes something forward
9. .....: To push or move something somewhere, often with a lot of force
10. .....: An engine and related parts supplying the motive power of a self-propelled object

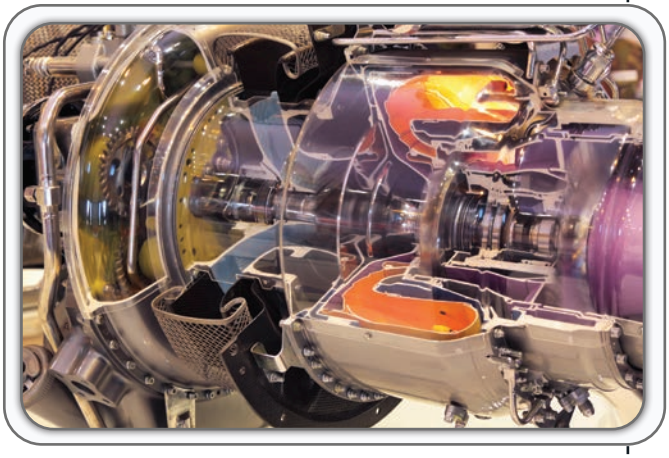
14. Translate the sentences into Turkish.

1. All turbine engines have an inlet to bring free-stream air into the engine.
   .....
2. Fuel combustion produces the energy required to run machines.
   .....
3. An aircraft power plant is an engine that is made up of many components, such as cylinders, pistons, and fans. They help airplanes and helicopters get off the ground.
   .....
4. Ambient air is drawn into the engine intake and then mixed with fuel.
   .....
5. Aircraft engines ignite to harness the power required for flight.
   .....

15. Read the text and find the similar meanings of the highlighted words. Then choose the correct answer.

Gas Turbine Engines

A gas turbine engine is simply a reaction engine that [1]generates thrust or propulsion by rapidly [2]discharging gas. It [3]operates in accordance with Newton's third law of motion, which states that "for every action (force), there is an equal and opposite reaction (force)." Gas turbine engines are highly preferable aircraft powerplants and are used more widely than piston engines. The majority of modern passenger and military aircraft are powered by gas turbine engines. They have five main components:



inlets, compressors, combustion chambers or combustors, turbines and exhaust nozzles, which are also called the core of the engine. All gas turbine engines, which are also called jet engines, work on the same principle. A gas turbine is a rotary engine that [4]derives energy from a stream of combustion gases. Ambient air is drawn into the engine through the inlet, and the air is compressed and heated by the compressor. Then, fuel is added to the hot and compressed air in the combustion chamber, and the mixture is ignited. After the ignition has occurred, it is self-sustaining because the continuous flow of air and fuel [5]ensures continuous combustion. The burning fuel/air mixture adds high energy to the exhaust flow by heating and [6]expanding the air. This energy leaves the combustion chamber passing through one or more turbines. This serves to power the compressor(s). The remaining portion of the exhaust energy is ejected through a nozzle, which creates thrust. When the exhaust gas passes through the nozzle, it is [7]accelerated to high speed because it expands, so it provides propulsion, and the aircraft propels forward.

1.	A. provides	B. produces	C. pushes
2.	A. sending out	B. absorbing	C. creating
3.	A. says	B. works	C. has
4.	A. escapes	B. keeps	C. obtains
5.	A. guarantees	B. hinders	C. spends
6.	A. increasing	B. decreasing	C. extending
7.	A. destroyed	B. furthered	C. calculated

16. Read the text in Exercise 15 again and complete the boxes on the right with the components of gas turbine engines and put the sentences in the correct order.

A. ..... This is the place where fuel is added to hot and compressed.
B. ..... It serves to drive compressors.
C. ..... It extracts the energy and produces thrust.
D. ..... 1 It draws air into the engine. — inlet
E. ..... It compresses and heats the air.
F. ..... Hot and compressed air is ignited here.

17. Read the text in Exercise 15 and write T (True) or F (False) to the sentences.

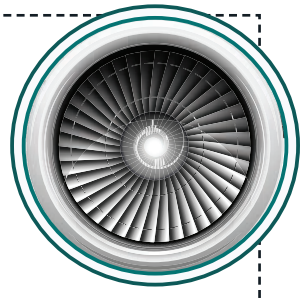
1. ..... The main purpose of a gas turbine engine is to generate thrust or propulsion by rapidly discharging gas.
2. ..... Piston engines are more popular than jet engines.
3. ..... Gas turbine engines are used to power passenger and military aircraft.
4. ..... A jet engine is a type of rotary powerplant that gets its power from a flow of combustion gases.
5. ..... Cold air is drawn to the engine.
6. ..... Fuel is added earlier than air.
7. ..... Turbines drive the compressors in gas turbine engines.

18. Look at the text in Exercise 15 and complete the missing letters with the components of jet / gas turbine engines.

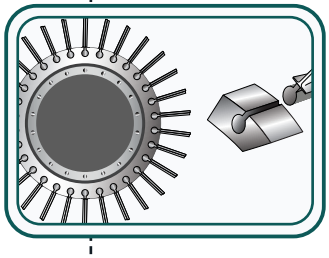
Components of Gas Turbine Engines

- _ _ _ _ t
- _ _ _ _ _ _ s _ _ _
- _ _ _ _ u _ _ _ _ _ _ _ _ _ _ _ _ _ _
- _ _ _ _ _ n _
- _ _ _ _ _ _ _ _ _ _ _ _ _ _

19. Read the paragraphs about the components of gas turbine power plants and put (X) to the correct answers.



Inlet: The inlet is a part of the aircraft that draws air into the propulsion system. What affects the performance of the propulsion system is the design of the inlet. On the other hand, the varying airflow demands of the engine have an effect on the performance of the inlet and the flight envelope of the aircraft. If an inlet is designed well, the engine produces high thrust with low fuel usage over a wide range of flight conditions and throttle conditions. On the contrary, if it has a poor design, it reduces the performance of the engine and the aircraft.



Compressor: Compressors are made up of a series of blades or airfoils, some rotating and some stationary. The compressor section of the engine is responsible for providing enough compressed air to meet the requirements of combustion. It raises the pressure of the mass of air drawn by the inlet and delivers it to the combustion section at the required pressure. The compressor section also serves as a source of bleed air for various systems. Compressors are classified into two types: axial flow and centrifugal flow. The main difference between them is how the air flows through the compressor.

Combustion chamber: It is located directly between the compressor and turbine sections. The combustion section's primary role is to burn the fuel/air mixture and add thermal energy to the air. To accomplish this effectively, the combustion chamber must provide a mechanism for the proper mixing of the fuel and air to ensure proper combustion. This mixture is efficiently burned, the hot combustion products are cooled to a temperature that the turbine inlet guide vanes/blades can withstand under operating conditions, and the hot gases are delivered to the turbine section. The combustion chamber is equipped with 20 fuel nozzles and 2 igniter plugs.



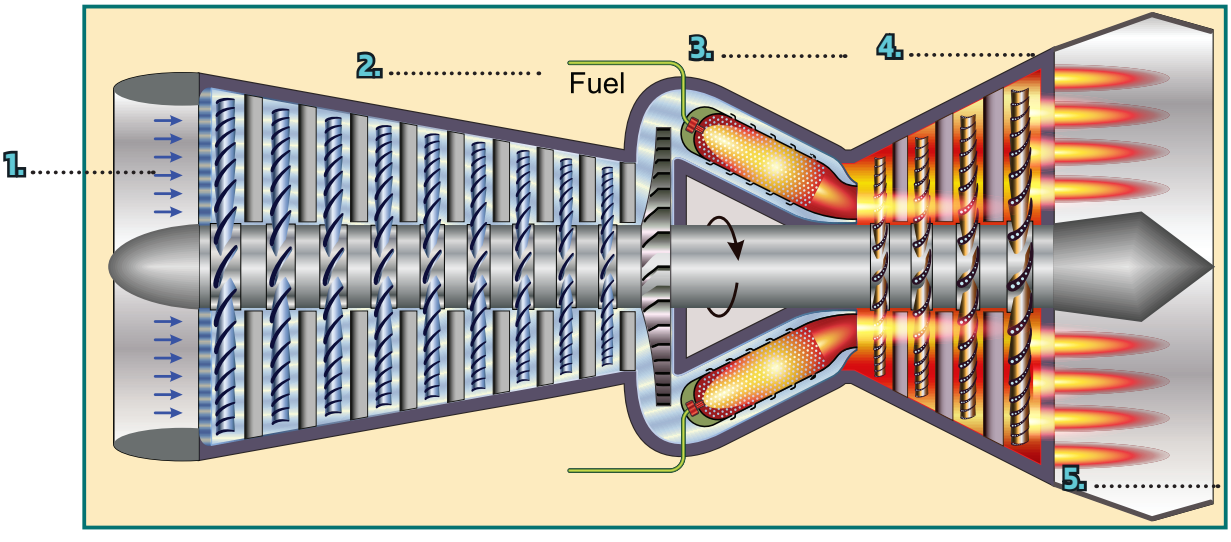
Turbines: The turbine converts the kinetic (velocity) energy of the expanding gases in the combustion chamber into mechanical energy to power the compressor and other components. A shaft connects the turbine to the compressor. The force of the turbine spins the compressor, which absorbs more air, restarting the cycle. The turbine is located directly behind the outlet of the combustion chamber. The turbine assembly is made up of two primary components: turbine inlet guide vanes and turbine blades.

Exhaust Nozzles: The purpose of the exhaust nozzle is to convert any energy remaining in the flow (after the turbine) to kinetic energy by accelerating the exhaust gases up to high velocity and decreasing pressure. This results in thrust. The exhaust nozzle is located directly behind the turbine section.



COMPONENTS OF GAS TURBINE POWER PLANTS					
Which component(s)	**Inlet**	**Compressor**	**Combustion Chamber**	**Turbine**	**Exhaust Nozzle**
1. is between the compressor and turbine sections?					
2. is responsible for drawing air into the engine?					
3. extracts bleed air?					
4. burns the mixture?					
5. powers like a windmill?					
6. 's good design ensures low fuel consumption?					
7. has the types of axial and centrifugal flow?					
8. produces thrust?					
9. consists of rotating or fixed blades?					
10. is connected to the compressor by a shaft?					
11. convert kinetic energy into mechanical energy?					
12. increases the pressure of air and sends it to the combustor?					
13. mixes fuel and air?					

20. Label the picture below with the components of gas turbine engines.



21. Read the text, then find and add the missing parts from box 6.

Turbojet Engines

The invention of jet engines was a breakthrough in the world of aviation, and turbojet engines were the first gas turbine engines invented. Although they seem very different from the reciprocating engine in a car or plane, they have the same operating system: intake, compression, power, and exhaust. Turbojets work by passing air through 5 main parts of the engine: air intake, compressor, combustion chamber, turbine and exhaust.

1. AIR INTAKE

It is basically a tube located directly in front of the engine. It may appear simple, but it is crucial. Its duty is to transfer air smoothly into the compressor blades. It must minimise airflow loss into the power plant at low speeds, and .....
.....
Because the air flowing into a turbojet needs to be subsonic, no matter how fast the aircraft is flying.

2. COMPRESSOR

It is powered by the turbine in the engine's back. .....
.....
..... . It is made up of a series of 'fans,' each with smaller blades. The air becomes more and more compressed while it passes through each compressor stage.

3. COMBUSTION CHAMBER

And this is where the real magic comes true. The high-pressure air is mixed with fuel and then they are ignited. As the fuel/air mixture burns, it proceeds through the engine towards the turbine. .....
.....
..... . Extra airflow is required to keep a turbojet cool, which is one of the main reasons why turbines run so lean.

4. TURBINE

The turbine is another set of 'fans' that operate similarly to a windmill, ...
.....
..... . The turbine blades are connected to and turn a shaft, which is also connected to the compressor blades at the front of the engine.
And the magic is about to complete.

5. EXHAUST

The high-speed burned mixture leaves the engine through it and .....
.....
..... . Finally, the aircraft pushes forward.

6.

A. thrust is produced
B. Turbojets operate extremely leanly, with around 50 parts air to every one part fuel
C. it must slow the airflow below Mach 1 at supersonic speeds
D. absorbing energy from the high-speed air which passes through it
E. It compresses the incoming air and increases its pressure significantly

22. Read the sentences about the pros&cons of Turbojet Engines and write the answers on the note papers on the right.

1. Turbojet engines have a simple design and construction and a low weight-to-power ratio.
2. They have a higher rate of climb.
3. They are very noisy.
4. They are capable of high speeds.
5. They consume too much fuel.
6. They are free from vibration as they have balanced forces.
7. They cause low maintenance and low cost.
8. Their efficiency reduces at a lower speed.

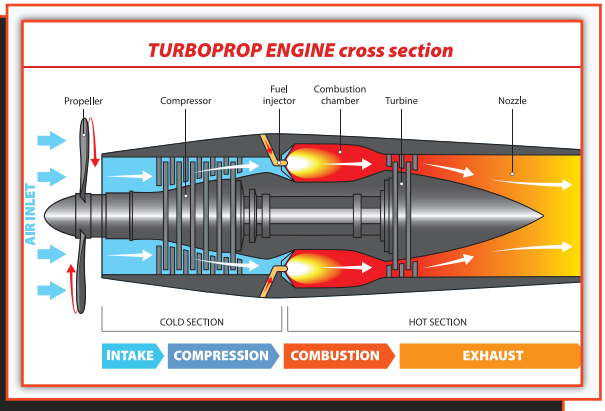
√

X

23. Read the text and write T (True) or F (False) to the sentences.

Turboprop Engines

A turboprop is a jet engine that drives an aircraft propeller. A turboprop engine houses a compressor, combustor and turbine. And it has the same operating system as the other jet engines. The primary distinction of a turboprop engine is that it has additional turbines, a power shaft, and a reduction gearbox to drive the propeller. Energy from the turbine is used to turn the propeller. The shaft connects the propeller to the turbine. The engine spins the shaft, which is connected to a gearbox. The gearbox controls the propeller's speed. The propeller generates thrust by moving a large mass of air. Turboprop engines are not used in high-speed aircraft because the efficiency of the propellers decreases as the speed of the aircraft increases. But they are very fuel-efficient and are not as heavy as turbojet engines. As they are more lightweight, they can perform more efficient takeoffs than typical jet engines. They are suitable for shorter distances. But their gearing systems are heavy and can require maintenance. Most propeller planes are powered by turboprop engines today. Turkish Primary and Basic Training Aircraft, Hürkuş, is an example of this.



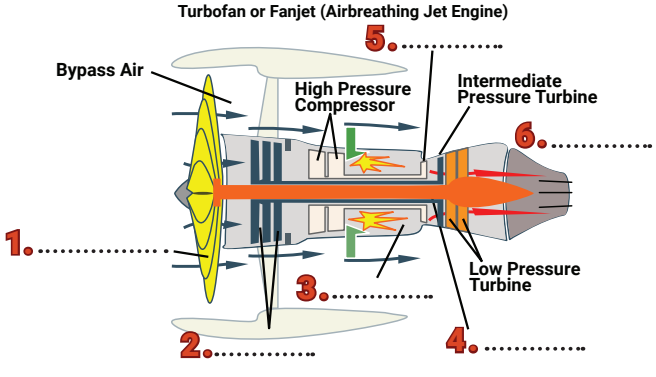
1. ..... The main difference between turboprop engines and jet engines is propellers.
2. ..... Turbines, a shaft and a gearbox are used to start the engine.
3. ..... The shaft links the turbine to the propeller.
4. ..... The shaft is spun by the engine.
5. ..... The gearbox adjusts how fast the propeller rotates.
6. ..... Thrust is produced by the shaft.

24. Read the text again and write the pros&cons of Turboprop Engines.

1.	√	1.
2.		2.
3.		3.
4.	X	

25. Look at the picture of the Turbofan Engine and label the words in the box.

- Low Pressure Shaft
- Combuster
- Intermediate Pressure Compressor
- Nozzle
- High Pressure Turbine
- Fan



26. Read the text and answer the questions.

Turbofan Engines

Turbofan engines are jet engines that have a huge fan at the front and create thrust by rotating with the compressor. The fan's tasks are to generate additional thrust, help the engine cool down, reduce engine noise, and make the engine more powerful without requiring additional fuel. This is the most important feature that distinguishes it from other aircraft engines.
How do turbofan engines work? First, the air is captured by the engine inlet. The inlet air is separated into two streams. One stream (bypass air) flows around the engine, while the other flows through the engine core. Then, bypass air circulates around the engine and is accelerated by a fan, producing extra thrust. Next, the air flows through the turbojet engine and continues the thrust production. Most commercial jet engines nowadays are turbofans.

1. What is the purpose of the fan in a turbofan engine?
   .....
2. Where does the air pass through?
   .....
3. Does the engine consume more fuel due to the fan?
   .....
4. What is the difference between turbofan engines and other engines?
   .....
5. What are the majority of commercial jet engines today?
   .....

27. Read the pros&cons of Turbofan Engines and circle the correct answer.

1. They are not very efficient at extremely high altitudes.
2. They are very quieter than turbojets.
3. They are fuel-friendly.
4. They are heavier than turbojets.

Pros √	Cons X
Pros	Cons
Pros	Cons
Pros	Cons

28. Read the text about Turboshaft Engines and write T (True) or F (False) to the sentences.

Turboshaft Engines

Turboshaft engines are most commonly used in helicopters. The main difference between a turboshaft and a turbojet engine is that a turboshaft engine uses most of its power to spin a turbine instead of generating thrust from the rear of the engine. A turboshaft engine has a very large shaft that is at the back of the engine. It works almost like a turbojet. The shaft that is attached to the turbine drives the gearbox and is responsible for transferring rotation from the shaft to the rotor blade. Then the helicopter flies through the sky.



1. ..... Turboshaft engines don't produce thrust from the back of the engine.
2. ..... Turboshaft engines are used in large passenger aircraft.
3. ..... A turboshaft engine has a large shaft at the front of the engine.
4. ..... The rotation from the turboshaft engine is what allows the helicopter to fly.

29. Read the pros&cons of Turboshaft Engines and circle the correct answer.

1. They are light in weight and have a good static performance.
2. They are smaller than piston engines.
3. They are very loud.
4. As the gear system is connected to the shaft, it may break down easily.

Pros √	Cons X
Pros	Cons
Pros	Cons
Pros	Cons

30. Read the interview between an aeronautical engineer and a reporter. Match the questions with the answers.

Mr Yılmaz: 1. .....
Mr Yiğit : Designing an aircraft requires high-level technological knowledge. Starting as a childhood dream for me, becoming an aeronautical engineer turned into a career plan over time. The fact that it contains different disciplines and requires high technological knowledge has always excited me.
Mr Yılmaz: 2. .....
Mr Yiğit : Sure. Aeronautics is a multidisciplinary branch of science that includes many fields such as mathematical modelling, analysis, design, manufacturing, maintenance, and certification. Young people who develop skills in this area can be successful in any field they choose to work. In general, I recommend they have general knowledge of these different fields and be experts in at least one of them, such as aerodynamics, mechanics of materials, or propulsion.
Mr Yılmaz: 3. .....
Mr Yiğit : The short answer is that the aviation industry is expanding with each passing day. An average of 10,000 transportation planes take off every day. This number does not include air taxis, unmanned aerial vehicles, or small-scale aircraft. We are talking about an industry that is growing every day in design, operation, and maintenance.
Mr Yılmaz: 4. .....
Mr Yiğit : It is quite difficult to answer this question. In my opinion, the heart of an aircraft is its requirements. Aircraft is the general name for fixed- and rotary-wing airplanes, lighter-than-air aircraft, and heavier-than-air aircraft. The design and operating purpose of an aircraft are determined by the requirements. An airplane that is not designed according to the requirements and is not operated within the flight/performance envelope defined in the requirements will not be meaningful.
Mr Yılmaz: 5. .....
Mr Yiğit : A jet engine is one of the engine types used in aircraft. It generates thrust by discharging the hot gases via a nozzle. There are several types of jet engines, namely turbojet, turbofan, turboprop, and turboshaft. It consists of a simple air intake, a fan or propeller (according to the type of the engine), a compressor, a combustion chamber, a turbine, and nozzle parts. After the air is compressed in the compressor section, it is burned with fuel in the combustion chamber. The high-temperature and pressurized air turns the turbine and comes out of the nozzle.
Mr Yılmaz: 6. .....
Mr Yiğit : Turbojet engines are generally suitable for high-speed, high thrust-to-weight ratio aircraft. Turboshaft engines are used in rotary-wing aircraft, also called helicopters. The other ones are used in different types of aircraft according to the desired flight envelope. Turboprops are suitable for low-speed cargo airplanes.
Mr Yılmaz: 7. .....
Mr Yiğit : Unmanned aerial vehicles are also expanding day by day with the development of electronic and control systems. These aircraft use piston-propeller (reciprocating) engines, turboprop engines, and turbofan engines.
Mr Yılmaz: Thank you for sharing your professional knowledge.
Mr Yiğit : My pleasure.

A. In which planes are these engines used or suitable?
B. What do you think the heart of an aircraft is?
C. What do you think about the development of unmanned aerial vehicles, and what engines are used in these vehicles?
D. Why did you choose a career as an aeronautical engineer?
E. Could you please explain jet engine technology to our students?
F. Would you recommend this profession to young people? Why?
G. What do you think about the future of the aviation industry?

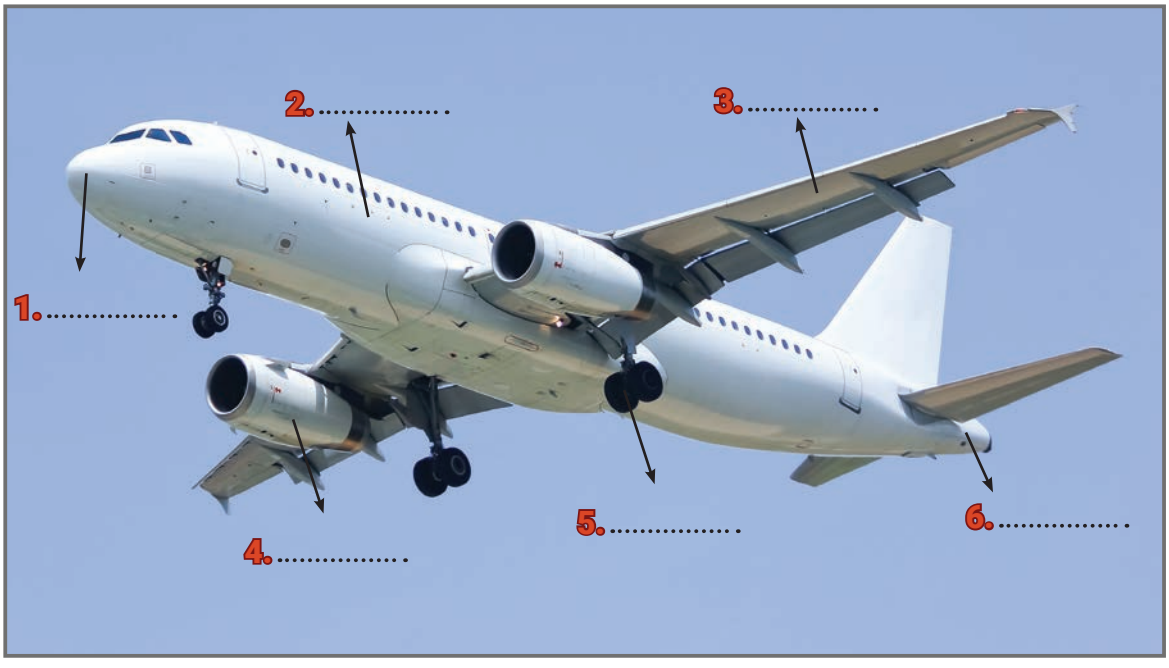
1. Answer the following questions and share your ideas with your friends.

Talk

1. Would you like to be a pilot? Why? Why not?
2. Is it difficult to fly an aircraft? Why? Why not?
3. What do you think are the parts of an aircraft? Tell the class.

2. Write the words in the box in the correct places on the picture.

tail - fuselage - wing - turbine engine - wheels - nose



3. Match the words with their definitions.

1. ..... The front part of an aircraft that houses the cockpit
2. ..... The central part of an aircraft that connects the wings, tail and nose
3. ..... The rear part of an aircraft that includes the horizontal stabilizer and vertical stabilizer
4. ..... The rotary device that creates exhaust for propulsion
5. ..... The main lifting surfaces of an aircraft that generate the upward force necessary to keep the aircraft airborne

A. Wing
B. Tail
C. Fuselage
D. Nose
E. Turbine engine

4. Complete the paragraph using the words in the box.

wings - cockpit - tail - machine - fuselage - nose - landing gear

An aircraft is a complex [1]..... that consists of numerous parts. Each of these parts has its own specific function to operate the aircraft safely and efficiently. Landing gear, nose, wheels, wings and tail are some of the main parts of an aircraft. The [2]..... supports the weight of the aircraft when it is on the ground and it is essential for ground operations such as taxiing, take-off, and landing. The [3]..... generate lift necessary for the aircraft to take off and stay in the air while the [4]..... and [5]..... provide stability and directional control. Finally, the [6]..... is the main body of the aircraft that provides

space for passengers, cargo, and important equipment as well as housing important systems and structures such as avionics and [7]..... Each of these parts plays a critical role in the operation of an aircraft to enable a safe flight.

5. Read the paragraph in Exercise 4 and answer the questions.

1. What is an aircraft?
   .....
2. Which part of an aircraft is important for ground operations?
   .....
3. Which parts of an aircraft provide stability and directional control?
   .....
4. What is the main body of an aircraft called?
   .....
5. For what purpose are all the parts of an aircraft important?
   .....

6. Write the questions in the correct places to complete the dialogue between a pilot and the students.

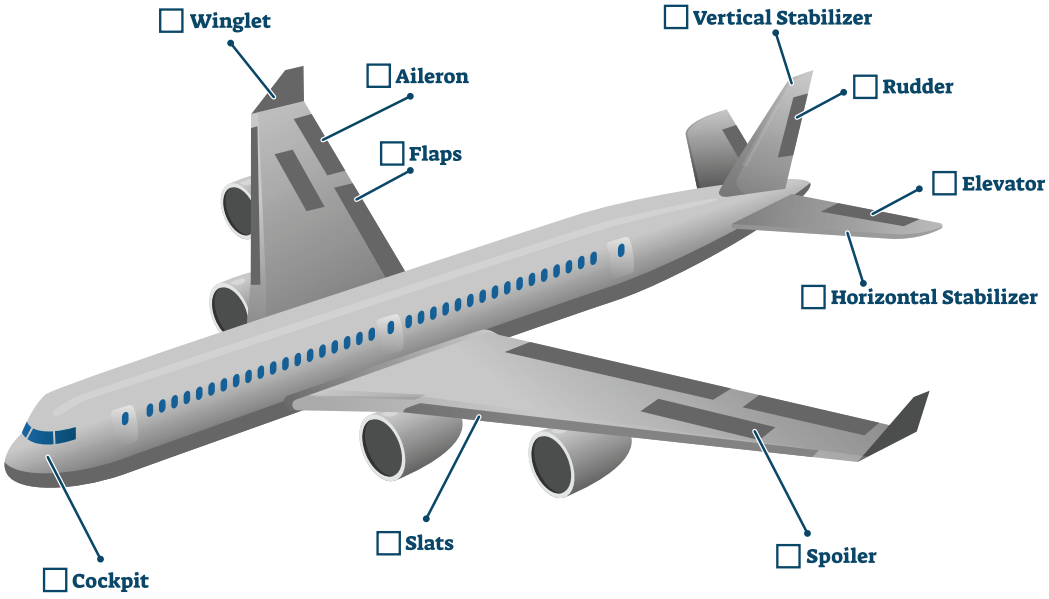
Semih : [1].....?
Pilot : Engine failure is a significant problem that can occur during the flight. A pilot should know how to manage and mitigate the problem as it is a matter of life and death.
Mustafa: [2].....?
Pilot : Well, a common problem you can have is the loss of electrical and hydraulic systems.
Azra : [3].....?
Pilot : It can affect significant aircraft functions, such as steering, brakes, and landing gear.
Bilge : [4].....?
Pilot : A pilot must rely on backup systems or manual to maintain the control of the flight.
Efecan : [5].....?
Pilot : Problems with the landing gear can be a significant issue and it is crucial that pilots are trained to properly respond to such situations. The first thing a pilot must do is to follow emergency instructions outlined in the aircraft's manuals. This involves informing air traffic control, trying to resolve the problem and preparing for an emergency landing if necessary.
Özge : Thank you for the information you have given us, captain. It is a pleasure for us to know that the pilots are trained well to properly manage such important problems.
Pilot : I'm glad to answer your questions.

A. How do you handle such a situation?
B. What is another problem you commonly encounter?
C. What would happen if this problem occurred during the flight?
D. What if there is a problem with the landing gear?
E. What is one of the most critical problems that can occur during the flight?

7. Write a similar dialogue in Exercise 6 and act it out in your class.

.....
.....
.....
.....
.....
.....

8. Match the words on the picture with their definitions.



1. It is the area of an aircraft where the pilot stays and controls the aircraft.
2. Movable surfaces that move up and down to control the pitch attitude of the aircraft during the flight. They are located on the tail of an aircraft.
3. Movable surfaces on the vertical stabilizer of an aircraft that control the turning (yaw) of the aircraft.
4. Movable aerodynamic surfaces on the leading edge of an aircraft's wing which pilots use to increase lift and improve the control during take-off and landing.
5. Movable surfaces on the top of an aircraft's wing which pilots use to decrease lift and increase drag.
6. Small and upturned wings at the tip of an aircraft's wings that improve the aircraft's efficiency by reducing drag and improving lift.
7. Movable surfaces on the trailing edge of an aircraft's wing that pilots use to increase lift and drag during take-off and landing.
8. Movable surfaces on the trailing edge of an aircraft's wings that pilots use to control the tilt (roll) of the aircraft.
9. It is the fin on the rear of an aircraft that provides stability in the yaw (turning) axis. It houses the rudders.
10. Fixed wings on the rear of an aircraft that provide stability in the pitch axis. The elevators are attached to them by hinges.

9. Choose the correct words to define the functions of the aircraft's surfaces.

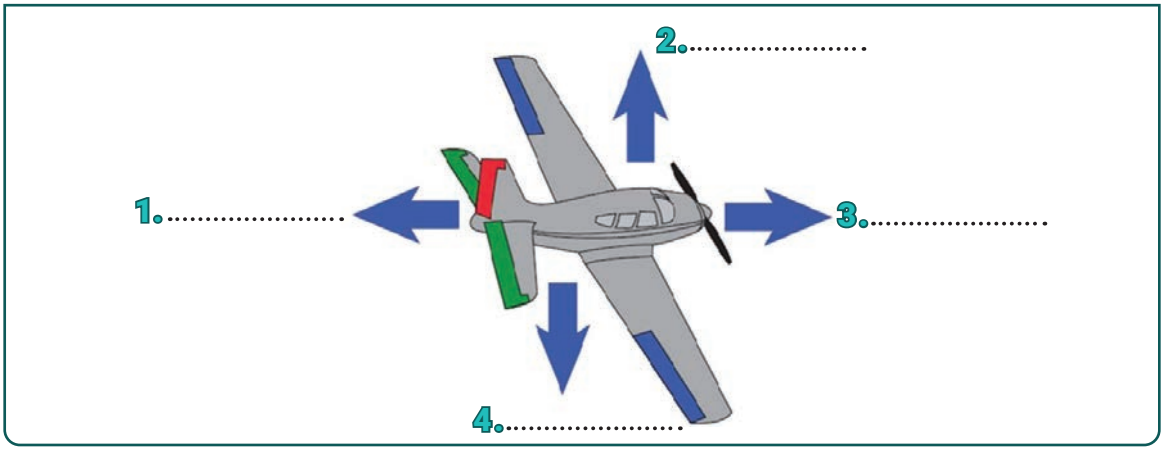
SURFACES	FUNCTIONS
1. aileron	controls **roll / yaw**
2. rudder	controls **lift / yaw** (turning)
3. elevator	controls **roll / pitch**
4. slat	**increases / decreases** lift and drag
5. flap	**decreases / increases** lift and drag
6. wing	generates **pitch / lift**
7. winglet	decreases **drag / lift**
8. vertical stabilizer	stabilizes **roll / yaw**
9. horizontal stabilizer	stabilizes **pitch / lift**
10. spoiler	**decreases / increases** lift and speed

10. Translate the following sentences into Turkish.

1. The rudder helps an aircraft to turn left or right.
.....
2. The elevator controls the pitch of the plane, making it go up and down.
.....
3. The aileron controls the roll of the plane, helping it to bank left or right.
.....

11. Write the words from the box in the correct parts of the picture.

thrust - drag - lift - weight



12. Match the words to describe each force.

1. weight
2. lift
3. drag
4. thrust

A. ..... pushes the aircraft downward.
B. ..... pushes the aircraft forward.
C. ..... pushes the aircraft backward and down.
D. ..... pulls the aircraft upward.



13. Read the dialogue between a flight instructor and the students of aviation department. Then, answer the questions.

Flight instructor: Good afternoon, everybody. I'm glad to see you all here. Today, we are going to talk about aircraft control surfaces, which are crucial for flying an aircraft. Let's start with the first question. Can anyone tell me what control surfaces are?

Arda : I think control surfaces are the movable parts that pilots use to control the aircraft's movement, like changing direction or altitude.

Flight instructor: That's correct. The three primary control surfaces are the aileron, elevator and rudder. The ailerons control the aircraft's roll, the elevator controls pitch, and the rudder controls yaw. The pilot uses trim tabs, pedals and control wheel to control the movement of these control surfaces.

Ege : How do the ailerons work?

Flight instructor: The ailerons are located on the trailing edge of the wings, and they move in opposite directions to each other. When the pilot moves the control wheel to the right, the right aileron moves up and left aileron moves down, causing the aircraft to roll to the right. The opposite happens when the pilot moves the control wheel to the left.

Ece : What about the elevator?

Flight instructor: The elevator is located on the tail of the aircraft, and it moves up and down. When the pilot moves the control wheel forward, the elevator moves down, causing the aircraft to pitch down. When the pilot moves the control wheel back, the elevator moves up, causing the aircraft to pitch up.

Bilge : How does the rudder work?

Flight instructor: The rudder is also located on the tail of the aircraft, and it moves left and right. When the pilot moves the rudder pedals to the left, the rudder moves to the left, causing the aircraft to yaw to the left. When the pilot moves the rudder pedals to the right, the rudder moves to the right, causing the aircraft to yaw to the right. It is important to remember that control surfaces work together to control aircraft movement.

1. What are the control surfaces?
   .....
2. What are the three primary control surfaces parts?
   .....
3. Where are the ailerons located?
   .....
4. Where is the elevator located?
   .....
5. What is the function of the rudder?
   .....

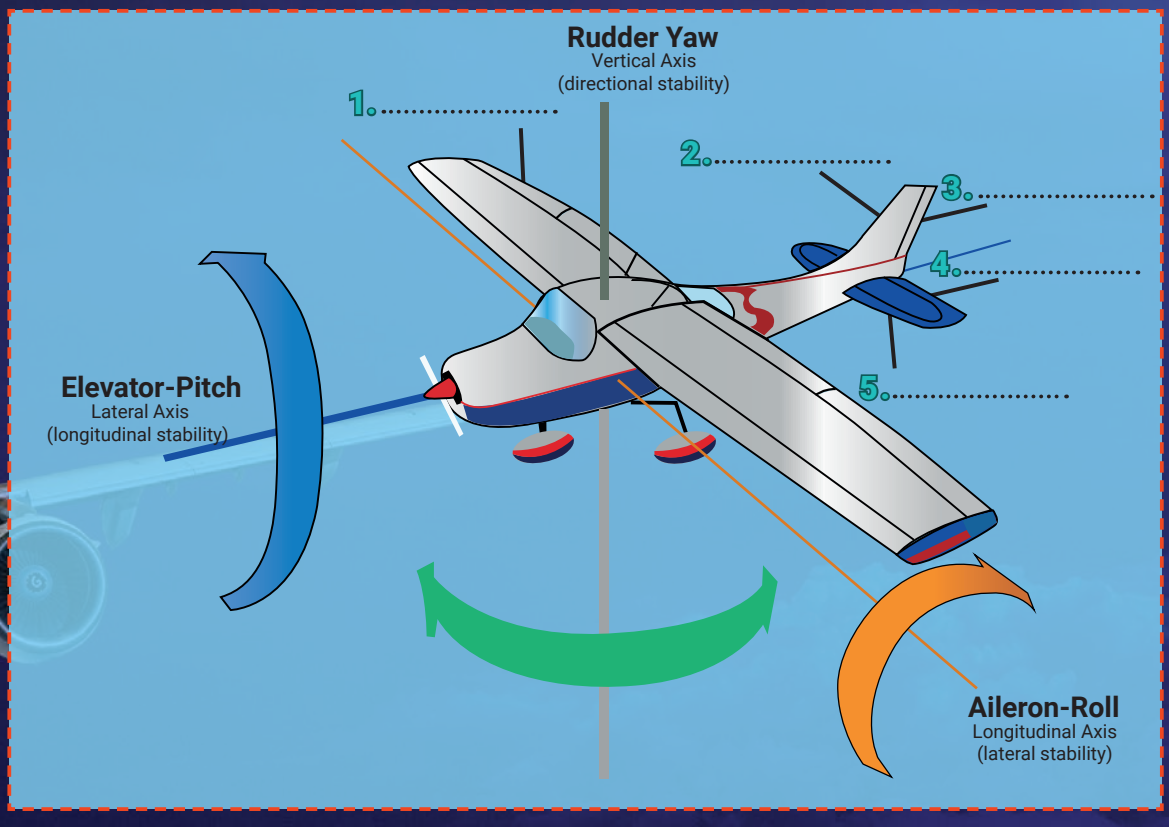


14. Read the dialogue in Exercise 13 again. Then, write T (True) or F (False) to the sentences.

1. ..... The flight control surfaces are immobile parts of an aircraft.
2. ..... The ailerons control the aircraft's roll.
3. ..... The elevator is located on the tail of the aircraft.
4. ..... The rudder is located on the edge of the wings.
5. ..... The flight control surfaces work separately to control an aircraft's movement.

15. Write the words from the box in the correct parts of the picture.

aileron - rudder - elevator - vertical stabilizer - horizontal stabilizer



16. Look at the picture in Exercise 15 and complete the table.

PRIMARY CONTROL SURFACES	AIRCRAFT MOVEMENT	AXES OF ROTATION	STATE OF STABILITY
ailerons			

17. Write the Turkish meaning of the following words or phrases.



1. Lateral axis .....
2. Longitudinal axis .....
3. Vertical axis .....
4. Vertical stabilizer .....
5. Horizontal stabilizer .....
6. Rudder .....
7. Elevator .....
8. Aileron .....

18. Complete the dialogue with the co-pilot's sentences.



Captain : Mary, can you feel that? The plane is not responding well to roll manoeuvres.
First officer: 1. .....
Captain : Let's have a quick look at the control surfaces. Could you take a look at the flaps and ailerons?
First officer: 2. ..... I can see that the left aileron is stuck. That's probably the main cause of the control issues.
Captain : Okay, let's run through the checklist and see if we can get it unstuck. Can you pass me the checklist?
First officer: 3. .....
Captain : I'm afraid I couldn't fix it. The aileron seems to be completely stuck.
First officer: 4. .....
Captain : Yes, I agree. Let's inform air traffic control and begin the diversion process.
First officer: 5. .....
Captain : We've been cleared to land at the nearest airport. Get ready for an emergency landing.
First officer: 6. .....
Captain : Great job, we landed safely.
First officer: 7. .....
Captain : We need to inform the ground crew and maintenance about the aileron issue. They'll assess whether the plane can be quickly repaired. If not, we may have to switch to another aircraft to continue the flight.
First officer: 8.....

A. Copy that. I'm ready.
B. Alright, I'll take a look now.
C. We should divert to the nearest airport to get it fixed.
D. Here you are.
E. Yeah, now that you mention it, something's not quite right.
F. Thanks, I'm just glad we were able to land without any further issues.
G. Okay, I'll inform the ground crew.
H. Understood. I'll contact the air traffic control.

19. Work in pairs, read the dialogue and act it out in the classroom.

20. Complete the paragraph using the words in the box.

increase - located - surfaces - direction - slower - between - panels - descend - helps - movable

Secondary flight [1]..... are vital parts of an aircraft's control system. This system consists of high lift devices that aid the pilot in managing the movement and the [2]..... of the aircraft. These devices are flats, slats, flight spoilers and trim systems. Flaps are [3]..... panels on the trailing edge of the wings that can be extended out to [4]..... lift and drag. This enables the aircraft to take off and land at [5]..... speed. Slats are similar to flaps, but they are [6]..... on the leading edge of the wings. They can be extended forward to create a gap [7]..... the slat and the wing. This allows air to flow over the wing at higher angles of attack without stalling. Spoilers are [8]..... on the upper surface of the wings that can be raised to disrupt airflow and reduce lift. This enables aircraft to [9]..... more rapidly. Trim system [10]..... alleviate control pressures by helping deflect their associated primary control surface.

21. Read the paragraph in Exercise 20 and answer the questions.

1. What are the functions of secondary flight control surfaces?
   .....
2. What are the secondary flight control surface devices?
   .....
3. Which devices increase lift and drag?
   .....
4. Which devices help to descend more rapidly?
   .....
5. Which devices are located on the upper surface of the wings?
   .....

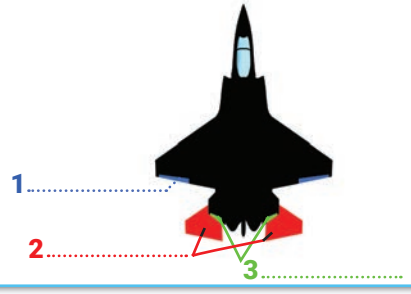


22. Put the words in the box under the correct heading.

flap - rudder - slat - spoiler - elevator - aileron

PRIMARY CONTROL SURFACES	SECONDARY CONTROL SURFACES

23. Label the correct primary control surfaces in Exercise 22 in the coloured places in the picture.



24. Read the text and match the highlighted words with their synonyms.

Aircraft maintenance is an [1]essential [2]aspect of ensuring the safety of air travel. Before each flight, a series of checks and procedures are performed to make sure that the aircraft is [3]airworthy. One important aspect of aircraft maintenance is the [4]inspection of flight control surfaces. As a part of routine maintenance procedures, control surfaces are inspected for damage, attachment and proper function.

The inspection of flight control surfaces is the [5]responsibility of the maintenance crew. This crew includes trained and certified mechanics and technicians. They [6]perform maintenance tasks on aircraft. They follow a checklist and [7]procedures that are related to the aircraft being inspected. The [8]checklist includes visual inspections of the control surfaces and testing of the control mechanism. It makes sure that all hardware and connections are secure as well.

In addition to the physical inspection, the crew review the maintenance records. They make sure that all required [9]maintenance and repairs have been completed. This review includes routine maintenance such as oil changes and component replacements. It also includes repairs or modifications that have been made to the aircraft.

After the inspection is completed, the maintenance crew give a report to the flight [10]crew. The report details any issues that have been found and repairs that have been made. The flight crew [11]review the report and make sure that all necessary inspections and repairs have been made before the flight.

A. ..... duty
B. ..... upkeep, repair
C. ..... process
D. ..... crucial
E. ..... carry out
F. ..... check-up
G. ..... to do list
H. ..... feature
I. ..... fit for service
J. ..... assessment
K. ..... staff

25. Read the text in Exercise 24 and answer the questions.

1. Why is aircraft maintenance important?
   .....
2. Who is responsible to perform maintenance flight control surfaces?
   .....
3. Who does the aircraft maintenance crew include?
   .....
4. What does the aircraft maintenance crew do after the inspection is completed?
   .....





26. Choose the correct words in bold to complete the paragraph.

An aircraft has several important parts. The [1]**cockpit / tail** is where the pilot sits and controls the plane. The main body of the aircraft is called the [2]**elevator / fuselage**. At the back of the aircraft there is the [3]**nose / tail**, which helps with stability and steering. The [4]**flats / elevators** and the [5]**rudder / slats** is/are also important for steering the aircraft. The [6]**ailerons / rudder** are located on the upper surface of the wing towards to wingtip. The [7]**wings / ailerons** are on the top of the aircraft and provide lift. The [8]**tail / nose** of the aircraft is pointed and helps with aerodynamics. Finally, there are [9]**flaps / wings** and [10]**elevators / slats** on the wings that can be extended to change the shape and angle of the wings to control speed and lift.

27. Choose the correct answers.

1. What is the function of the ailerons on an aircraft?
   A. To control pitch
   B. To control yaw
   C. To control roll
2. Which control surface is located on the tail of an aircraft and is used to control pitch?
   A. Rudder
   B. Elevator
   C. Flaps
3. What is the function of the rudder on an aircraft?
   A. To control pitch
   B. To control yaw
   C. To control roll
4. What control surface is used to increase the lift and drag of an aircraft during takeoff and landing?
   A. Flaps
   B. Ailerons
   C. Elevators
5. Which control surface is used to reduce lift and increase drag on an aircraft during landing?
   A. Spoilers
   B. Ailerons
   C. Elevators
6. Which control surface is used to control the aircraft's speed and altitude?
   A. Flaps
   B. Ailerons
   C. Elevators
7. What is the function of the spoilers on an aircraft?
   A. To increase lift and drag
   B. To decrease lift and increase drag
   C. To control pitch yaw
8. Which control surface is used to control the roll of an aircraft?
   A. Flaps
   B. Ailerons
   C. Elevators
9. Which control surface is used to control the yaw of an aircraft?
   A. Flaps
   B. Elevators
   C. Rudder
10. What is the purpose of the trim tab on an aircraft's control surface?
    A. To adjust the aircraft's speed
    B. To adjust the aircraft's altitude
    C. To reduce the control forces required by the pilot

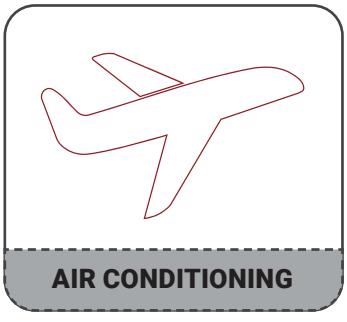
1. Answer the following questions. Share your ideas with your friends.

Talk

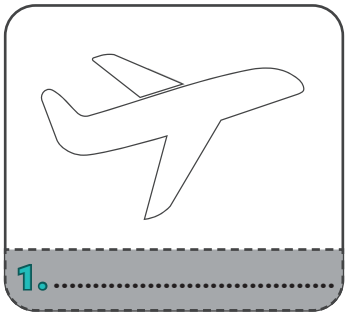
1. What aircraft systems do you know? Name as many as you can.
2. Can you name any flight instruments?
3. How does ice affect an aircraft's performance?

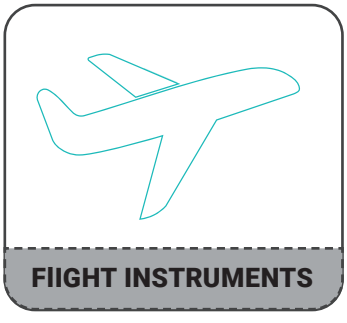
2. Look at the schema and write the missing systems in the box. There are 3 extra.

OXYGEN - ENGINES - AXIS - HYDRAULIC - PNEUMATICS - BRAKES

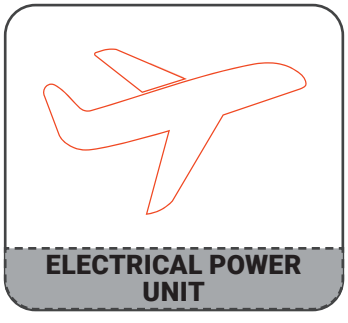

AIR CONDITIONING


SAFETY AND WARNING

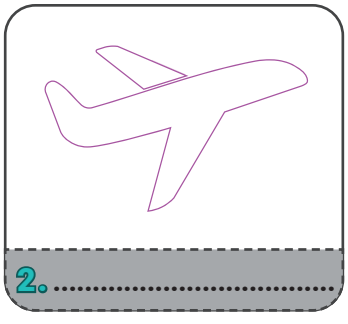

1. .....

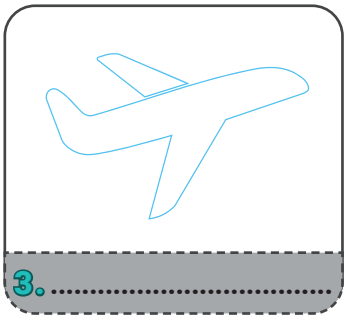

FIIGHT INSTRUMENTS

AIR CRAFT SYSTEMS


ELECTRICAL POWER UNIT


AVIATION FUEL

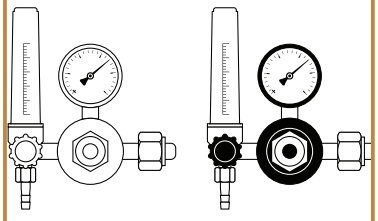

2. .....


3. .....


ICE AND RAIN POTECTION


AVIATION LIGHTS

3. Match the aircraft systems with the pictures.



1 .....



2 .....



3 .....

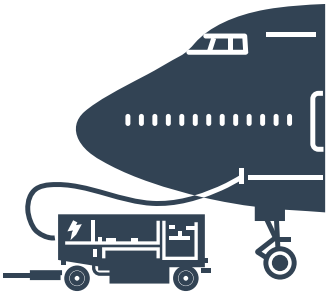


4 .....

A. AIR CONDITIONING
B. SAFETY AND WARNING
C. AVIATION FUEL
D. PNEUMATICS
E. ELECTRICAL POWER UNIT
F. OXYGEN
G. ICE AND RAIN PROTECTION
H. AVIATION LIGHTS
I. HYDRAULIC
J. FIIGHT INSTRUMENTS



5 .....



6 .....



7 .....



8 .....



9 .....

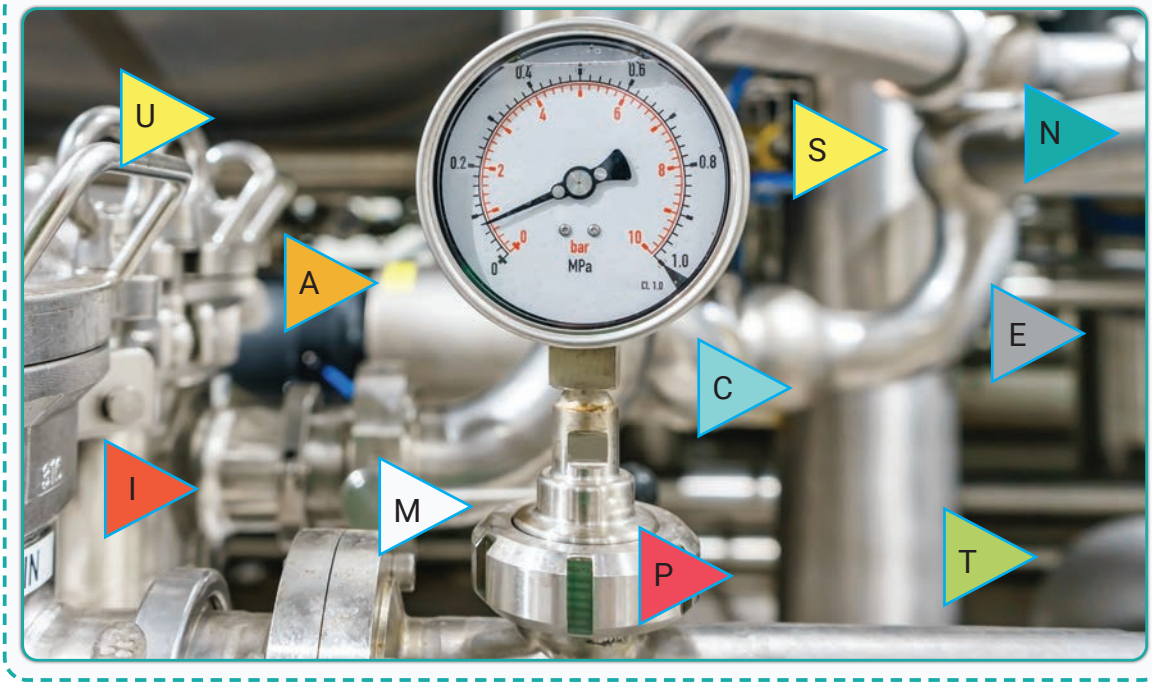


10 .....

PNEUMATICS

4. Put the letters in order to complete the definition.

_ _ _ _ _ _ _ _ _ _ is a branch of engineering that makes use of gas or pressurized air.



5. Read the uses of compressed air and add two more.

1. Environmental control
2. Ice protection
3. Windscreen demisting and rain dispersal
4. Turbine engine start
5. Water tanks
6. .....
7. .....



6. Choose the correct answer.

What is the name of the engine in the picture?

A. Turbofan engine
B. Turboprop engine



7. Write the word groups into correct places.

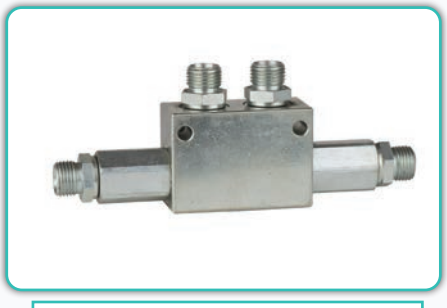
Engine starters - External ground source - Air conditioning packs - APU load compressor
Thermal anti-ice systems - Hydraulic reservoirs - Engine bleed air - Potable water system

The pneumatic system supplies pressurized air to some systems and components such as [1].....,[2].....,[3].....,[4].....,[5]..... Also, there are some sources that the pneumatic power has such as [6].....,[7].....,[8]..... In a turbofan engine, air is bled at two different stages of the compressor; a low pressure port at an intermediate stage and a high pressure port at a final stage. Fan air is used to cool bleed air. The air at a temperature of approximately 250°C, taken from the motor compressor, is cooled by the cold air in the fan part of the motor. The engine fan part draws air into the engine so that the engine can produce more thrust with less fuel. At the same time, a small amount of this air is stolen to cool the pneumatic air. A check valve is needed to prevent air flowing from high to low prssure bleeding ports. The low pressure bleeding port is open when the engine is in danger, whereas the high pressure bleeding port is open when the pressure coming from the intermediate stage is not enough. So, the engine must be running in a way that prevents it from being damaged by extensive air bleeding.

8. Match the highlighted words in Exercise 7 with the pictures.



1. .....



2. .....

9. Match the halves of the sentences.

1. Two stages of the compressor are	A. ..... to cool the air.
2. Fan air is necessary	B. ..... when the pressure coming from the intermediate stage is not enough.
3. A check valve is needed	C. ..... the low pressure bleeding port is open.
4. When the engine is in critical conditions,	D. ..... decreases the engine performance.
5. The high pressure bleeding port is open	E. ..... low pressure port at an intermediate stage and a high pressure port at a final stage.
6. Extensive air bleeding	F. ..... to prevent air flowing from high to low pressure bleeding ports.

10. Write the number of the sentences below into the correct categories.



PNEUMATICS

ADVANTAGES	DISADVANTAGES

1. Air, which is the source of pneumatic energy, can be obtained unlimitedly in the atmosphere.
2. The air is clean and does not pollute the environment.
3. Since the working pressure is 6-7 bar, large forces cannot be obtained.
4. Speed and force can be adjusted to different values.
5. Compressed air can be transported over long distances.
6. When a muffler is not installed on the exhaust line, it makes an annoying sound.
7. Circuit elements are simple and inexpensive.
8. Since the air that completes its task is ejected from the exhaust line, there is air consumption.
9. High speed can be achieved.
10. It is safe against overloads.
11. Compressed air has no danger of ignition.
12. Due to the compressibility of the air, it is not likely to achieve the piston speed at the desired values.

AIR CONDITIONING

11. Cross out 3 words which are not related to air conditioning.

AMBIENT TEMPERATURE

STAIRS

VENTILATION



COOLING

DISTRIBUTION

TEMPERATURE

SAFETY

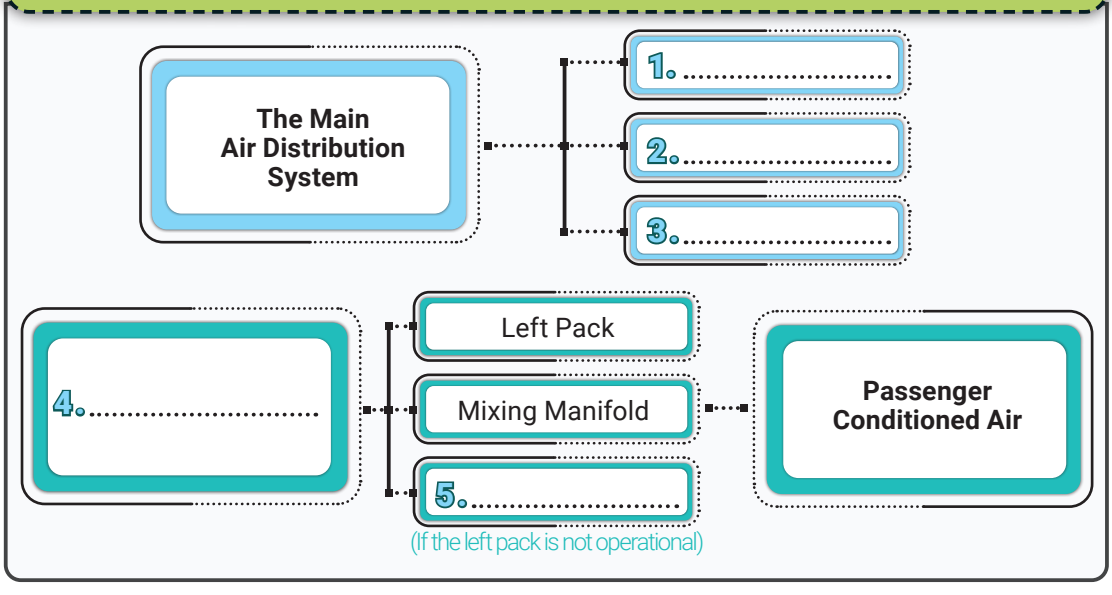
MOISTURE

HEATING

GEAR

12. Read the text and complete the schema with the highlighted words.

The main air distribution system in aircraft gets air from Air Conditioning Packs, Ground Conditioned Air, and the Recirculation System. The mixing manifold collects and mixes air from any combination of the sources. The Flight Compartment gets conditioned air from the left pack and the mixing manifold. The flight compartment gets conditioned air from the Right Pack if the left pack is not operational. Passenger conditioned air distribution gets air from the mixing manifold. The air goes through riser ducts and up sidewalls to an overhead distribution duct.



13. Read the extract from a magazine and choose the correct answer for the passenger's question.

Question: 'I was on a flight from London to the US which was delayed because of the long line of planes ahead of us. While we were waiting, the pilot turned off the engines to preserve fuel. So, it got very hot inside. My question is; was it really necessary to save the cost?

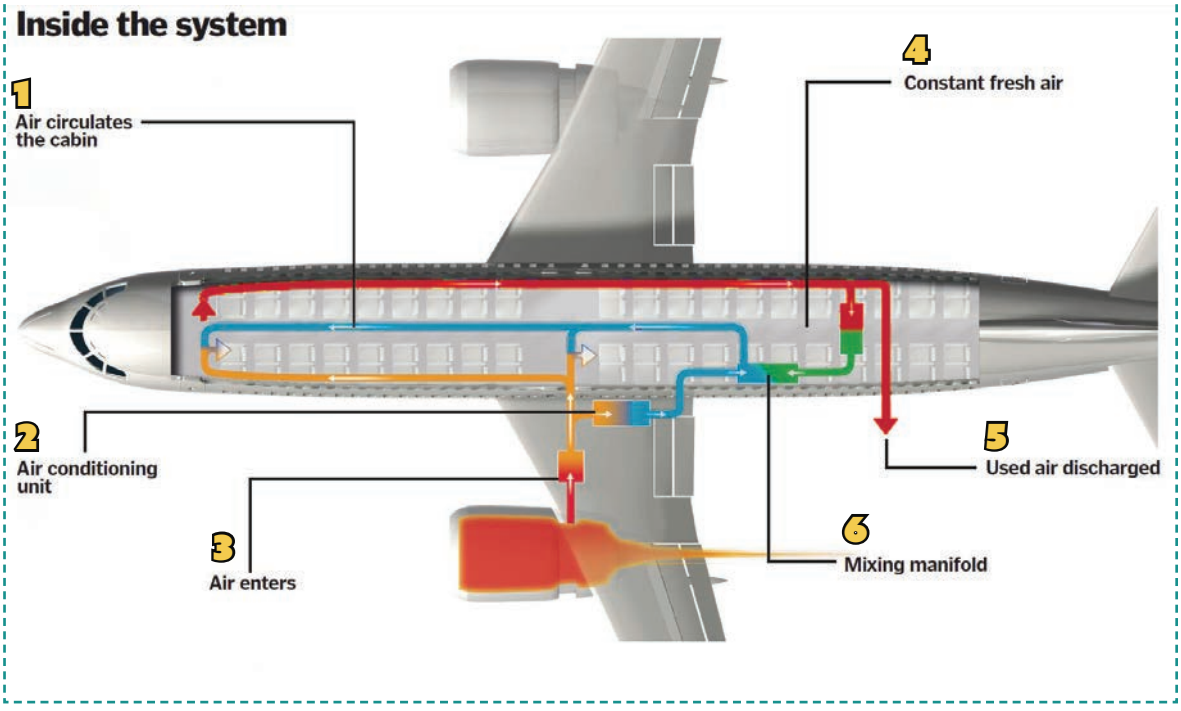
Answer A: 'Actually, it is normally not necessary to shut down all the engines as they do not waste so much fuel. It seems that your pilot did everything to make you sweat!'



Answer B: 'It was normal for the pilot to turn off the engines to save fuel because they conserve fuel whenever they can. But the real problem is that when the engines are turned off, APU (Auxiliary Power Unit) is used for electricity and cooling. So, it is surprising that it was not enough for you to make you comfortable.'

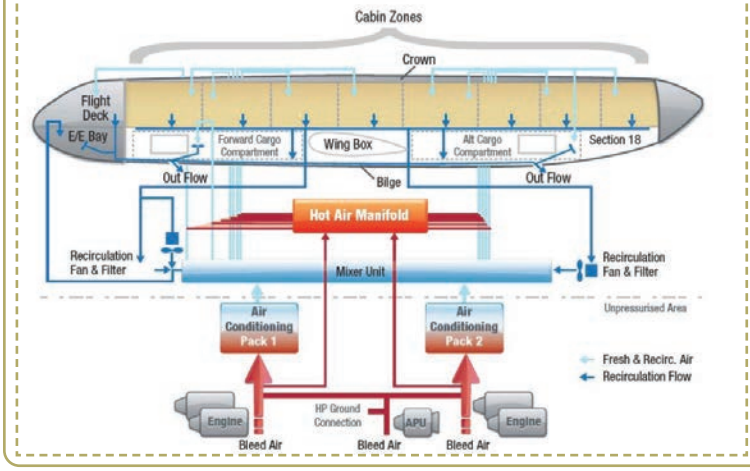
Answer C: 'As far as I know, although the pilots turn off the engines, air conditioning system still continues working. As the cooling system works separately, you can't have felt that hot inside the plane. There must have been an error somewhere in the system.'

14. Match the titles with the explanations in the box.



..... A. When the outside air arrives at the mixing manifold, it is combined with cleaned air.	..... B. When the air enters through the aircraft's jet engine, it becomes extremely hot.	..... C. When the hot air reaches the air conditioning unit, it is cooled really fast here.
..... D. The cabin's air changes about 20-30 times per hour, which 50% is recycled through filters.	..... E. When the outside air enters, the same amount of air is thrown out to keep the balance.	..... F. After the air leaves the mixing manifold, it enters the cabin where the passengers can supply it via overhead outlets.

15. Look at the picture and write how the air conditioning system works.



First, when the bleed air is taken in, it goes to a primary heat exchanger to cool slightly. Then, ...
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

16. a) Read the text and choose the correct title for each paragraph.

Passenger Compartment Heating - Cockpit Compartment Heating – Cargo Compartment Heating

Heating

The heating system provides the necessary warm air for the passenger compartment and cargo compartment. The heating process is carried out with the use of conditioned air and a pipeline. Conditioned air passes through the cabin's overhead distribution line and heats the passenger compartment. Cargo compartments, on the other hand, are passively heated by passing the air coming from the passenger cabin through the outside of the cargo side panels.

1. .....
The heating or cooling of the cockpit air is provided by the controls determined by the temperature control system. The air temperature reaches the desired level when the adjusted air exits through the exits located in the cockpit compartment.

2. .....
Heating of the passenger compartment takes place independently of the cockpit via the overhead distribution line. The conditioned air enters the cabin through the outlets located on the side walls of the passenger compartment. By adjusting the pack air temperature, the cabin temperature is also determined.

3. .....
Passenger compartment air passes through the passenger compartment's lower side wall vents. This air passes through the side walls of the cargo compartment and is used as the heating air in the compartment. The air provided by the equipment cooling fans is used as heating air by passing under the front cargo compartment while the aircraft is in the air.

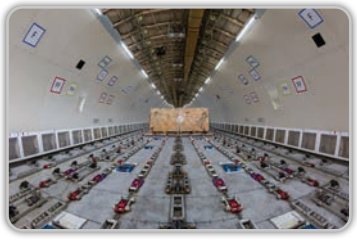
16. b) Match the paragraphs in Exercise 16 a with the correct pictures.



A. .....



B. .....



C. .....

17. Write the Turkish meanings of the words.

1. department:
2. passenger:
3. cockpit:
4. cargo:
5. determine:
6. distribution:
7. heat:
8. adjust:

FLIGHT INSTRUMENTS

18. Answer the following questions. Share your ideas with your friends.

Talk

1. Do you know what flight instruments pilots are trained to use?
2. Do you know what an altimeter is used for?
3. How does a pilot get informed by the flight instruments?

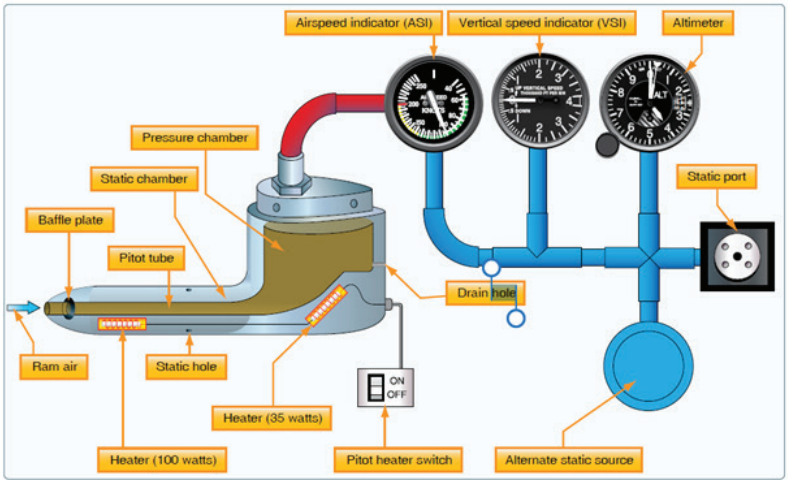
19. Read the text and answer the questions.

A pilot must know how to read and use the flight instruments in order to fly any aircraft safely. The pilot must also be able to spot related mistakes and issues with these instruments. The pitot-static system and related instruments, the vacuum system and related instruments, gyroscopic instruments, and the magnetic compass are all covered by a pilot. A pilot can safely use the instruments to their fullest extent when he or she is aware of how each one functions and can spot when one of them is having problems. These flight instruments give a pilot information about the aircraft's altitude, airspeed and attitude.



1. What must a pilot be able to read and use?
   .....
2. What systems does a pilot dominate?
   .....
3. What are the three terms that the flight instruments give information about?
   .....

20. Look at the picture and choose the correct answers for the sentences below.



1. The pitot-static system consists of three main indicators called .....
   a. airspeed indicator, vertical speed indicator and altimeter.
   b. pilot tube, holes and heater.
2. The aim of the pitot-static system is to provide .....
   a. heating and cooling.
   b. static and pitot pressures.

21. Choose the correct titles in the box. Then, match the paragraphs with the pictures.

Airspeed Indicator - Altimeter - Attitude Indicator - Vertical Speed Indicator

A. ..... Picture:
This indicator shows the aircraft's height (in feet or meters) above the sea-level by measuring the local air pressure. It has a local barometric pressure adjustment that must be precisely calibrated in order to get accurate altitude measurements (relative to sea level). That means it is one of the most vital instruments installed in the aircraft.

B. ..... Picture:
It displays the plane's attitude toward the horizon. This allows the pilot to determine if the wings are in level and whether the plane's nose is pointing upward or downward. This is a crucial piece of equipment for flying and is particularly helpful when vision is bad. In the event that this instrument or its power fails, pilots are trained how to use other instruments in combination.

C. ..... Picture:
This indicator (VSI) shows whether the aircraft is ascending, falling, or flying level. In feet per minute, the rate of ascent or descent is shown (fpm). The VSI exhibits 0 in level flight if calibrated properly.

D. ..... Picture:
It displays the aircraft's speed (often expressed in knots) in relation to the air around it. It operates by detecting the ram-air pressure in the pitot tube of the airplane. The airspeed of an airplane is measured using a pitot tube, which is a measurement device for fluid flow.
In order to determine the true airspeed and the speed over the ground, the indicated airspeed must be corrected for air density which varies with altitude, temperature, and humidity.









22. Read the texts and choose the correct words.

A magnetic compass displays the [1] **direction / height** of the aircraft in relation to magnetic north. Although it is dependable in level, steady flight, the inclination of the earth's magnetic field might cause it to give [2] **right / confusing** signals when turning, rising, descending, or accelerating. The heading indicator is therefore also used when flying an airplane. To achieve real north or south, which points to the axis of [3] **rotation / speed** of the earth, it may be necessary to adjust the direction stated for navigational purposes (which points to a magnetic pole).

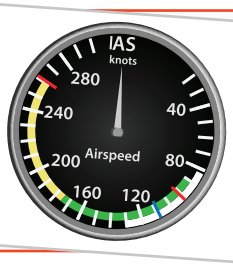


The turn coordinator can be used to create and sustain a standard-rate **turn / flight**[4]. The instrument's face has two marks, one on the left and one on the right. The first mark serves as a pointer for level zero rate of turn of the wings. A standard rate of rotation is denoted by the second mark on the left and right sides of the instrument. A turn rate of 3° per [5] **second / hour** is referred to as a "standard-rate turn." The turn coordinator does not show a specific bank angle; it only displays the turn's rate and [6] **aviation / direction**.



23. Look at the airspeed indicator and match the colours with what they symbolise.

1. ..... Green	A. speed range that should not be entered
2. ..... Red	B. speed range to be considered
3. ..... Yellow	C. flap opening range
4. ..... White	D. normal speed range

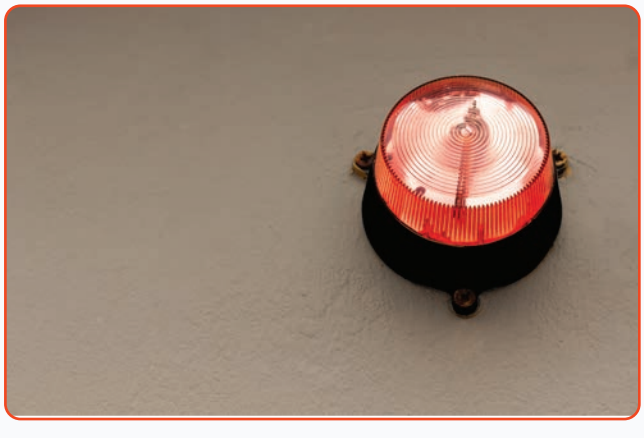


24. Write the flight instruments in the correct places.



SAFETY AND WARNING

25. Look at the picture and the example, and name as many applications as you can about what indicator lamp can be used in.



Smoke detection	

26. Read the text and write T (True) or F (False) to the sentences.

The possible fire zones of modern multiengine aircraft are protected by a fixed fire protection system since fire is one of the most significant threats to an aircraft. A fire zone is a part of an aircraft that the manufacturer has specifically engineered to have high levels of inbuilt fire resistance and the need for fire detection and/or extinguishing equipment. In contrast to any sort of transportable fire extinguishing apparatus, such as a hand-held Halon or water fire extinguisher, the term "fixed" describes a permanently installed system. A fire detection system and a fire extinguishing system make up a full fire protection system on modern airplanes as well as many older aircraft.



The following are examples of areas on an airplane with a fixed fire detection and fire extinguisher system:

1. Engines and auxiliary power unit (APU)
2. Cargo and baggage compartments
3. Lavatories on transport aircraft
4. Electronic bays
5. Wheel wells
6. Bleed air ducts



In the various monitoring zones, detectors are set to look for flames or overheating conditions such as:

1. Overheat detectors
2. Rate-of-temperature-rise detectors
3. Flame detectors
4. Smoke detectors
5. Observation by crew members

1. ..... Fire is not an important issue for aircraft.
2. ..... The term 'fixed' means a long-lasting installed system.
3. ..... Fire detection and fire extinguishing equipment are included in the fixed fire protection system.
4. ..... Aircraft do not have any fire zone as part of them.
5. ..... Cargo and baggage compartments do not include a fire detection system.

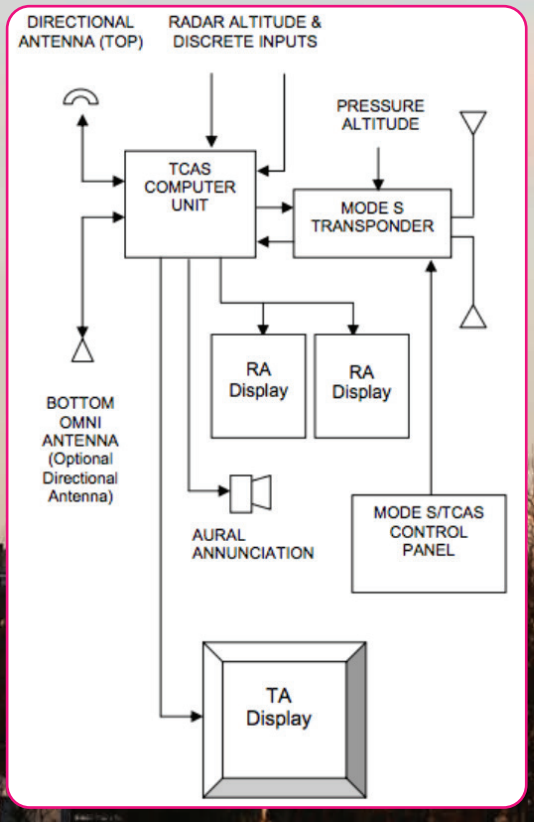
27. Look at the Aircraft Aural Warnings table and fill in the blanks with the correct phrases in the box.

Decrease aircraft speed - Continuous horn - Whenever the fire warning system is tested - Fire warning

WARNING SYSTEM	WARNING SIGNAL	CAUSE OF WARNING SIGNAL	CORRECT ACTION
1. Flight control	Intermittent horn	1. Speed brakes are not down. 2. Flaps are not in takeoff range. 3. Auxiliary power exhaust door is open. 4. Stabilizer is not in the takeoff setting.	Correct the aircraft for proper takeoff conditions.
2. Mach warning	Clacker	Airspeed or mach number exceeds limits.	*
3. Pressurization	Intermittent horn	If cabin pressure becomes equal to atmospheric pressure at the specific altitude.	Correct the condition.
4. Landing gear	*	Landing gear is not down and locked when flaps are less than full up and throttle is retarded to idle.	Raise flaps; advance throttle
5. *	Continuous bell	* Any overheat condition or fire in any engine or main wheel or nose wheel well, APU engine, or any compartment having fire warning system installed. *	1. Lower the heat in the area where the F/W was activated. 2. A signal may be silenced pushing the F/W bell cutout switch or the APU cutout switch.
6. Communication	High chime	Any time captain's call button is pressed at external power panel forward, or rearward cabin attendant's panel.	Release button; if button remains locked in, pull button out

28. Read the dialogue and look at the picture that shows how it works, and fill in the blanks.

The interviewer: Hello everybody. Today we have a very experienced pilot as a guest in our programme. Welcome, Mr Kaya.
Mr Kaya : Thank you. I am glad to be here today.
The interviewer: I have a few questions about the new collision avoidance system. Firstly, could you please tell us about the new solution 'TCAS' and what it stands for?
Mr Kaya : Sure. TCAS means traffic collision avoidance system. It is designed to reduce the risk of mid-air collisions between aircraft. It provides collision avoidance for a wide spectrum of aircraft types. The level of protection provided by TCAS equipment depends on the type of transponder the target aircraft has. It should be known that TCAS provides no protection against aircraft that do not have an operating transponder. TCAS has TAs (traffic advisories) and RAs (resolution advisories) to be able to make escape maneuvers in the vertical dimension.
The interviewer: Could you please clarify the transponder?
Mr Kaya : It should be installed and operational in the aircraft so that the TCAS system can be operational. If the transponder systems fail to work, the TCAS Performance Monitor will detect this failure and automatically place TCAS into standby.
The interviewer: Thanks for the informative explanation. So, what does the TCAS Processor use to control collision avoidance?
Mr Kaya : Good question. It uses a pressure altitude, radar altitude, and discrete aircraft status inputs.
The interviewer: Thank you for attending and answering our questions. I wish you a successful working life.



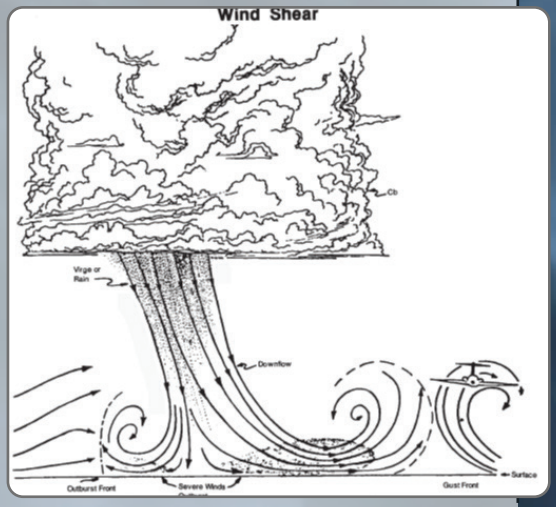
1. TCAS stands for .....
.....
2. RA means .....
.....
3. TA means .....
.....
4. If aircraft do not have an operating transponder, ...
.....
.....
5. TCAS is designed to .....
.....
6. The TCAS Processor uses .....
.....
7. When the TCAS Performance Monitor detects a failure, ...
.....
.....
.....

29. Read the text and choose the correct question for each paragraph.

Wind Shear: Danger to Pilots?

A. .....

Wind shear is a change in wind speed or direction over a short distance. It can occur either horizontally or vertically, at high or low altitude.



B. .....

1. Frontal activity.
2. Thunderstorms.
3. Temperature inversions.
4. Surface obstructions.

C. .....

Pilots must know wind shear is there. They must also know the magnitude of the change, and must be prepared to correct or go around immediately.

D. .....

1. Specialized training and procedures: Flight crews today know how to fly safely out of wind shear, and they practice these skills in simulators.
2. Reactive alerting: This function warns flight crews when an aircraft is going through possible wind shear conditions.
3. Predictive alerting: This new system foresees the possible wind shear before it occurs, so pilots can be prepared beforehand.
4. Ground-based Doppler Radar: This special radar can detect some forms of wind shear, which greatly helps pilots take action.

- How do pilots cope with wind shear?
- What does wind shear mean?
- What are the sources of wind shear?
- What developments has the aviation industry made so far in order to get over wind shear?

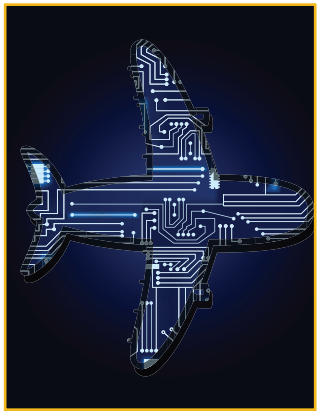
30. Choose the correct answer.

1. There is a fixed fire detection and fire extinguisher system ...
   A. under the seats B. in cargo compartments
2. Fixed means ...
   A. permanent B. temporary
3. If there is a warning in the landing gear, pilots should ...
   A. raise flaps B. correct the condition
4. TCAS performs well if ...
   A. the aircraft has the smoke detection system B. the aircraft has an operating transponder
5. One of the sources of wind shear is ...
   A. earthquake B. thunderstorm

ELECTRICAL POWER UNIT

31. Look at the components and write which system they form.

Motors	Generators	Batteries	Bus-bars
Fuses			Transformer Rectifiers
Relays and contactors			Inverters
Circuit breakers	Proximity switches	Micro-switches	Switches



32. a) Read the text and fill in the blanks with the words in the box.

generators - RAT - electrical - circuits - supply

The supply and consumer circuits make up the entire airplane [1] ..... system. Equipment circuits are another name for consumer circuits. Various equipment components are powered by each equipment circuit. All of them get their [2] ..... from bus bars that are powered by batteries or [3] ..... An aircraft's entire electrical system is composed of supplies, generators and battery circuits with transformers. Rectifiers are examples of power supplies [4] ..... The bus bars receive electricity from these. The aircraft engines, a Ram Air Turbine ([5] .....), also called an Air Driven Generator, a hydraulically powered motor, and the Auxiliary Power Unit (APU) can power only APU generators. Generators powered by the engines of aircraft serve as the standard source of supply.

What is RAT?

In cases where hydraulic and electrical power are lost and other backup systems do not work, this small propeller is the only savior. In emergency situations, the RAT can be taken out from under the tail cone or under the wing, and can rotate the propeller with the speed of the aircraft to provide power to the primary hydraulic systems. Then, it generates 5 KW of electricity through its own generator when the AC buses cannot be used even when they are de-energized.

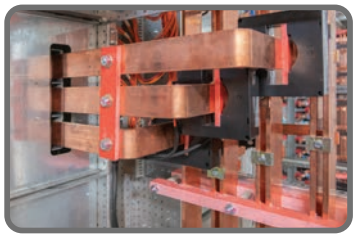
32. b) Match the highlighted words in the text with the pictures.



A. .....

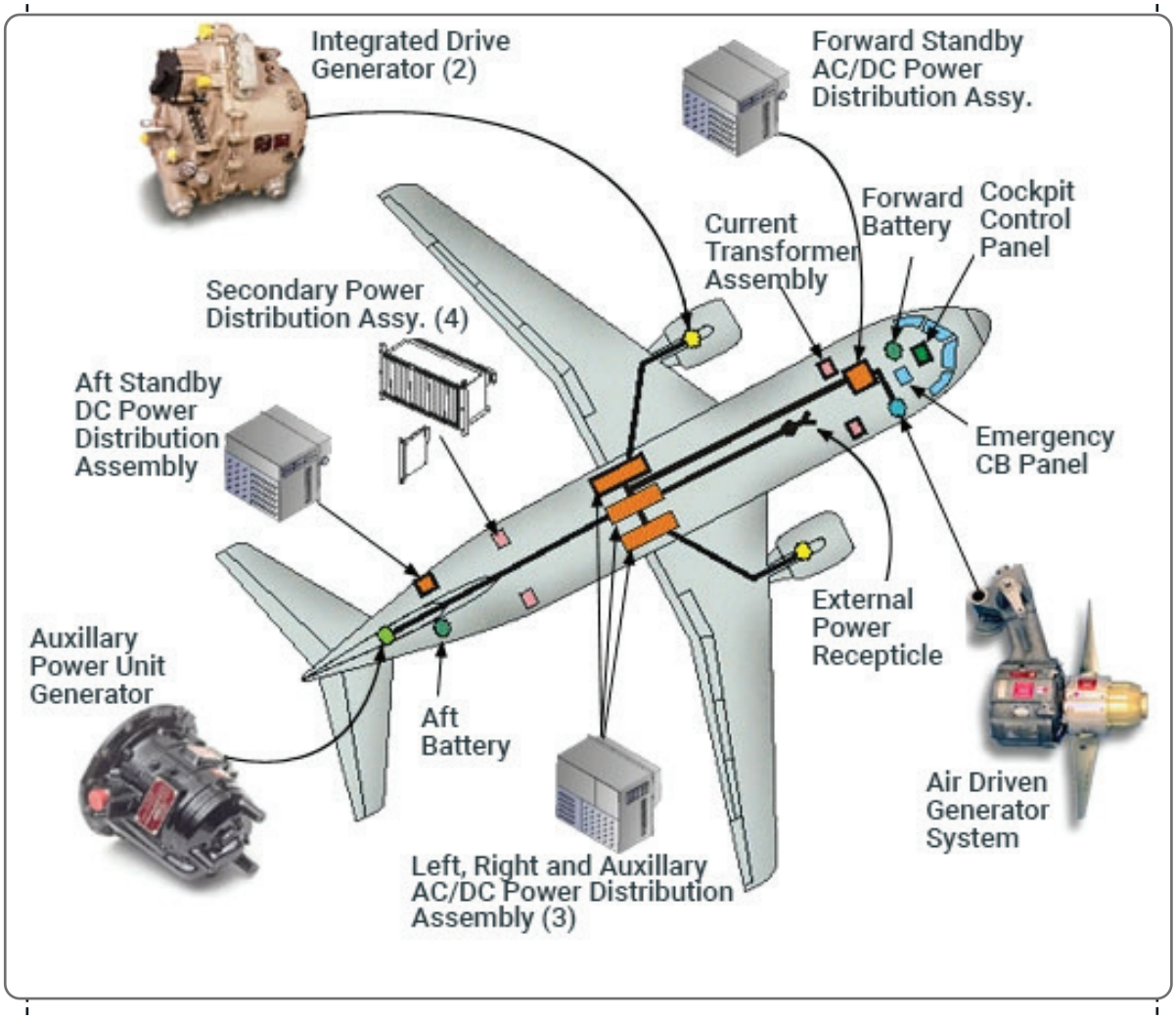


B. .....



C. .....

33. a) Look at the picture, read the text, and complete the puzzle with the highlighted terms.

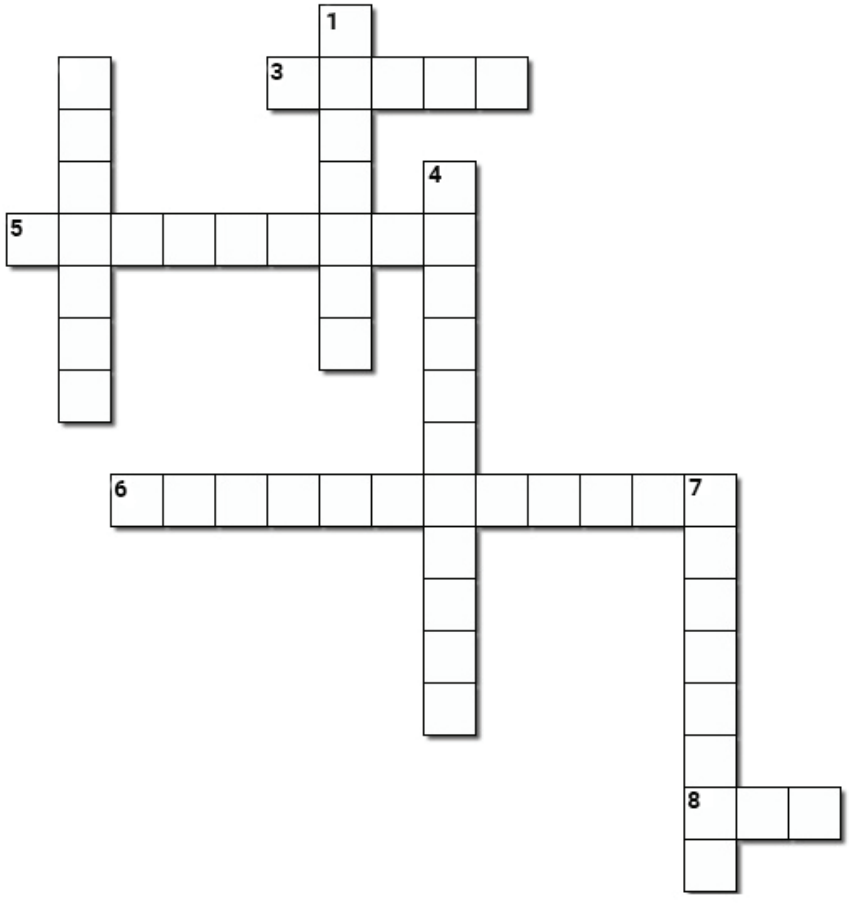


An **APU** is a device commonly found in aircraft and provides energy for functions. It also provides bleed air for air conditioning and engine start- up. The APU has a generator so that the mechanical energy can be used to generate electricity. That is the function of the APU generator. The APU generator can be connected to the main aircraft electrical system and it will provide the necessary power for the aircraft.

External DC Power is used for ground operations to save battery power and can be used to start the APU. When an external DC is connected to the aircraft, its contactor is energized to provide power to the APU start contactor.

A Current Transformer (CT) is used to measure the current of another circuit and also to monitor high-voltage lines across national power grids. The current transformer reduces a high current to a lower value and therefore provides a safe way of monitoring the electrical current flowing in an AC transmission line.

Integrated Drive Generator (IDG) is an electrical generator which provides electricity for the aircraft. It consists of a generator and a Constant Speed Drive (CSD), uses the kinetic energy of the aircraft engines and converts it into electrical energy.

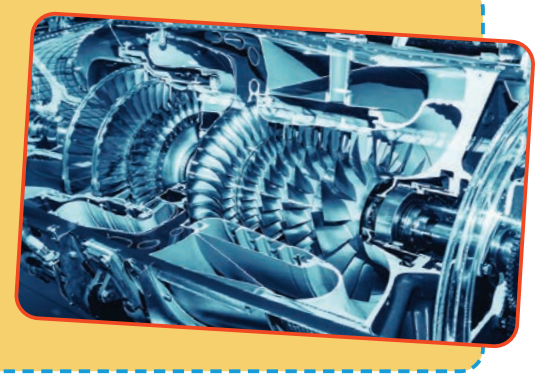


Across
3. It is a supply (a device) with mechanical or electrical energy.
5. It is a machine for converting mechanical energy into electricity.
6. It carries more than 1000 volts between conductors.
8. It stands for Auxiliary Power Unit.

Down
1. To observe and check the progress
2. Relating to or resulting from motion.
4. It is an apparatus for reducing or increasing the voltage of an alternating current.
7. Coming or derived from a source outside.

33. b) Read the text in Exercise 33 a again and answer the questions.

1. What does an APU provide?
   .....
2. What is an APU generator used for?
   .....
3. What is used to save battery power?
   .....
4. What does a CT monitor?
   .....
5. What does an IDG consist of?
   .....



AVIATION FUEL

34. Look at the picture and unscrumble the letters.



I-A-V-T-A-O-N-I U-E-F-L

_ _ _ _ _ _ _ _ _ _ _ _ _

35. Read the dialogue and complete the table.



Interviewer: We are here to ask you some questions about aviation fuel types. Firstly, can you please tell us what the features of modern aviation fuel types are?

Technician: Sure. Modern aviation fuel is unique for its specific energy. So, this high energy storage capacity enables long-distance flights.

Interviewer: Thanks for the information, Mr Özcan. Now, let's talk about the main types. As far as I know, one of them is Jet A1, isn't it?

Technician: Exactly. It is the most used fuel type worldwide. It is especially suitable for international travels and for different climates.

Interviewer: Good to learn. What about the others?

Technician: Jet B is an alternative to Jet A1. It is very useful in extremely cold areas. Also, there is AVGAS which is the short form of aviation gasoline. It is especially suitable for crop-dusting, private flying, and flight training.

Interviewer: Could we also mention the biofuel?

Technician: Of course. It is an ecologically friendly alternative to the fossil-based ones. Another advantage of it is that it is renewable and carbon-efficient. However, we can say that it is currently ideal for short-term flights and light cargo transportation.

Interviewer: Mr Özcan, thanks a lot for the interview. See you in the next show.

AVIATION FUEL TYPES	
JET A1	suitable for [1] ..... travel suitable for varying [2] .....
JET B	used in civil aviation useful in [3] ..... areas
AVGAS	engine aircraft suitable for crop-dusting, [4] ..... , and flight training
BIOFUEL	[5] ..... alternative renewable and carbon-efficient type ideal for [6] ..... flights

HYDRAULIC

36. Match the questions with the paragraphs.

A. What are the advantages of using aviation hydraulic systems?
B. What are aviation hydraulics?
C. What are the features of aviation hydraulics?
D. What are the types of hydraulic fluids?
E. What are the basic components of aviation hydraulic systems?

1. .....
Hydraulic systems help planes take off, fly, and land. They provide planes and pilots with the most reliable system available, and they are also used to help control and manage equipment such as brakes, flaps, thrust reversers, flight controls, and landing gear.



2. .....
A hydraulic system consists of some basic parts such as a pump, reservoir, actuating cylinder, pressure relief valve, and heat exchanger.

3. .....
There are so many benefits of using aviation hydraulics. First of all, they are cost-effective to install and maintain. Besides, they are energy efficient because they run continuously at a constant speed. They are also dependable and reliable, which makes them easy to repair and maintain. Moreover, hydraulic systems respond to control inputs quickly and effectively. This is essential to aviation as having a safe flight may depend on being able to react more quickly and effectively. Another benefit of aviation hydraulic systems is that the fluid is resistant to compression.

4. .....
Today, three main types of fluid are mostly used in hydraulic systems. Mineral-based fluid is dyed red, a petrochemical product, and works great for preventing corrosion. It is also very dependable for temperature changes. Another one is vegetable-based fluid which is dyed blue and made of castor oil. Even though it seems to be very effective, there are some doubts that it causes corrosion. The last type of fluid is synthetic-based one. It is dyed purple and made from alcohol and phosphoric acid. Despite its benefits, it can soften some plastic, which may ruin some parts.

5. .....
The viscosity of hydraulic oil is a really important feature as it improves the performance of the system by resisting fluctuations in temperature and providing protection against high temperatures. Another important feature is density. If the density of the fluid increases, the fluid's erosive potential increases. So, it also improves the system's contamination for a long period of time.

37. Read the text again in Exercise 36 and complete the boxes.

FEATURES OF AVIATION HYDRAULIC

1. .....
2. .....

TYPES OF HYDRAULIC FIUID

1. .....
2. .....
3. .....

COMPONENTS OF AVIATION HYDRAULIC

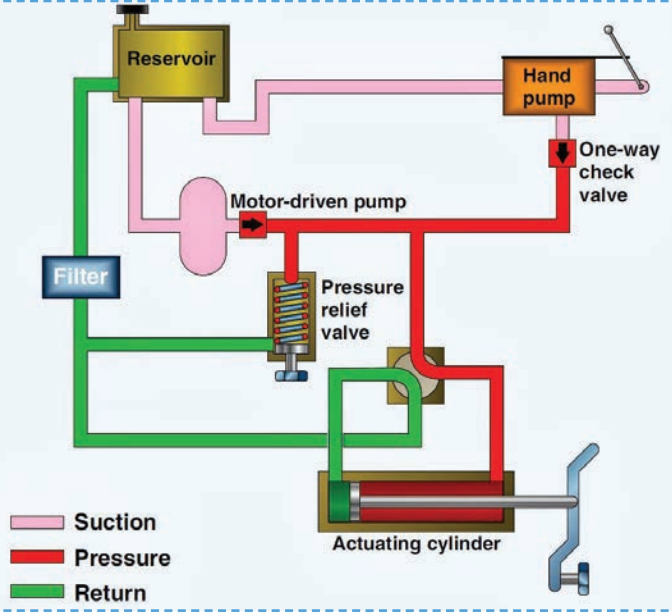
3. .....
4. .....
5. .....
6. .....
7. .....

ADVANTAGES OF AVIATION HYDRAULIC

11. .....
12. .....
13. ..... and .....
14. ..... and .....
15. .....

38. Look at the picture and match the explanations with the correct components in the box.

reservoir – pumps – pressure relief valve – actuating cylinder



1. ..... : The system may have one or two power-driven ones and a hand one. They generate the power that helps to pressurize the system.

2. ..... : It is a tank in which an adequate supply of fluid for the system is stored. The fluid flows from there to the pump, where it is forced through the system and eventually returned to it.

3. ..... : It is one of the most important parts of the hydraulic system. It is utilized to give a moving object or device-propelled linear motion by converting fluid pressure and flow to mechanical force.

4. ..... : It is used to regulate the amount of pressure placed on a confined liquid. This is necessary to avoid hydraulic lines rupturing or component failure due to excessive pressure.

ICE AND RAIN PROTECTION

39. Read the article below and choose the correct title.

A. How to make ice
B. The enemies of aviation
C. Dangers of cold temperatures

NEWSPAPER 2023/07/06 Thursday ANKARA

.....

Rain, snow and ice have always been the enemies of aviation. Ice can rapidly form on aircraft leading-edge surfaces at altitude. Especially water droplets immediately turn to ice on the aircraft surfaces. Ice forming creates two [1]..... :

- The malformation of the airfoil can decrease the amount of lift.
- The additional weight that icing causes can create unbalancing problems that make the aircraft hard to control.

The ice and rain protection systems used on aircraft keep ice from forming on the following airplane [2] ..... :

- Wing leading edges
- Horizontal and vertical stabilizer leading edges
- Engine cowl leading edges
- Propellers
- Propeller spinner
- Air data probes
- Flight deck windows
- Water and waste system lines and drains
- Antenna

There are several ways to [3]..... ice formation which are:

1. Heating surfaces with hot air
2. Heating by electrical elements
3. Breaking up ice formations, usually with inflatable boots
4. Chemical application



40. Choose the correct words/word groups for the blanks in Exercise 39.

1. A. main dangers	B. main advantages
2. A. systems	B. components
3. A. prevent and control	B. cause and help

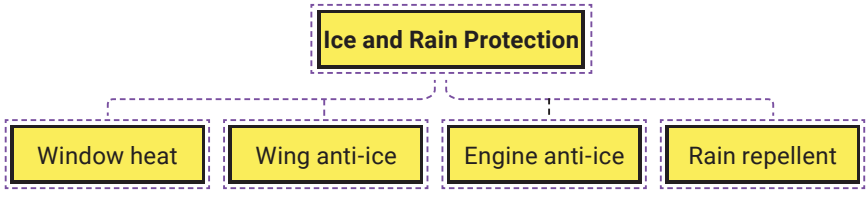
41. Read the explanation and put a tick to the correct information.

There is some equipment designed for anti-icing or deicing. Anti-icing equipment is put into operation before entering icing conditions and is designed to prevent ice from forming. So, it can be done by

- ☐ keeping the surface dry
- ☐ opening the windows
- ☐ heating water to evaporate it
- ☐ heating the surface
- ☐ turning off the air-conditioning
- ☐ maintaining regularly



42. Look at the diagram, read the paragraphs and write correct questions or answers.



How To Prevent Icing On The Wings?

The Wing Anti-Ice System (WAI) is operated on the ground and also in-flight. Two 125°C thermal switches that automatically close the wing TAI (Thermal Anti-Ice) system shutdown valves if the air temperature exceeds 125°C. The system cleans the wing leading edge slats of ice accumulation. The pneumatic manifold supplies controlled hot air to the system. Each wing has a shutdown valve that regulates airflow. A single control switch on the pilot's overhead panel is used to operate both valves. The system consists of supply and distribution ducting, two control valves, electrical control components, thermal switches and indicating components.

1. .....?
   It stands for Wing Anti-Ice.
2. .....?
   It happens when the air temperature exceeds 125 °C.
3. .....?
   Yes, it is on the pilot's overhead panel.
4. .....?
   The system consists of supply and distribution ducting, two control valves, electrical control components, thermal switches and indicating components.

How To Prevent Icing On The Engine?

The main purpose of the engine anti-ice system, as it is installed on most types, is to prevent ice from forming on the engine nacelle's air intake port. It does not stop the formation of ice on the fan blades or in the early stages of the engine core (compressor). In order to de-ice an engine normally, loose contaminants are first removed with a brush or broom, and then the affected regions are heated to melt any ice. The aircraft can be warmed by being kept in a hangar for a while, but more frequently, hot air directed from an outside heat source is utilized.

5. What is the main purpose of the engine anti-ice system?
   .....
6. What is done in order to de-ice an engine?
   .....
7. How can the aircraft be warmed?
   .....

Window Heating

The airplane uses electrical heating to defrost the side windows in the cockpit and de-ice each windshield. On each side, two separate Window Heat Computers (WHCs) automatically control the system, guard against overheating, and signal errors. While at least one engine is running or the aircraft is in flight, the window heating automatically turns on. Before starting the engines, the flight crew turns on the PROBE/WINDOW HEAT pushbutton switch manually. In flight, windscreen heating functions at normal power; on the ground, it operates at low power. The switch is made automatically. There is only one heating setting for the windows

8. .....?
They automatically control the system, guard against overheating, and signal errors.
9. .....?
It operates at low power.
10. .....?
It operates at normal power.

Rain Protection

During taking off and landing in the rain, rain-removal systems are important to allow the pilot to see the approach and departure paths and surrounding area clearly while maintaining a clear view of the airport during the flight. The systems are rarely needed when flying at a high altitude. The rain can be removed from the windshields in a number of ways. Although many aircraft lack a rain removal system, those that do often use one or a combination of the following systems:
Windshield wipers, a chemical rain-repellent coating, a hydrophobic seal coating, and pneumatic rain removal.

11. How do the rain-removal systems help the pilot?
.....?
12. Do all aircraft have a rain removal system?
.....?

AVIATION LIGHTS

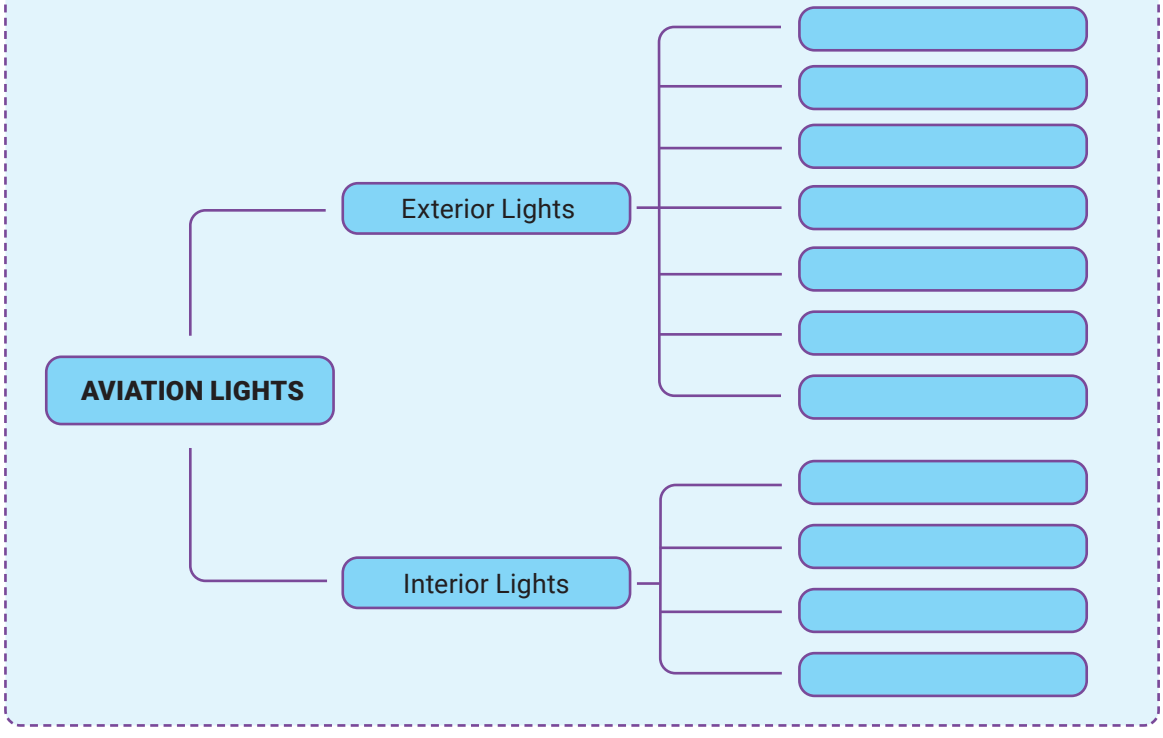
43. Look at the picture and answer the questions.

1. What is the biggest factor in noticing aircraft when we look at the sky?
.....
2. What is the function of flashing lights on the fuselage of aircraft?
.....
3. How many different types of lights are there on aircraft and where are they located?
.....



44. Put the types of lights into the correct category.

- Tail Lights
- Emergency Lights
- De-ice Lights
- Taxi Lights
- Lavatory Lights
- Navigation Lights
- Beacon Lights
- Reading Lights
- Landing Lights
- Strobe Lights
- Wash Lights



45. Read the presentations of the students and fill in the blanks with the words in the box.

advertising - taxiway - wing - snowy - prevent - bottom - illuminate

Okan

Taxi Lights: They are generally used for night flights. They are used on the [1]..... when the aircraft is going to the runway for takeoff. In some airlines, these lights are turned off when the runway is reached. The taxi lights, which are also turned on during landings, are located on the nose landing gear of the aircraft. It also opens when entering the taxiway when the plane lands. Besides, these lights are called dipped beams.



Ceren

Landing Lights: They are generally used for night flights. Depending on the aircraft types, their position on the fuselage may vary. These lights should [2]..... the runway very well during takeoffs and landings.



Fahrettin

Navigation Lights: The colored lights on the wing tips of an aircraft you see at night or during night flights have definitely caught your attention. These lights are called 'navigation lights'. The right wing of the aircraft is always green, and the left [3]..... of the aircraft is always red. These lights are always on. These lights show the position of the aircraft in the air and on the ground. Pilots flying in the air can understand in which direction another aircraft is headed thanks to these lights. These lights also help the tower and the servants in operation. If the right wing of an airplane is green and the left wing is red, it is coming towards us. If a white or yellow light illuminates on the left and right wings of the aircraft as well as on the tail cone, the aircraft is heading in the same direction as us.



Sevgi

Strobe (Anti-Collision) Lights: These lights, located on the wing tips and tail cone of the aircraft, are used to [4]..... collisions. Each wing tip has high-intensity strobe lights that flash a white light. These flashing lights are very bright and are intended to attract attention during the flight. They are also sometimes used to make the aircraft more prominent on the runway and during taxiing. The lights, which have a different flashing style according to each aircraft model, make the aircraft noticeable in the air.



Deren

Beacon Lights: These are the red lights located at the top and [5]..... of the aircraft fuselage and illuminated in the form of flip-flops. These lights indicate that the engines are in working condition and that the ground handler should not approach the engine area after a certain distance. Red anti-collision lights are also turned on by maintenance personnel when testing dangerous components such as landing gear doors or wings. Walking near a running jet engine or turboprop is more dangerous than dealing with chainsaws. When ground personnel see the red lights flashing, they realize that the area is not safe.



Umay

Tail (Logo) Lights: The elevators in the tail of the aircraft are the lights on the small wings. These lights are commonly used for [6]..... benefits. The lights are also effective for collision avoidance. They make it easier for pilots to detect aircraft on the ground and in flight. Logo lights also help ground controllers identify aircraft on taxiways.



Mila

De-Ice Lights: They are generally used in the winter months in [7]..... weather, and at night to see the ice formed on the wings and engine surfaces of the aircraft. They are located on the sides of the aircraft fuselage and are positioned so that they can see the rear. These lights are used just before the aircraft lands and takes off.



46. Read the texts in Exercise 45 and match the highlighted words and phrases with their Turkish meanings.

1. dikkat çekmek: .....
2. saptamak: .....
3. istikamet, yön: .....
4. hızlanma yolu: .....
5. yaklaşmak: .....
6. çarpışma: .....



47. Answer the questions according to the texts in Exercise 45.

1. Where are the taxi lights located?
   .....
2. Are landing lights mostly used for day flights?
   .....
3. What do the navigation lights show?
   .....
4. Which colours are the navigation lights?
   .....
5. What is the function of the strobe lights?
   .....
6. What is the purpose of the beacon lights?
   .....
7. What do ground personnel understand when they see the red lights flashing?
   .....
8. What is the other name for tail lights?
   .....
9. What is the benefit of using de-ice lights?
   .....
10. Which lights are good for advertising?
    .....

48. Complete the sentences with the words in the box about interior aviation lights.

lavatory lights - wash lights - reading lights - emergency lights

1. When you need any help in case of an emergency during the flight, ... are used.
2. When you use the lavatory during the flight, you can use ..... which are usually LED.
3. In order not to disturb the other passengers, you can move the ..... to direct the light where you need it for reading. It is an independent lighting system at the top of the passenger seat and controlled from individual seat controls so that passengers can read when the cabin lights are off.
4. Also called dome lights, ... illuminate the ceiling and the sides of the aircraft and these lights are the main lights of the cabin.

OXYGEN

49. Read the dialogue and match the highlighted words with the pictures.

The interviewer: **Hello everyone. As you all know, the human body is dependent on oxygen and we are all afraid of being short of breath. Today, our guest is the aircraft maintenance mechanic, Tim. Welcome to our channel, Tim. Can we please start by explaining what 'hypoxia' is?**

Tim : Hello, I hope I can answer all the questions in your mind. OK, hypoxia, by definition, is the lack of sufficient oxygen in the blood, tissues, and/or cells to maintain normal physiological function. There are so many factors which cause hypoxia such as breathing air at a reduced barometric pressure, malfunctioning oxygen equipment at altitude, drowning, pneumonia, or extreme environmental temperatures.

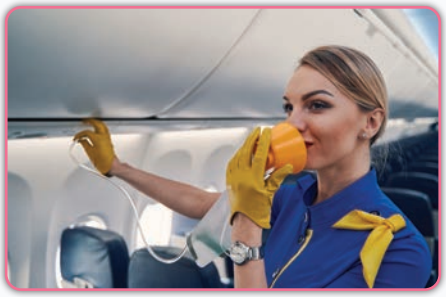
The interviewer: **So tell us, Tim, what is the most common reason of hypoxia in aviation?**

Tim : The most common ones are flying, lack of supplemental oxygen, pressurization, or oxygen system malfunction.

The interviewer: **Well, I think there must be some precautions to maintain the oxygen equipment, right?**

Tim : Of course. First, we keep them clean. Second, we protect the oxygen masks from direct sunlight and dust. I mean, we store them in proper containers. Finally, we inspect the oxygen storage containers to be sure that they are safely fastened.

The interviewer: **Thank you for all this valuable information, Tim. See you in the next episode where we are going to talk about the basic components of the system.**



1. .....



2. .....



3. .....



4. .....

50. Read the dialogue in Exercise 49 again and write T (True) or F (False) to the sentences.

1. ..... Hypoxia means not having enough oxygen in the blood.
2. ..... Oxygen masks must be kept in sunlight.
3. ..... Pressurization is one of the results of hypoxia.
4. ..... People might suffer from hypoxia if there is an oxygen system malfunction.

51. Read the explanation and choose the correct words.

Storage Systems: Oxygen can be stored in the aircraft as gas, liquid, or solid.
ABO : Gaseous Aviator's [1] Breathing / Booster Oxygen
LOX : [2] Last / Liquid Aviator's Breathing Oxygen
MSOG: Molecular Sieve Oxygen [3] Gas / Generators

52. Match the groups of advantages and disadvantages with the oxygen types in Exercise 51.



A. .....
Advantages
One liter of it will expand into 900 gaseous liters of ABO.
This provides space savings.
Disadvantages
If it comes in contact with exposed skin, it can cause severe frostbite.

B. .....
Advantages
It is considered as a replacement for liquid and gaseous stores on aircraft.
It increases system safety and minimizes logistic requirements.
Disadvantages
It contains 5% argon and it might have physiological effects when breathing.

C. .....
Advantages
It is economical.
It can be stored in high or low-pressure containers.
Disadvantages
The weight and the bulk of the containers might be a problem.

53. Read the explanation and choose the correct word for the acronym PRICE.

Before every flight, pilots, crewmembers and technicians must perform the 'PRICE' check.
1. **PRESSURE / PERFORM**: to ensure that there is enough oxygen pressure
2. **RESEARCH / REGULATOR**: to inspect the oxygen regulator for functioning properly
3. **INFORMATION / INDICATOR**: to check the flow indicator to ensure a proper flow of oxygen
4. **CONNECTIONS / CONTAINERS**: to ensure that all the connections (oxygen lines, plug-in coupling, and the mask) are fastened
5. **ENGINE / EMERGENCY**: to prepare the oxygen equipment in the aircraft in case of an emergency.

54. Each box has a term that doesn't belong there. Find it and write it in the correct box.

AIR CONDITIONING
- Aircraft altitude
- Ambient temperature
- Smoke detection
- Cabin altitude
- Differential pressure

PNEUMATIC
- Power generation
- Check valve
- Low pressure
- Turbofan engine
- Oil's viscosity

FIIGHT INSTRUMENTS
- Altimeter
- Attitude indicator
- Airspeed indicator
- Ambient pressure
- Heading indicator

AVIATION FUEL
- Fuel chemists
- AC Generator
- Fuel control
- Fuel transfer
- Fuel pressurization

ELECTRICAL POWER UNIT
- Power supply
- Compressor
- Passenger service power
- Auxiliary power unit
- Volt

ICE & RAIN PROTECTION
- Window heat
- Wing anti-ice
- Fuel flow
- Wiper controls
- Rain repellent

HYDRAULIC
- Fuel chemists
- AC Generator
- Fuel control
- Fuel transfer
- Fuel pressurization

AVIATION LIGHTS
- Power supply
- Compressor
- Passenger service power
- Auxiliary power unit
- Volt

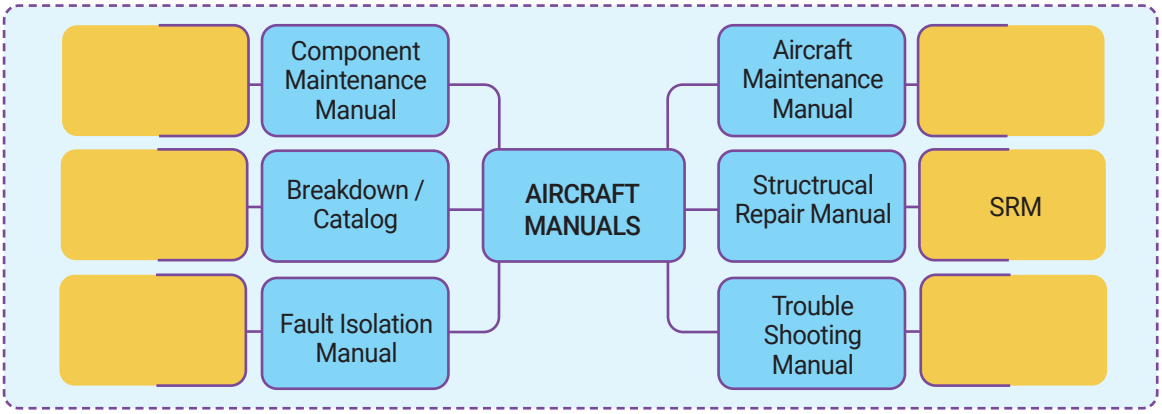
OXYGEN
- Window heat
- Wing anti-ice
- Fuel flow
- Wiper controls
- Rain repellent

55. Write the hidden message written in the Aviation Alphabet in the word chain.

Alphaindiaromeocharlieromeoalphafoxtrottangosierrayankeesierratangoechomikesierraalpharomeoechovictorindiatangoalphalima

_____ _____ _____ _____

1. Look at the diagram below and write the acronyms of aircraft manuals.



2. Read the dialogue and choose the correct answers.

John: Hi, I'm John. I'm a student in an aviation maintenance program. I've heard of a few different types of aircraft manuals, but I'm not sure what they're all for.
Jane: Sure thing. Well, the Aircraft Maintenance Manual, or AMM, is the main reference document for the maintenance, repair, and overhaul of an aircraft. It includes all the information necessary to maintain and operate the aircraft.
John: What other types of manuals are there?
Jane: The Structural Repair Manual, or SRM, provides detailed instructions for any structural repairs. Both the Troubleshooting Manual (TSM) and Fault Isolation Manual (FiM) prescribe a series of steps to be used when troubleshooting any problems or malfunctions for aircraft. Although they serve the same purpose, they are used in different aviation corporations. The Component Maintenance Manual, or CMM, provides instructions for maintaining and testing components. The Illustrated Parts Breakdown, or IPB, is a catalogue which lists all of the parts, components of the aircraft and their replacement parts.
John: Wow, that's a lot of different manuals. Do I need to know all of them?
Jane: Actually, yes. Generally, you'll mostly need to use the AMM and SRM on a regular basis. But when you search for any malfunctions or faults, you will use TSM and FiM. If you make a material request, you will use IPB /IPC.

1. What is the main reference document for the maintenance, repair, and overhaul of an aircraft?
A. Aircraft Maintenance Manual
B. Structural Repair Manual
C. Troubleshooting Manual
D. Component Maintenance Manual

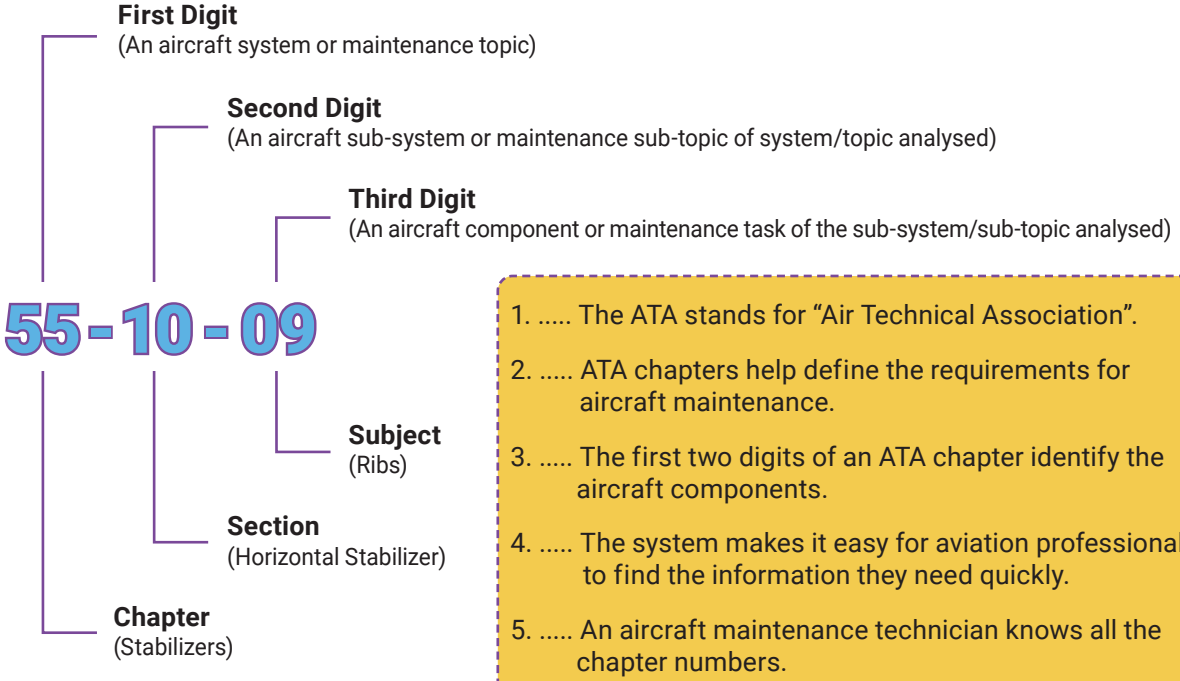
2. Which manual provides detailed instructions for troubleshooting any problems or malfunctions?
A. Aircraft Maintenance Manual
B. Structural Repair Manual
C. Troubleshooting Manual
D. Component Maintenance Manual

3. What is IPB used for?
A. To describe how to maintain and test components
B. To contain all of the aircraft's parts, components, and replacement parts
C. To give detailed instructions for any kind of malfunction
D. To give information about the manuals

4. What type of manual provides instructions for maintaining and testing components?
A. Aircraft Maintenance Manual
B. Structural Repair Manual
C. Troubleshooting Manual
D. Component Maintenance Manual

3. Read the dialogue and write T (True) or F (False) to the sentences.

Ahmet: Excuse me, I am so confused about ATA chapters. Can you tell me what ATA chapters are in aviation?
Hamit : Sure! ATA stands for "Air Transport Association", and it's an international standards organization for the aviation industry. Each chapter is a set of rules and regulations related to a specific area of aviation.
Ahmet: So what do ATA chapters cover?
Hamit : They cover a range of topics, from safety and maintenance to airport operations. They help define the requirements for aircraft maintenance. Each chapter is organized around a specific topic, like airworthiness, navigation or flight operations.
Ahmet: It sounds like the ATA chapters are really important for the aviation industry.
Hamit : Absolutely! The ATA chapters are the foundation for the industry. The first two digits of an ATA chapter identify an aircraft system or maintenance topic, and the second two digits identify an aircraft sub-system or maintenance sub-topic of system/topic analysed. The last two digits identify an aircraft component or maintenance task of the sub-system/sub-topic analysed. This system makes it easy for aviation professionals to find the information they need quickly.
Ahmet: Well, I am an aircraft maintenance technician. Do I need to be familiar with each and every chapter? Which chapters are more important for me?
Hamit : No, you are only responsible for knowledge related to your job. For example, chapter 27 flight controls, chapter 28 fuel systems, and chapter 32 landing gear are crucially important for you.
Ahmet: Do ATA chapter numbers differ from aircraft to aircraft?
Hamit : Chapter numbers are standard on all aircraft. If you are going to do work related to landing gear on an F16 aircraft, you will need to refer to chapter 32, and if you are going to do work related to landing gear on a Boeing 747, you will need to refer to chapter 32, again. You will understand it better when you examine the function number below.



1. ..... The ATA stands for "Air Technical Association".
2. ..... ATA chapters help define the requirements for aircraft maintenance.
3. ..... The first two digits of an ATA chapter identify the aircraft components.
4. ..... The system makes it easy for aviation professionals to find the information they need quickly.
5. ..... An aircraft maintenance technician knows all the chapter numbers.
6. ..... On all aircraft, chapter numbers are standard.

4. Read the sentences about translation requirements, then decide if you already know them or new to you. Complete the table with their numbers.

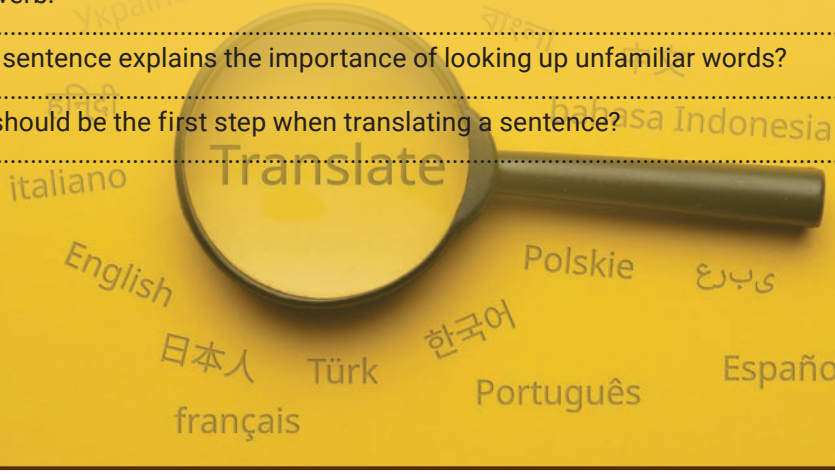
How can I become a translation expert?

1. When translating from English to Turkish, it's important to read the document twice and make sure you understand the main idea.
2. Any new words should be looked up in a technical dictionary to ensure you understand their meaning.
3. Translation should be done paragraph by paragraph and then sentence by sentence.
4. Focus on preserving the meaning, not the exact words.
5. Don't try to make the translated text identical to the original; otherwise, the meaning of the sentences may be lost.
6. Understanding and translating maintenance guides and booklets are usually easier because they usually contain familiar patterns, structures, and commands.
7. Be careful when reading a text, as some words may have multiple meanings. Read the text carefully, so you can correctly determine the meaning of any unfamiliar words.
8. The main difference between Turkish and English is the position of the verb; in Turkish, the verb is placed at the end, whereas in English, it is placed immediately after the subject.
   In Turkish: Subject + Object + ... + ... + Main verb
   In English: Subject + (auxiliary verb) + Main verb + ... + ...
9. To begin translating an English sentence, first, scan the end of the sentence, then identify the main verb, subject and finally start translating.

ALREADY KNOW	NEW TO ME

5. Look at Exercise 4 again and do the exercises according to it.

1. Translate the sentence “Translation should be done paragraph by paragraph and then sentence by sentence.” into Turkish.
   .....
2. Identify the verb and subject in the sentence “In Turkish, the verb is placed at the end.”
   .....
3. Find the main verb in the sentence: “Don’t try to make the translated text identical to the original; otherwise, the meaning of the sentences may be lost.”
   .....
4. Translate the sentence: “The main difference between Turkish and English is the position of the verb.”
   .....
5. Which sentence explains the importance of looking up unfamiliar words?
   .....
6. What should be the first step when translating a sentence?
   .....



6. Study the box about basic sentence structure and identify the parts of sentences below.

It is critical to identify the different parts of a technical sentence. Primarily, they are the **Subject**, the **Verb**, the **Object**, the **Means**, and the **Purpose**. Purpose shows aims, goals, reasons, etc. Some sentences do not have all these parts. Often passive voice is used in technical sentences.

SUBJECT	VERB	OBJECT	MEANS	PURPOSE
The pressure switch	sends	a signal	through the EPC	to turn off the APU.
The piping	is fastened	————————	with two clamps	in order to prevent vibration.

1. A riveted structure must be supported in order to retain its original size, shape, and positioning.
   Subject: .....
   Verb: .....
   Purpose: .....



2. Smoke is detected by optical sensors in aircraft.
   Subject: .....
   Verb: .....
   Means: .....

3. Do not touch hot parts to avoid burning.
   Verb: .....
   Object: .....
   Purpose: .....

4. A thorough inspection must be done to determine the extent of the damage via special devices.
   Subject: .....
   Verb: .....
   Means: .....
   Purpose: .....

5. Any manoeuvre, gust, or gust plus manoeuvre outside the structural envelope can damage the airplane structure.
   Subject: .....
   Verb: .....
   Object: .....

6. An attitude indicator is used for the position of an aircraft.
   Subject: .....
   Verb: .....
   Purpose: .....

7. Read the section on Corrosion Prevention from SRM and underline the main verbs. Then complete the translation on the right with their Turkish equivalents.

Corrosion Prevention



1. General

a. Corrosion is a process that causes the deterioration of a metal material due to chemical or electrochemical reactions. This can lead to the weakening of the aircraft structure as the metal is transformed into different compounds.

b. Corrosion prevention is one of the most crucial functions to maintain the aircraft in a safe and serviceable condition. The following actions are required for successful corrosion control.

- regular maintenance,
- a clean structure,
- early detection of corrosion,
- complete removal of corrosion when it arises,
- frequent inspection of corrosion-preventative measures,
- immediate repair of any damage.

c. Corrosion-resistant materials and protective treatments are used in the construction. This is done to lessen the likelihood of corrosion. Special anti-corrosion treatments are applied to certain areas, such as underneath the galleys and restrooms.

2. Causes of Corrosion

Corrosion is an electrochemical process that occurs when an electrical potential difference is present between a metal

Korozyonu Önleme

1. Genel

a. Korozyon, kimyasal veya elektrokimyasal reaksiyonlar nedeniyle metal malzemenin bozulmasına neden olan bir [1]süreçtir. Bu, metalin farklı bileşiklere dönüşmesine neden olarak uçak yapısının zayıflamasına [2].....

b. Korozyon önleme, uçakların güvenli ve uygun hizmet durumunda tutulması için en önemli işlevlerden [3]..... . Başarılı bir korozyon kontrolü için aşağıdaki eylemler [4] ..... .

- düzenli bakım,
- temiz bir yapı,
- erken korozyon tespiti,
- korozyon oluştuğunda tamamen ortadan kaldırılması,
- korozyon önleme tedbirlerinin sık sık denetlenmesi,
- herhangi bir hasarın anında onarımı.

c. Yapım esnasında korozyona dayanıklı malzemeler ve koruyucu işlemler [5]..... . Bu, korozyon olasılığını azaltmak için [6]..... . Uçak mutfağı ve tuvalet altı gibi belirli alanlara özel korozyon önleyici işlemler [7]..... .

2. Korozyonun Sebepleri

Korozyon, bir metal ile çevresi arasında bir elektriksel potansiyel farkı ve bir elektrolit mevcut olduğunda meydana

and its environment and an electrolyte is present. This reaction can be caused by various corrosive agents, such as acids, alkalies, salts, the atmosphere, water, and microorganisms. They create an environment conducive to corrosion when they come in contact with the metal surface.

3. Types of Corrosion

Corrosion is an electrochemical process that converts metal into oxidized, hydroiodic, or sulfatic compounds. It involves two electrochemical reactions:
-The metal oxidizes and leads to an anodic change.
-The corrosive agent reduces and results in a cathodic change.
Though the initial effects of corrosion are not always visible, it typically begins on the surface of the material. The subsequent paragraphs provide examples of the various types of corrosion that can occur on aircraft structures.

a. Pitting Corrosion: It begins on the surface of a material and then extends downwards into the material, and weakens its strength. This type of corrosion is particularly hazardous due to the vertical nature of the corrosion.

b. Filiform corrosion: Clad aluminium alloy sheets are prone to filiform corrosion. It appears as thin thread-like lines that spread out sideways and remain on the surface of the sheet, without penetrating into the core. It can also start at rivets, and will only be visible when the paint on the sheet breaks due to the corrosion damage.

c. Intergranular corrosion: It tends to penetrate into the core of the material, often along the grain boundaries, without any signs visible on the surface. This type of corrosion can be identified by a network of corrosion cracks or lines on the metal. If this hazardous type of corrosion is left unchecked, it can cause the weakening of the structure even before any evidence is seen.

gelen elektrokimyasal bir [8]..... . Bu reaksiyon asitler, alkaliler, tuzlar, atmosfer, su ve mikroorganizmalar gibi çeşitli aşındırıcı maddeler tarafından [9]..... . Metal yüzeyle temas ettiklerinde korozyona elverişli bir ortam [10]..... .

3. Korozyon Türleri

Korozyon, metali oksitlenmiş, hidrojik ya da sülfatik bileşenlere dönüştüren bir elektrokimyasal [11]..... . İki elektrokimyasal reaksiyon [12]..... :
-Metal [13]..... ve anodik bir değişime [14]..... .
- Aşındırıcı madde [15] ..... ve katodik bir değişime [16]..... .
Korozyonun ilk etkileri her zaman görünür olmayabilir, ancak genellikle materyalin yüzeyinde [17]..... . Sonraki paragraflar, uçak yapılarında meydana gelebilecek çeşitli korozyon türlerine ilişkin örnekler [18] ..... .

a. Çukurcuk Korozyon: Bir malzemenin yüzeyinde [19] ..... ve sonra malzemenin içine, aşağı doğru [20] ..... ve gücünü [21]..... . Bu korozyon türü özellikle korozyonun dikey oluşu nedeniyle [22]..... .

b. Filiform Korozyon: Kaplamalı alüminyum alaşımlı saclar ipliğimsi korozyona [23]..... . Bu, yan yana yayılan ve çekirdeğe nüfuz etmeden levha yüzeyinde kalan ince iplik gibi çizgiler olarak [24]..... . Ayrıca, perçinlerden de [25] .....ve sadece korozyon hasarı nedeniyle boya kırılırsa [26].....

c. Taneler Arası Korozyon: Yüzeyde görünür herhangi bir belirti olmaksızın, tane sınırları boyunca boyunca, malzemenin çekirdeğine derinlemesine nüfus etme [27]..... . Bu korozyon türü, metal üzerindeki korozyon çatlakları veya çizgileri ağı tarafından [28] ..... . Bu tehlikeli korozyon türü göz ardı edilirse, herhangi bir belirti göstermeden yapının zayıflamasına [29]..... .

8. Study and learn.

PASSIVE VOICE S+BE+PAST PARTICIPLE			
TENSE	**ACTIVE VOICE**	**PASSIVE VOICE**	**Form**
Present Simple	The mechanic **inserts** the O-ring into its groove.	The O-ring **is inserted** into its groove.	am/is/are + Past Participle (V3)
Future Simple	They **will apply** special coatings to those areas.	Special coatings **will be applied** to those areas.	will + be + Past Participle (V3)
Modals	We **must do** a thorough inspection.	A thorough inspection **must be done**.	Modals + Past Participle (V3)
Passive Infinitive	We need **to change** this component.	This component **needs to be changed**.	to + be + Past Participle (V3)
Passive Gerund	The company is proud of **hiring** Ahmet.	Ahmet is proud of **being hired** by the company.	being+ Past Participle (V3)

9. Read the section on the Replacement Of Structural Components on SRM and complete the verbs in paranthesis in the correct form of passive voice.

Replacement of Structural Components

1. General

CAUTION: WHEN A RIVETED OR BOLTED STRUCTURE NEEDS [1] to be replaced (replace), IT MUST [2] ..... (SUPPORT) IN ORDER TO RETAIN ITS ORIGINAL SIZE, SHAPE, AND POSITIONING.

A. If the damage cannot [3] ..... (fix), or it is not feasible or cost-effective to do so, it [4] ..... (recommend) to replace the entire component.

2. Safety Precautions

WARNING: FOLLOW THE MANUFACTURER'S INSTRUCTIONS WHEN USING ANY CLEANING AGENTS. THESE CLEANING AGENTS ARE HAZARDOUS.

3. Instructions for Replacement

A. If a structural component [5] ..... (damage), the relevant identification page should [6] ..... (consult). The column before last on the page, titled 'Action or Repair', will indicate what repair [7] ..... (require). If no repair is mentioned, then the component should [8] ..... (replace). If extra information [9] ..... (need), the relevant industry should [10] ..... (contact). If service experience indicates that a specific repair is needed, then the manual will [11] ..... (revise) to include this.

B. Before replacing any structural components, a thorough inspection must [12] ..... (do) to determine the extent of the damage. Check for any signs of deformation and/or loose fasteners in the damaged area and around it. Additionally, connected parts and their connections may [13] ..... (damage) as well.

4.Parts to be Replaced

If a part needs [14] ..... (replace) for any reason, the part [15] ..... (acquire) from the relevant industry if a drawing number and part number are listed in the applicable identification page's "Thickness in mm (inch) or Part Number" column. Additionally, refer to the INTRO paragraph.

5.Replacement

A. Removal of Damaged Component

1. Make sure that neither mechanical parts nor electrical bonding straps [16] ..... (attach) to the damaged component before removing it. The Aircraft Maintenance Manual's relevant chapter should [17] ..... (consult) for instructions on removing electrical bonding straps.

2. Remove the relevant fasteners being careful not to harm cables, non-visible or covered assemblies, or the surrounding components.

3.Remove the damaged component.

B. Preparation for Installation

Remove any sealant if necessary, thoroughly clean and remove any grease from the repair area.

6. Installation

A. Put the replacement component, align drill holes, and remove burrs (deburr).

1. Refer to the relevant chapter for the replacement of any fasteners.
2. When reinstalling fasteners, it ..... [18] (advise) to use larger ones, rather than solid rivets, in already existing holes.

10. Look at Exercise 9 and complete the translation with the Turkish equivalents of passive verbs.

Yapısal Ünitelerin Değiştirilmesi

1. Genel

DİKKAT: PERÇİNLİ VEYA CİVATALI BİR YAPININ [1] ..... yenisiyle değiştirilmesi ..... GEREKİYORSA, ORİJİNAL BOYUT, ŞEKİL VE KONUMUNU KORUYABİLMEK İÇİN [2] ..... .

A. Eğer hasar [3] ..... veya bunu yapmak uygun değil ya da uygun maliyetli değilse, komponentin/ünitenin tamamının değiştirilmesi [4] ..... .

2. Güvenlik Önlemleri

UYARI: HERHANGİ BİR TEMİZLİK MADDESİ KULLANIRKEN ÜRETİCİNİN TALİMATLARINA UYUN. BU TEMİZLİK MADDELERİ TEHLİKELİDİR.

3. Değiştirme Talimatları

A. Eğer yapısal bir ünite (komponent) [5] ..... , ilgili tanılama sayfasına [6] ..... . Sayfada sondan önceki 'Eylem veya Onarım' başlıklı sütun, hangi onarımın [7] ..... gösterecektir. Eğer herhangi bir onarım belirtilmemişse, ünitenin [8] ..... . Ek bilgiye [9] ..... , ilgili işletmeyle [10] ..... . Servis deneyimi belirli bir onarımın gerekli olduğunu gösteriyorsa, bakım el kitabı bunu içerecek şekilde [11] ..... .

B. Herhangi bir yapısal üniteyi değiştirmeden önce, hasarın ölçüsünü belirlemek için kapsamlı bir inceleme [12] ..... . Hasarlı alanda ve etrafında herhangi bir şekil bozukluğu ve/veya gevşek bağlantıları kontrol edin. Ayrıca, bağlı parçalar ve bağlantıları da [13] ..... .

4. Değiştirilecek Parçalar

Eğer bir parçanın herhangi bir nedenle [14] ..... gerekiyorsa, ilgili tanılama sayfasının "mm (inç) cinsinden Kalınlık veya Parça Numarası" sütununda listelenen bir çizim numarası ve parça numarası ile, parça ilgili işletmeciden [15] ..... . Ayrıca, GİRİŞ paragrafina bakın.

5. Yenisiyle Değiştirme

A. Hasarlı Parçanın Sökülmesi

1. Hasarlı parçayı sökmeden önce ne mekanik parçaların ne de elektriksel topraklama köprüsünün hasarlı üniteyle [16] ..... emin olun. Elektriksel topraklama köprüsünü çıkarmak için Havaaracı Bakım El Kitabının ilgili bölümüne [17] ..... .
2. Kablolara, görünmeyen veya örtülü düzeneklere veya çevresindeki parçalara zarar vermemeye dikkat ederek ilgili bağlantı elemanlarını çıkarın.
3. Hasarlı üniteyi çıkarın.

B. Montaja Hazırlık

Gerekiyorsa sızdırmazlığı sökün, onarım alanını iyice temizleyin ve yağdan arındırın.

6. Montaj

A. Yeni üniteyi yerleştirin, matkap deliklerini hizalayın ve çapakları temizleyin.

1. Bağlantı elemanlarının nasıl değiştirileceğine ilişkin ilgili bölüme bakın.
2. Bağlantı elemanlarını yeniden takarken mevcut deliklerde dolu gövdeli perçin yerine daha büyük olanların kullanılması [18] ..... .

11. Read the Air Supply Check Valve Removal/Installation Procedure on AMM and find the Turkish meanings of highlighted words, then match them with their definitions.

1. Equipment and Materials

1. [1]Torque Wrench 0.8 m. daN. (71 lbf. In.)
2. [2]Blanking Plugs/Caps
3. [3]O-Ring

2. Procedure

A. Job-Set Up

1. Open access door 121BL.

B. Removal

1. Remove the [4]clamps and slide the flexible sleeve onto the [5]duct to free the check valve.
2. Remove the clamp.
3. Hold the [6]check valve, and open the attachment clamp. Remove the check valve and remove and discard the O-ring.
4. Cap open duct ends.

C. Installation

1. Remove blanking plugs/caps and check for the correct condition of the duct flange and [7]flexible sleeve.
2. Clean and inspect check valve interface and/or adjacent area.
3. Install the new O-ring in its groove on the filter [8]flange.
4. Install the check valve in the flexible sleeve and on the filter flange, with an arrow indicating air flow direction pointing rearwards. Install the clamp. Do not tighten at this stage.

NOTE: Check valve angular positioning is provided by means of a location stud (TOP marking located at upper part).

5. Make sure that the O-ring is inserted into its groove properly.
6. Install and tighten the clamp. TORQUE to the value given on the clamp.
7. Install flexible sleeve; install and tighten the clamps.
8. Tighten the attachment clamp.

D. Close-Up

1. Ensure that the working area is clean and clear of tools and miscellaneous equipment items.
2. Close access door 121 BL.

1. Tork anahtarı, D
2. _____, _____
3. _____, _____
4. _____, _____
5. _____, _____
6. _____, _____
7. _____, _____
8. _____, _____

A. A device used to cover an opening or connection
B. A tool that holds two or more objects together
C. A valve that allows fluid to flow in one direction only
D. A tool used to apply a specific tightening force to a fastener such as a nut or a bolt
E. A flexible tube used to protect or insulate a wire
F. A flat, circular plate that is used to connect objects together
G. A pipe or conduit for conveying air
H. A rubber seal used to prevent the leakage of liquid or gas

12. Read the procedure in Exercise 11 and complete the translation with the sentences removed from the translation.

1. Ekipman ve Malzemeler
1. Tork Anahtarı 0,8 m. daN. (71 lbf. In.)
2. Kör Tapa / Kapak
3. O-ring

2. Prosedür

A. İşe Hazırlık
1. 121BL erişim kapağını açın.

B. Sökme
1. .....C..... [1]
2. Kelepçeyi sökün/ çıkarın.
3. [2] .....
4. Açık boru uçlarını kapatın.

C. Montaj
1. [3] .....
2. [4] .....
3. Yeni O-ringi filtre flanşındaki yuvasına takın.
4. [5] .....

NOT: Tek yönlü valf açısal konumlandırması bir yerleştirme saplaması ile yapılır/sağlanır. (Üst kısımda ÜST işareti bulunur)

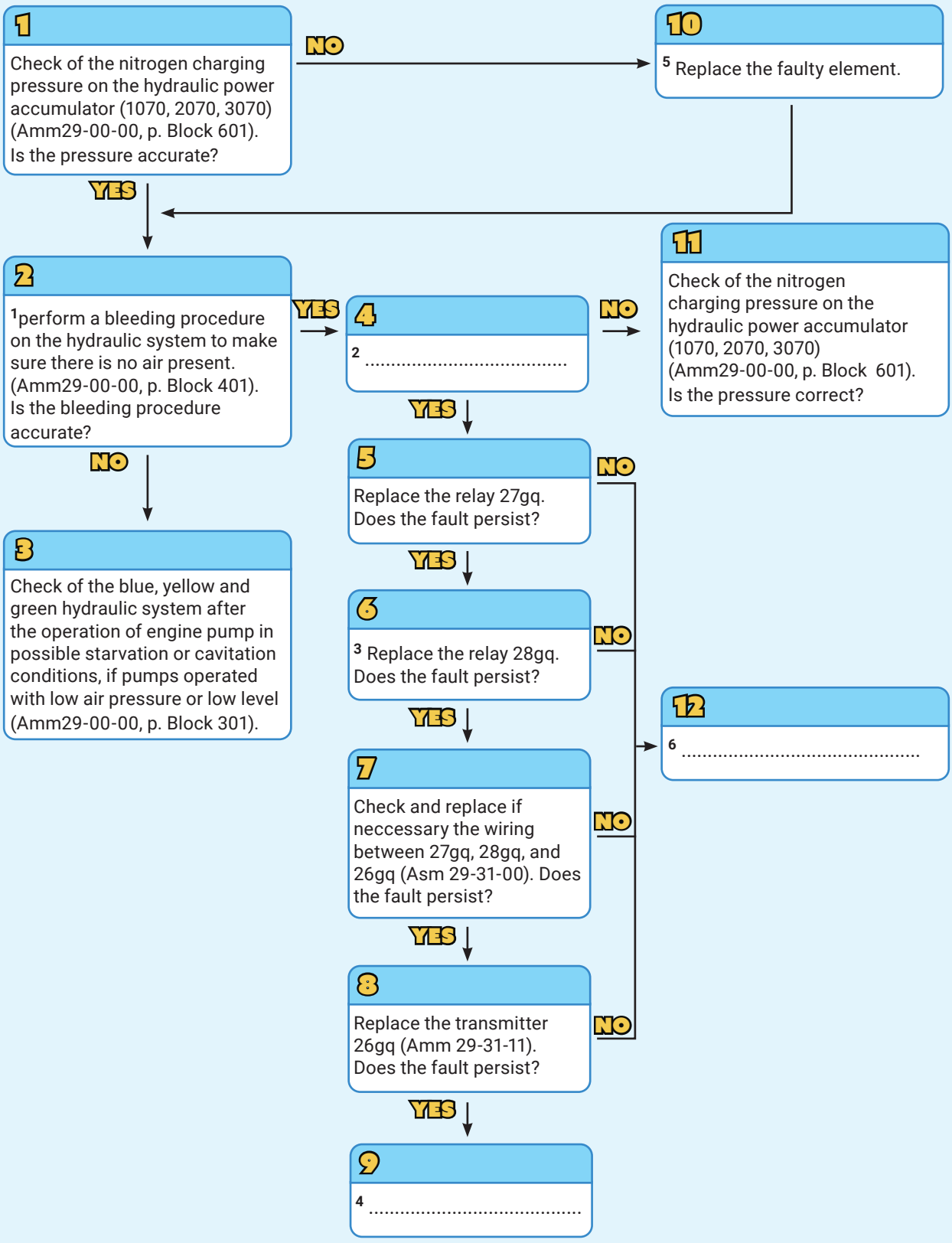
5. [6] .....
6. Kelepçeyi takın ve sıkın. Kelepçede verilen değeri torklayın
7. Esnek manşonu takın; kelepçeleri takın ve sıkın.
8. [7] .....

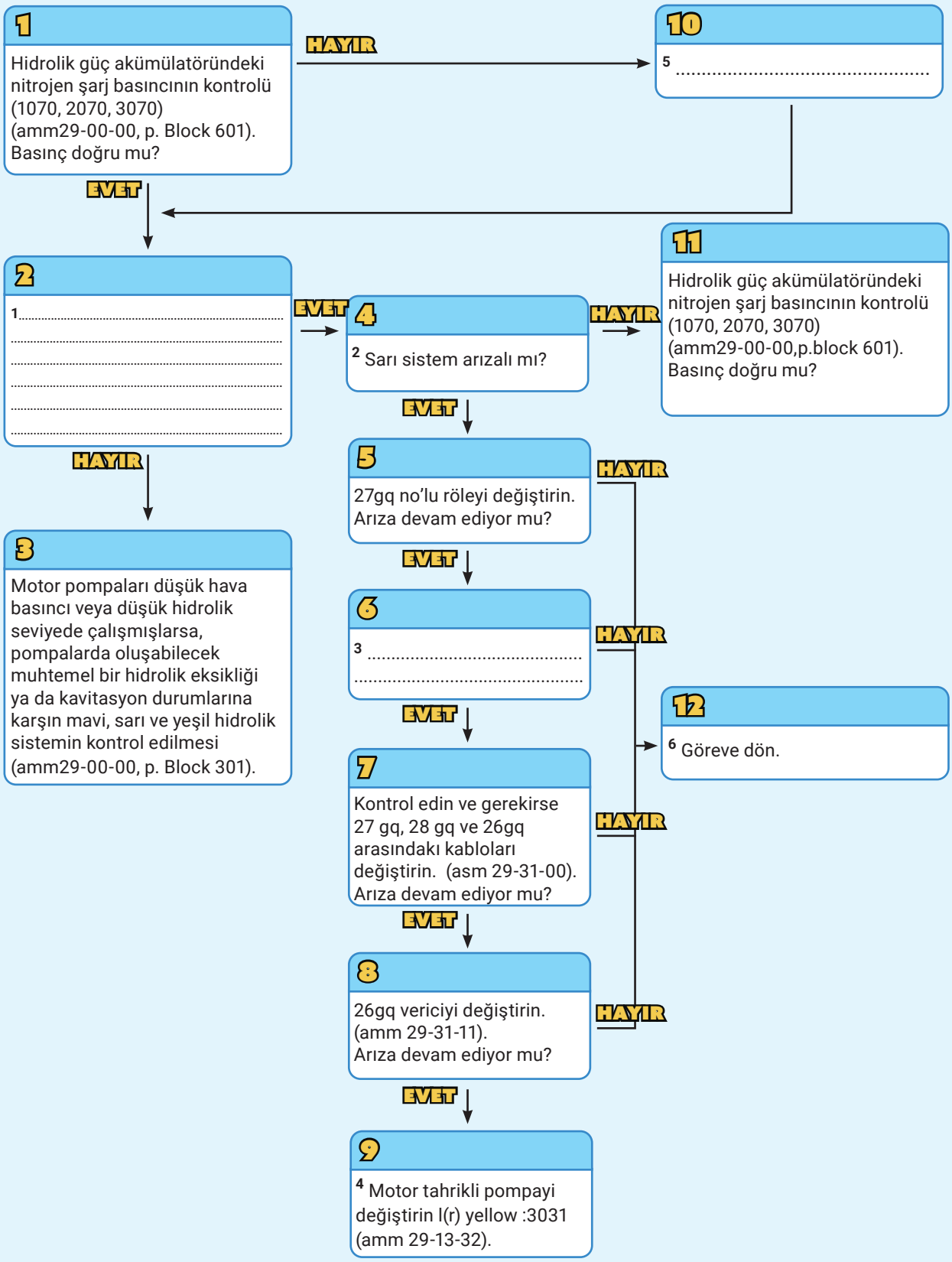
D. Kapanış
1. Çalışma alanının temiz olduğundan ve alet ve çeşitli ekipman parçalarından arındırıldığından emin olun
2. 121 BL erişim kapağını kapatın.

A. Kör tapaları/kapakları sökün/çıkarın ve boru flanşının ve esnek manşonun doğru konumda olup olmadığını kontrol edin.
B. Bağlantı kelepçesini sıkın.
C. Kelepçeleri sökün ve tek yönlü valfi serbest bırakmak için esnek manşonu boruya kaydırın.
D. Tek yönlü valfi esnek manşona ve filtre flanşına, hava akış yönünü gösteren ok arka tarafi gösterecek şekilde takın. Kelepçeyi takın. Bu aşamada sıkmayın.
E. Tek yönlü valf arayüzünü ve/veya bitişik alanı temizleyin ve inceleyin.
F. O-ringin yuvasına doğru şekilde yerleştirildiğinden emin olun.
G. Tek yönlü valfi tutun ve bağlantı kelepçesini açın. Tek yönlü valfi çıkarın ve O-ringi çıkarıp atın.



13. Study the diagrams of the Hydraulic Pressure Fault and fill the gaps with the correct translation.




1
Hidrolik güç akümülatöründeki nitrojen şarj basıncının kontrolü (1070, 2070, 3070) (amm29-00-00, p. Block 601). Basınç doğru mu?
HAYIR
10
5 .....
EVET
2
1 .....
HAYIR
3
Motor pompaları düşük hava basıncı veya düşük hidrolik seviyede çalışmışlarsa, pompalarda oluşabilecek muhtemel bir hidrolik eksikliği ya da kavitasyon durumlarına karşın mavi, sarı ve yeşil hidrolik sistemin kontrol edilmesi (amm29-00-00, p. Block 301).
EVET
4
2 Sarı sistem arızalı mı?
HAYIR
11
Hidrolik güç akümülatöründeki nitrojen şarj basıncının kontrolü (1070, 2070, 3070) (amm29-00-00,p.block 601). Basınç doğru mu?
EVET
5
27gq no'lu röleyi değiştirin. Arıza devam ediyor mu?
HAYIR
EVET
6
3 .....
HAYIR
EVET
7
Kontrol edin ve gerekirse 27 gq, 28 gq ve 26gq arasındaki kabloları değiştirin. (asm 29-31-00). Arıza devam ediyor mu?
HAYIR
EVET
8
26gq vericiyi değiştirin. (amm 29-31-11). Arıza devam ediyor mu?
HAYIR
EVET
9
4 Motor tahrikli pompayi değiştirin l(r) yellow :3031 (amm 29-13-32).
12
6 Göreve dön.

14. Read the warnings from AMM and match them with their translations. Translate the last warning into Turkish.

WARNINGS	UYARILAR
1. The correct fire fighting equipment must be available near the work area before you start work in a fuel tank. 2. Use the approved hand and eye protection when you apply the sealant. It is a skin irritant. 3. Do not get the compound on your skin. If you do, rub it off immediately with a clean cloth and wash the skin with soap and rinse with clean water. 4. Carbon dust is electrically conductive and can cause an explosion. When you work with CFRP composite materials immediately remove dust with a vacuum cleaner. 5. Use an isolation transformer when you use mains electric power on the aircraft. You must only use power tools and equipment that are explosion-proof.	A. ..... Bileşimi cildinize sürmeyin. Bunu yaparsanız hemen temiz bir bezle ovalayın ve cildi sabunla yıkayın ve temiz suyla durulayın. B. ..... Bir yakıt tankında çalışmaya başlamadan önce, çalışma alanının yakınında doğru yangın söndürme ekipmanı bulunmalıdır. C. ..... Sızdırmazlık maddesini uygularken onaylanmış el ve göz korumasını kullanın. Cildi tahriş edicidir. D. ..... Karbon tozu elektrik iletkenliğinden dolayı patlama potansiyeline sahiptir. CFRP kompozit malzemelerle çalıştığınızda hemen elektrikli süpürge ile tozu alın. E. .....

15. Read the section on damage classification from SRM. Look up the highlighted words and complete the translation with their Turkish equivalents.

Damage Classification

1. General

A. 'Damage' is defined as any kind of permanent change or [1] distortion to any cross–section of a structural element.

B. A structural component's [2] cross-section may deform or change for a variety of reasons, which can generally be divided into four major groups. These are mechanical action, chemical or electrochemical reaction, thermal action or [3] cycling, and [4] inherent metallurgical characteristics.

Definition of the Damages

[5] **Abrasion:** It is a damaged area due to scuffing, rubbing, [6] scraping or other types of erosion, which results in a change in the area's shape and texture. They are typically rough and uneven. It is caused by mechanical action and thermal action or cycling.

[7] **Crack:** A crack is when a material has either a partial break or a complete [8] fracture. It is caused by mechanical action.

[9] **Debonding:** Debonding is the term used to describe the separation of materials

Hasar Sınıflandırması

1. Genel

A. Hasar, yapısal bir elemanın herhangi bir kesitinde kalıcı bir değişiklik veya [1] bozulma olarak tanımlanır.

B. Yapısal bir bileşenin [2] ....., genellikle dört ana gruba ayrılan çeşitli nedenlerle deforme olabilir veya değişebilir. Bunlar mekanik etki, kimyasal veya elektrokimyasal reaksiyon, termal etki veya [3] ..... ve [4] ..... metalurjik özelliklerdir.

Hasarların Tanımı

[5] .....: Sürtünme, sürtme, [6] ..... veya diğer erozyon türleri nedeniyle bölgenin şekil ve dokusunda değişikliğe neden olan hasarlı bir alandır. Genellikle pürüzlü ve düzensizdir. Mekanik bir etki, termal etki veya döngüden kaynaklanır.

[7] .....: Bir malzemenin kısmi kırılması veya tamamen [8] ..... durumudur. Buna mekanik bir etki neden olur.

[9] .....: Başarısız bir [10] ..... dan dolayı malzemelerin ayrılmasını tanımlamak

caused by a failed [10] adhesive. It is caused by mechanical action, chemical-electrochemical reaction, thermal action or cycling.
[11] **Dent:** A dent is a section of the material that has been pushed inward, with regard to its usual contour. The material's cross-sectional area remains the same, and the [12] edges of the affected area are smooth. It is caused by mechanical action.
[13] **Gouge:** It is an area of any size that has been damaged, resulting in a change in its cross-sectional area. This kind of damage is usually caused by contact with something sharp, which creates a continuous [14] groove in the material that is either sharp or smooth in shape. It is caused by mechanical action.
[15] **Mark:** A mark is damage of any size that consists primarily of visible scratches, [16] nicks, chips, burrs, or gouges. The damage must be treated as a whole area rather than as a collection of small scratches or gouges. It is caused by mechanical action.
[17] **Scratch:** A scratch is a [18] surface-level damage to a material, usually caused by a sharp object, that results in a change in the cross-sectional area. It is caused by mechanical action.

için kullanılan terimdir. Mekanik bir etki, kimyasal-elektrokimyasal reaksiyon, termal etki veya döngüden kaynaklanır.

[11] .....: Malzemenin normal konturuna göre içe doğru itilmiş bir bölümüdür. Malzemenin kesit alanı aynı kalır ve etkilenen alanın [12] ..... pürüzsüzdür. Mekanik bir etkiden kaynaklanır.
[13] .....: Kesit alanında bir değişikliğe neden olan, hasar görmüş herhangi bir boyuttaki bir alandır. Bu tür bir hasara genellikle keskin bir şeyle temas neden olur, bu da malzemede keskin veya pürüzsüz bir şekle sahip sürekli bir [14] ..... oluşturur. Buna mekanik bir etki neden olur.
[15] .....: öncelikle görünür çizikler, [16] ....., talaşlar, çapaklar veya oyuklardan oluşan herhangi bir boyuttaki hasardır. Hasar, küçük çizikler veya oyuklar topluluğu olarak değil, bütün bir alan olarak ele alınmalıdır. Buna mekanik bir etki neden olur.
[17] ..... genellikle keskin bir nesnenin neden olduğu ve kesit alanında bir değişikliğe neden olan bir malzemeye [18] ..... zarar verir. Buna mekanik bir etki neden olur.

SELF-ASSESSMENT			
I can	☺	😐	☹
read, write and use the terms related to aircraft engines.			
translate the text related to aircraft engines.			
read, write and explain the components of aircraft engines.			
explain the working principle of aircraft engines.			
read, write and explain the terms related to flight control surfaces.			
explain how the flight control surfaces work.			
translate the terms and sentences related to flight control surfaces.			
use English terms and definitions related to aircraft systems in accordance with grammatical rules.			
read, write and explain terms related to aircraft systems in a foreign language.			
use terms related to aircraft systems in English.			
translate foreign language texts about aircraft systems.			
say the types of aircraft manuals and why they are used for.			
read, write and explain aircraft manuals.			
read, write and understand ATA Chapters.			
identify different parts of a sentence.			
translate the texts in aircraft maintenance manuals.			

Each player rolls the dice, moves to the number of squares indica
reaches to the 'well done' squar

Board Game



licated, gives the answer and waits for his turn. The player that are is the winner. So, good luck!



APPE

ENDIX

UNIT ONE - Personal Protective Equipment

1. Students' own answers
2. Personal Protective Equipment 212
3. A. 1 B. 3 C. 5 D. 2 E. 7 F. 4 G. 6 H. 8
4. 1. Communicate with the operator 2. Be careful about dressing 3. Avoid smoking
   4. Manage physical and mental situations 5. Control the tools
5. A. Danger B. Caution C. Safety D. Bio-Hazard
6. 1. avoid 2. have 3. wear 4. wash 5. stop 6. parked 7. touch 8. access

UNIT ONE - Module One

1. Students' own answers
2. 1. Airplane 2. Aeroplane 3. Aeroplane 4. Aircraft
3. AVIATION
4. 1. It is a kind of alphabet used by aviators. Each English letter corresponds to a code.
   2. They use it to avoid misunderstanding.
   3. The International Civil Aviation Organization
   4. Echo - Bravo
5. B: Bravo - D: Delta - I: India - J: Juliet - K: Kilo - L: Lima - P: Papa - R: Romeo - U: Uniform V: Victor
6.

Translation	**Acronym**	**Aviation Alphabet**
Hava Taşımacılığı Birliği	ATA	Alpha-Tango-Alpha
Yapısal Onarım Bakım Kitabı	SRM	Sierra-Romeo-Mike
Sorun Giderme Bakım Kitabı	TSM	Tango-Sierra- Mike
Komponent Bakım Kitabı	CMM	Charlie-Mike-Mike
Sorun tespiti el kitabı	FIM	Foxtrot- India-Mike
Ana iniş takımı	MLG	Mike-Lima-Golf
Burun iniş takımı	NLG	November-Lima-Golf
Yabancı Cisim Hasarı	FOD	Foxtrot-OscarDelta
Tam Yetkili Dijital Motor Kontrolü	FADEC	Foxtrot-Alpha-Delta-Echo/Charlie
Resimli Parça Dökümü	IPB/IPC	India-Papa-Bravo-Charlie

7. 3: Three 8: Eight 12: Twelve 15: Fifteen 19: Nineteen
   22: Twenty-two 26: Twenty-six 60: Sixty 70: Seventy 100: One hundred
8. 523: five hundred and twenty-three 2690: two thousand, six hundred ninety
   312: three hundred and twelve 999: nine hundred ninety-nine
   71: seventy-one 96: ninety- six 125: one hundred twenty-five.
9. 428: four hundred twenty-eight 4.28: four point two eight
   42.8: forty-two point eight 0.428: zero point four two eight
10. 1. D 2. E 3. C 4. A 5. B 6. G 7. F
11. Students' own answers
12. Length
13. 1. One foot is equal to thirty points four eight / forty-eight centimetres.
    2. One yard is equal to three feet.
    3. One mile is equal to five thousand two hundred eighty feet.
    4. One mile is equal to one thousand seven hundred sixty yards.
    5. One nautical mile is equal to one thousand one hundred fifty miles.
14. 1. One foot is equal to thirty point four eight / forty-eight centimetres.
    2. 1 yd= 0.9144
    3. One mile is equal to one thousand six hundred nine meters.
    4. 1 mi = 1.609 km
15. 1. It is 64 metres long. It is 209 feet 2. 1 foot 3. 3.28084 feet
    4. It depends but it is about 90,000 feet 5. 2125.984 yards
16. 1. 60,000 2. 90,000 3. 51,000 4. 80,000 5. 100,000
17. Mass
18. oz lb/lbs st
19. 1. 0.1 kg 2. 22.05 lb 3. 40 kg 4. 4.54 kg 5. 6.25 lb 6. 42 lb
20. 2. ½ oz=14 g 3. 1 lb=0.45 kg 4. 50 gr=1.7 oz 5. 1 kg=2.2 lbs
21. 1. consumes 2. safely 3. destinations 4. burn 5. altitude 6. friction

22. 1. 5 gallons /12 litres. 2. Speed, altitude, the load of the aircraft and friction.
3. It shows the level of fuel in the tank. 4. During the after-flight maintenance.
23. 1. destination 2. altitude 3. burn - consume 4. friction 5. consume 6. safely
24. Capacity
25. 1. Boeing 747-400 tipi yolcu uçağının yakıt kapasitesi 216,840 litre iken 737-400'ün yakıt kapasitesi 26,170 litredir.
2. 300 litre kaç gallon eder?
3. 50 galon yakıt 189 litre yakıta eşittir.
4. Bir F16 savaş uçağının kapasitesi 3500 litredir. İçinde 1250 litre yakıt vardır. Onu doldurmak/fullemek için daha ne kadar yakıta ihtiyaç vardır?
5. 25 quart 23.66 litreye eşittir.
26. 1. Velocity 2. Speed
27. Velocity and Speed
28. 1. knot 2. Mach
29. 1. Kelvin Scale 2. Celsius Scale 3. Fahrenheit Scale
30. 1. It boils at 373K and freezes at 273K.
2. It boils at 100 °C and freezes at 0 °C.
3. It boils at 212°F and freezes at 32°F.
31. Students' own answers.
32. 1. 42.4x1.8 =76.32 +32=108.32 °F 42.4+273=315.4 K
2. 1. 16 2. 45 3. 35 4. 121
3. 1. 64.4 2. 26.6 3. 100.4 4. 32
33. 1. Millisecond 2. Second 3. 4. Hour 5. Day 6. Week
7. Month 8. Year 9. Decade 10. Millennium 11. Century
34. 1. 200-220psi
2. They can carry 38 tons of loads and meet the ground 500 times. Their pressure is 6 times higher than cars' tires'. Their pressure is 200-220 psi so they don't blow up.
3. Their pressure is so high and they are filled with nitrogen.
4. They drift but don't turn
5. By drifting on the ground, they emit smoke.
35. Pressure
36.

Unit of Measurement	Symbol
Pound per square inch - PSI	psi
Pascal	Pa
Bar	bar

37. 1. Ampere 2. Ohm 3. Volt
38. Electrical Parameters: Voltage Resistance Current
39. **Lenght:** Imperial Units: Inch, Foot(feet), Yard, mile, Nautical mile. International Standard / Metric Units: Millimeter (mm), Decimeter (dm), Centimeter (cm), Meter (m), Decameter, Hectometer and Kilometer (km)
Mass: Imperial Units: Ounces, pounds- libres, stones. International Standard / Metric Units: Miligram, centigram, desigram, gram, decagram, hectogram.
Capacity: Imperial Units: Pint, quart, gallon. International Standard / Metric Units: Mililiter,centiliter, deciliter,liter, decaliter, hectoliter, kiloliter.
Velocity: Imperial Units: Knot, mach. International Standard / Metric Units: Meters per second (m/s).
Temperature: International Standard / Metric Units: Millisecond, Second, Minute, Hour, Day Week, Decade, Month, Year, Century, Millennium.
Pressure: Imperial Units: PSI, or pounds per square inch. International Standard / Metric Units: Pascal or Pa, Bar (bar)
Electricity: Volt, Ampere, Ohm.
40. 1. F 2. I 3. J 4. G 5. A 6. B 7. C 8. D 9. H 10. E
41. 1. B 2. A 3. C 4. C 5. A 6. B 7. C 8. B

UNIT ONE - Module Two

1. Students' own answers
2. 1. Set squares 2. Pencils 3. Rulers 4. Protractors 5. Curved rulers (pistole)
   6. Rapido sets 7. Compasses 8. Templates 9. T-square 10. Eraser
3. 1. The act of creating drawings that visually communicate how something works or is constructed is known as Technical drawing.
   2. To design, to produce, for technical support to construct something.
   3. Using lines, symbols, and shapes.
   4. Students' own answers.
4. 1. T- square 2. A compass 3. Curved ruler 4. Protractor 5. Set square
   6. Rulers 7. Rapido sets 8. Template 9. Pencil 10. Eraser
5. 1. t-square 2. compass 3. set square
6. 1. B Graph paper 2. D Blueprint Paper 3. A Drawing paper
   4. C Tracing Paper 5. E Copying paper
7. **Sample Answer: Student A:** What are the dimensions of A2 paper or What size is A2 paper?
   Student B: The dimensions of A2 paper are five hundred and ninety - four times four hundred and twenty. (In the spoken speech, 594 x 420 is read as five ninety-four by four twenty.)
8. **Sample Answers:** International Paper Sizes/Paper Sizes/ Standard Paper Sizes/Paper Types
9. 1. True 2. False. A4 is more common. 3. False. You get A2. 4. True
10.

Paper Type (Size)	Areas of Usage
A0, A1	Technical drawings and posters
A1, A2	Flip charts
A2, A3	Drawings, diagrams, large tables
A4	Letters, magazines, forms, catalogues, laser copier, printer
A5	Handbooks
A6	Greeting cards
B5, A5, B6, A6	Books
C4, C5, C6	Envelopes for A4 letter paper: unfolded (C4), folded once (C5), folded twice (C6)
B4, A3	Newspapers
B8, A8	Playing cards

11. 1. Continuous thick line 2. Continuous thin line 3. Continuous thin freehand line
    4. Continuous Thin Zig-zag Line e.g. Dashed Thick Line 5. Dashed Thin Line 6. Chain Thick Line
    7. Chain Thin Line 8. Thin Chain Line with Thick Ends
12. 1. Dashed thin and thick lines 2. Continuous thin line
    3. Continuous Thin Freehand Line and Continuous Thin Zig-zag Line 4. Thin chain line with thick ends.
13. Students' own answers
14. 1. True 2. True 3. False. It means three. 4. True 5. False. Five points
    6. False. They are added at the beginning.
15. 1. Triangle 2. Rhombus 3. Square 4. Oval 5. Circle
    6. Hexagon 7. Pentagon 8. Heptagon 9. Octagon 10. Rectangle
16. **Triangle Prism:** 9 edges, 5 faces, and 6 vertices.
    Cylinder: 2 faces and one curved surface, 2 edges, and 0 vertices.
    Hexagonal prism: 8 faces, 18 edges, and 12 vertices.
    Rectangular prism: 6 faces, 8 vertices and 12 edges.
    Cone: 1 vertex, 1 edge, 1 face and 1 curved surface.
17. 1. Square and Rhombus 2. Circle 3. Rectangular prism 4. Hexagonal prism 5. Rectangle
    6. Triangular prism 7. Heptagon 8. Oval 9. Pentagon 10. Cone
18. Students' own answers.
19. 1. Acute angle: 3. An angle that is less than 90°.
    2. Right Angle: 6. An angle that is exactly 90°.
    3. Obtuse Angle: 5. An angle that is greater than 90° and less than 180°.
    4. Straight Angle: 1. An angle that is exactly 180 °.

5. Reflex Angle: 2. An angle that is greater than 180° and less than 360°.
6. Full Angle: 4. An angle that is exactly 360°.

20. **A:** A. 1 B. 4 C. 3 D. Extra E. 2
B: A. 3 B. 1 C. Extra D. 2 E. 4
21. 1. Continuous Thin Freehand Lin
2. Continuous Thick Line
3. Chain Thin Line
4. Dashed Thin Line
22. 1. width 2. height 3. length 4. thickness 5. deep 7. high 9. wide
23. 1. deep 2. wide 3. height 4. thickness 5. width 6. lengthen 7. deepen 8. thicken
24. 1. B 2. C 3. A 4. D
25. 2. How long 3. How deep 4. How high 5. How many
26. 1. Obtuse 2. Tracing 3. Chainthick 4. Hexagonal 5. Deep 6. Graph
7. Protractor 8. Rhombus 9. Thickness 10. Length 11. Heptagon 12. Compass

UNIT ONE - Module Three

1. Students' own answers
2. 1. pozidriv screwdriver 2. torx screwdriver 3. slotted head 4. philips screwdriver
5. square screwdriver
3. 1. b 2. a
4. 1. Ball-peen hammer 2. Rubber hammer
3. It is used for straightening and forming metal. 4. soft-faced hammer
5. 1. cutters 2. handles 3. jaws 4. pipe grips 5. fulcrum
6. 1. Needle Nose Plier 2. Flush Cut Plier 3. Joint Plier 4. Parrot Plier
5. Bent Nose Plier 6. Locking Plier 7. Duckbill Plier 8. Crimping Plier
7. 1. C 2. B 3. D 4. A
8. 1. E 2. A 3. D 4. B 5. C
9. 1. T 2. F 3. F 4. T
10. 1. The technician is cutting the wire with a crimping plier.
2. The technician is tightening the screw with a joint plier.
11. 1. Titreşim 2. Gevşemek 3. Cıvata 4. Cıvata somunu 5. Boru
6. Çok yönlü 7. Emniyet teli 8. Emniyet pensesi 9. Bükücü 10. Güvenli bir şekilde
12. 1. B 2. C 3. A 4. C 5.B
13. A. TWISTER B. PIPES C. SAFETY WIRE
1. doing reliable safety wiring 2. bolts, nuts or pipes 3. loosening
14. 1. B 2. A 3. D 4. A
15. 1. drill 2. drill bit 3. hole 4. screw 5. hand drill 6. electric drill
16. 1. speed brace 2. flat chisel 4. file 6. ratchet and socket (3 and 5 extra)
17. 1.b 2.a 3.a 4.a 5.b 6.b 7.b 8.b 9.b 10.a
18. 1. inspection mirror 2. aviation snips 3. scriber
19. 1. Open-end Wrench 2. Offset Box Wrench 3. Combination Wrench
4. Students' own answers 5. Students' own answers

UNIT ONE - Module Four

1. Students' own answers
2. MATERIAL
3. 1. Turning the raw materials into finished and semi-finished products and the tools used are called industry.
   2. Aluminum is used in aircraft fuselage.
   3. Cement is used in building construction.
   4. to ensure the reduction of aircraft weight and improvement of passenger safety.
   5. metal and non-metallic materials.
4. 1. NON-METAL 2. FERROUS MATERIALS 3. INORGANIC 4. ALLOY STEEL
5. 2
6. 1. cyrstalline 2. electricity 3. reflect 4. solid 5. high
7. 7a A.4 B.3 C.1 D.2
   7b 1. reflect 2. ductility 3. mercury 4. crystallize
8. 1. Cast iron 2. Carbon steel 3. Stainless steel 4. Alloy steel 5. Tool steel
9. 1. 6350 main mineral: Chrome vanadium steel 3%, 0.50% carbon
   2. 2250 main mineral: Nickel 2%, 0.50% carbon
   3. 4340 main mineral: Molybdenum 3%, 0.40% carbon
   4. 2475 main mineral: Nickel 4%, 0.75% carbon
10. 1. Karbon
    2. Nikel
    3. Nikelli krom
    4. Molipten
    5. Krom
    6. Krom vanadyum
    7. Tungsten
    8. Silisyum manganez
11. 1. iron 2. carbon 3. low-carbon steel 4. stainless steel 5. True
    6. wing skins 7. high-alloy steels 8. Ductility
12. %50 composite %20 aluminum %15 titanium %5 other
13. 1. low density, corrosion resistance, electrical conductivity
    2. TITANIUM
    3. excellent electrical conductivity
    4. good electrical, magnetic, and magnetostrictive power
14. 1. conductivity 2. magnetic 3. durable 4. negligible 5. tensile 6. corrosion 7. elevated 8. density
15. 1. Corrosion 2. Density 3. Electrical conductivity 4. Magnetic power
16. **NATURAL ORGANIC MATERIALS:** 1. wood 2. oil 3. leather 4. cork 5. rubber
    ARTIFICIAL ORGANIC MATERIALS: 1. plastic 2. poliester 3. teflon 4. Polyethylene
17.

	METAL MATERIALS	NON-METAL MATERIALS
1. Conducting electricity	√	
2. Being brittle		√
3. Being able to be gases		√
4. Being malleable	√	
5. Being ductile	√	
6. Having metallic luster	√	
7. Reflecting light	√	
8. Being able to be found in nature		√
9. Being shiny	√	
10. Conducting heat	√	
11. Having organic and inorganic types		√

18. **NATURAL INORGANIC MATERIALS:** 1. clay 2. salt 3. mineral
    ARTIFICIAL INORGANIC MATERIALS: 1. cement 2. lime 3. ceramic 4. glass
19. 1. İletmek 2. Yansıtmak 3. Kil 4. Kauçuk 5. Çimento 6. Mantar
20. 1. Metal olmayan malzemeler elektriği ve ısıyı iletmesi iyi değildir.
    2. Demir içermeyen malzemeler ya hiç demir içermez ya da az miktarda demir içerir.

3. Alüminyum en iyi düşük yoğunluk, korozyon direnci ve elektrik iletkenliği ile bilinir.
4. Bakır mükemmel elektrik iletkenliğine sahiptir.
5. Titanyum biraz pahalı olmasına rağmen oldukça dayanıklıdır.
6. Paslanmaz çelik haddelenebilir, çekilebilir, bükülebilir veya herhangi bir şekle getirilebilir.
7. Demirli malzemelerde çok fazla demir bulunur.
8. Takım çelikleri, ana kargo destek pabuçları, mancınık kancaları, uçak gövdesi yapıları ve yüksek menteşeler gibi uçak parçaları için yaygın olarak kullanılmaktadır.

21. A. Having a high strength-to-weight ratio
B. Being durable
C. New design alternatives
D. Easy to produce
E. Low cost in production
22. 1. dayanç-ağırlık oranı 2. çekmek, kullanmak 3. oksitlemek 4. sabitlik 5. sağlamlaştırma 6. birleştirme, montaj 7. zaman kazandırıcı 8. atık
23. 1.C 2.A 3.B
24. 1. wood, steel 2. aluminum 3. composite

UNIT ONE - Module Five

1. Ss' own answers
2. 1. Franklin 2. Volta 3. Faraday 4. Edison 5. Tesla
3. Ss' own answers
4. 1. Some examples are machines, operating devices,etc.
2. All matters are made of atoms.
3. The nucleus
4. The movement of electrons around a nucleus creates an electric current.
5. The path taken by electric current is called a current.
5. 1. current 2. electrons 3. positive 4. battery 5. electricity
6. Ss' own answers
7. 1. Alternating Current 2. Direct Current
8. 1. current 2. DC 3. AC 4. direct current 5. alternating current 6. direction 7. back and forth 8. power 9. voltage 10. aircraft 11. power stations 12. devices
9. 1. Alternatif akım çok fazla enerji kaybı olmadan uzun mesafelere aktarılabilir.
2. Doğru akımda enerji kaybı fazla olduğu için uzak mesafelere enerji aktarımında kullanılmaz.
3.Alternatif akım jeneratörünün yapımı/tasarımı doğru akım jeneratöründen daha basittir/kolaydır.
4. Alternatif akım jeneratörlerinde kullanılan motorların bakımı kolay ve kokusuzdur.
5. Doğru akım jeneratörleri alternatif akım jeneratörlerinden daha dayanıklıdır.
6. Doğru akım jeneratörleri büyük motorlara elektrik sağlamada kullanışlıdır.
10. Ss' own answers
11. **CONDUCTORS**; copper, silver, gold, aluminum, iron, platinium, mercury
INSULATORS; rubber, plastic, paper, ceramic, glass,wood, air
SEMICONDUCTORS; germanium, gallium arsenide, silicon
12. 1. İletkenler manyetik alanda tutulduğunda enerji depolamazlar.
2. Yalıtkanlar manyetik alanda tutulduğunda enerji depolarlar.
3. Bir iletkenin termal iletkenliği (ısı toleransı9 çok yüksektir.
4. Bir yalıtkanın termal yalıtkanlığı çok düşüktür.
5. Yarı iletkenler metal olmayanlardan daha iletken ve metal olanlardan daha az iletkendir.
13. Ss' own answers
14. 1. circuit breaker 2. electric distribution panel 3. bulb socket/holder 4. light bulb 5. plug 6. cable 7.socket/outlet 8. power source/battery 9. light switch.
15. 1. circuit breaker/fuse 2. plug 3. bulb 4. cable 5. battery 6. light switch
16. Ss' own answers
17. 1. power source 2. load 3. control device 4. protection device
18. 1. A-5 2. B-4 3. C-3 4. D-2 5. E-1
19. Ss' own answers
20. 1-F 2-T 3-T 4-F 5-T

21.

Name of the component	Battery	Switch	Fuse	Conductor	Load/Receptor
Definition	2	1	5	3	4
Symbol	D	A	B	E	C

22. A. 1. components 2. branches 3. flow 4. circuit 5. lamps
B. 1. contains 2. another 3. series 4. current 5. stops
23. 1. Paralel bir devrenin elemanları yan yana bağlanır.
2. Paralel bir devrede akımın geçmesi için birden fazla yol vardır.
3. Paralel devrenin bir kısmı çalışmasa bile devrenin tamamı çalışmaya devam eder.
4. Seri bir devrede akımın geçmesi için tek yol vardır.
5. Seri bir devrede bir kısım çalışmazsa devrenin tamamı çalışmaz.
24. Series Circuit; It has one path for current to flow.
Components of a series circuit are connected end to end one after another.
If a part of a series circuit is broken the whole circuit stops working.
Parallel Circuit; It has more than one path for current to flow.
Components of parallel circuits are connected side by side.
If a part of a parallel circuit is broken the rest of the circuit keeps working.
25. 1. S1/S5 2. S1/S2/S3 3. L1/L2/L3/L4 4. S2/S3 5. L5

UNIT ONE - Module Six

1. Ss' own answers.
2. Ss' own answers.
3. 1-A 2-A 3-B 4-C 5-B 6-C 7-B 8-B 9-A 10-C 11-B 12-B
4. Ss' own answers.
5. 1. Measurement is finding a number that shows the size, capacity, amount or degree of something using an instrument or device.
2. kilogram, meter, degree ...
3. volt, watt, ampere or ohm
4. voltage
5. The diameter of a wire affects low or high currents.
6. 2. 2.7KΩ= 2.7x1000=2700Ω
3. 18KΩ= 18x1000= 18000Ω
4. 2.2MΩ= 2.2x1000=2200KΩ
7. 1. direnç değeri 2. hata payı 3. rezistör 4. çarpan 5. renk bandı 6. yüzde
8. Ss' own answers.
9. The first number gives the first digit.
The second number gives the second digit.
The third number gives the third digit.
The fourth number gives the fourth digit.
The fifth number indicates the number of zeros (multipliers).
The sixth number indicates the tolerance of the resistor.
10.

1. Orange Orange Brown Gold 3 3 x10 %5	330Ω ±%5
2. Red Red Brown Gold 2 2 x100 %5	2.2 KΩ ±%5
3. Yellow Purple Red Gold 4 7 x100 %5	4.7 KΩ ±%5
4. Brown Black Black Red Gold 1 0 0 x100 %5	100 KΩ ±%5

11. A-1 B-3 C-2
12. 1. Choose 2. Plug 3.Turn on 4. Insert 5. Turn off
13. 1. Resistance 2. Red, red, orange
14. Ss' own answers.
15. 1-F 2-T 3-T 4-F 5-F
16. 2. 31,5 kV =31500 V 3. 380V=380000.mV 4. 600V=0,6 kV 5. 40mV =0,04 V
17. 1. electromotive 2. pressure 3. measure 4. parallel
18. S- Switch L- lamp DC- Direct Current V- voltmeter
19. 1. Voltage 2.AC 3.Parallel
20. 1. 1.5 V 3. 5 V 6. 100 V 7. 120V 8. 230 V
21. Ss' own answers.
22. A-3 B--5 C-4 D-1 E-2
23. 2. 250 A = 250/1000= 0,25kA 3. 0,025 A = 0.025x 1000=25mA 4. 30 mA =30/1000= 0,03A
24. 1. electricity 2. circuit 3. connected 4. resistance
25. 1. switch 2. direct current (DC) 3. ampere 4. lamp
26. 1. ampere 2. voltage- current- resistance 3. AC
27. 1. Döner anahtarı kullanarak pens metreyi akımı ölçmek için ayarlayın.
    2. Döner anahtarın doğru ölçüm aralığında olduğundan emin olun.
    3. Pens metrenin uçlarını açarak akımı ölçülecek teli içine alın.
    4. Pens metrenin ekranındaki sayıyı okuyun.
28. 1-B 2-C 3-A
29. 1-V 2-R 3-I
30. 1- calculate 2- quantities 3- proportional 4- formulas
31. 1. 12/0,4=30Ω 2.12/30= 0,4 A 3. 10X5=50 V
32.

Quantities	Symbols	Units	Abbreviations
1. Voltage	V	Volt	V
2. Resistance	R	Ohm	Ω
3. Current	I	Ampere	A

33. Ss' own answers.
34. 1. converted 2. rate 3. required 4. combination 5. power
35. 2. 0,0240 MW = 0,0240X106= 24000W 3. 100 W = 100/1000 = 0,1kW
    4. 0,31 kW = 0,31X1000 = 310 W 5. 0,04 W = 0,04X= 40 mW
36. 1. electric power 2. measure/ watt 3. circuit/ wattmeter 4. two (L-M) 5. parallel/load
37. 1-B 2-D 3-C 4- A
38. A-power supply B- current coil C-voltage coil D-load
39. 1. watt 2 .watt
40. Ss' own answers.
41. 5. The moving parts of a circuit indicated by the signals.
    6. How much of the signal is noise.
    7. Whether the noise is changing with time or not.
42. 1. DC 2. inductance 3. capacitance 4. AC
43. 1. A refers to voltage 2. B refers to frequency
44. 1. oscilloscope 3. controlling 3. detecting
45. 1. digital screen 2. AC voltage 3. rotary switch 4. DC current 5. Current probe input
    6. Common probe output 7. Probe input for voltage, resistance and more 8. AC current
    9. Resistance 10. AC/DC mV 11.DC voltage 12.Brightness button
46.

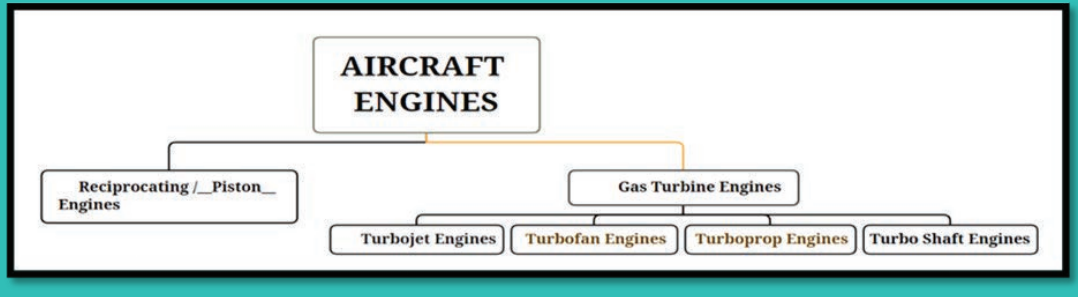
1. It is used to measure voltage, current, resistance, etc.	Volts, amperes, ohms ...
2. It is used to measure voltage.	volts
3. It is used to measure current	ampere
4. It is used to measure resistance	ohm
5. It is used to measure power	watt

47. 1. closed 2. short 3. open 4. voltmeter 5. ammeter
6. oscilloscope 7. parallel 8. series 9. ohm 10. multimeter

UNIT ONE - Board Game

1.
2. -11.6 °C
3. equal to
4. Roll again
5. 4.5 kg
6. 12.7 cm
7. 1522.41 mph
8. 2.6 gallons
9. equal to
10. 24
11. 52,800
12. YOU NEED A HOLIDAY! GO BACK TO START
13. çimento
14. 52,800
15. 45.36
16. triangular prism, cylinder, hexagonal prism, rectangular prism, cone.
17. SKIP 5 SPACES
18. Component Maintenance Manual
19. 15 feet
20. Indicating the lines or surfaces to which a special requirement is applied.
21. screwdriver
22. Needle Nose Plier
23. Alternating Current
24. ROLL AGAIN
25. Direct Current
26. bolts, nuts or pipes
27. waste
28. YOU NEED A HOLIDAY! GO BACK TO START
29. Natural Organic Material
30. non-ferrous
31. alloy steel
32. ROLL AGAIN
33. conductor
34. insulator
35. semiconductor
36. ROLL AGAIN
37. control
38. SKIP 5 SPACES
39. negative
40. GO BACK 3 SPACES
41. resistance
42. current

UNIT TWO - Module One

1. Ss' own answer.
2. 1. C 2. D 3. A 4. B
3. Sample answer: Newton's third law states that for every action, there is an equal and opposite reaction. This means when one object pushes another, the second object will push back with an equal force. For example, when a hammer hits a nail, the nail pushes back on the hammer with an equal force. Another example is when a swimmer pushes off a pool wall; the wall pushes back on the swimmer with an equal force, propelling them forward.
4. 1. Take off 2. Drag 3. Vertical 4. Accelerate 5. Thrust 6. Generate
5. 1. Their role is crucial and they are the heart of aviation progress. The role of aircraft engines in aviation progress is to provide thrust to generate enough speed for the wings to lift and to overcome the weight of the aircraft for vertical takeoff.
   2. According to Newton's third law, an aircraft will move forward with equal and opposite force. Thrust is the name given to this reaction force.
   3. The propulsion system is the system that produces thrust to push an object forward.
   4. The basis for the principle of aircraft engines' operation is Newton's third law of action and reaction.
   5. There are two types of aircraft engines: reciprocating or piston engines and gas turbine engines. Gas turbine engines have four types: turbojet, turbofan, turboprop, and turboshaft engines.
6. 1. Reliable 2. Lightweight 3. Powerful 4. Small 5. Easily streamlined
   6. Repairable 7. Fuel efficient 8. Economical
   Possible Answers: Enormous, Economical, Modern
7. 

8. 1. Intake / Exhaust valve 2. Piston 3. Connecting rod 4. Spark plug
   5. Crankshaft 6. Cylinder 7. Crankcase
9. 1. exhaust valve 2. Piston 3. Connection rod 4. Cylinder 5. Crankshaft
   6. Crankcase 7. Spark plug 8. Intake valve
10. 1. Spark Plug 2. Intake valve 3. Exhaust valve 4. Piston 5. Connection Rod
    6. Cylinder 7. Crankshaft
11. 1. E 2. C 3. F 4. D 5. A 6. B
12. a. POWER b. EXHAUST c. İNTAKE d. COMPRESSİON
    1. Intake 2. Compression 3. Power 4. Exhaust
13. 1. Inlet 2. Combustion 3. Compressor 4. Nozzle 5. Turbine
    6. Ignite 7. Ambient 8. Propulsion 9. Propel 10. Power plant
14. 1. Tüm türbin motorlarında, motora serbest hava akışı sağlamak için bir giriş bulunur.
    2. Yakıtın yanması, makineleri çalıştırmak için gereken enerjiyi üretir.
    3. Bir uçak motoru, silindirler, pistonlar ve fanlar gibi birçok üniteden oluşan bir motordur. Uçakların ve helikopterlerin havalanmasını sağlarlar.
    4. Ortamdaki hava motor girişine çekilir ve ardından yakıtla karıştırılır.
    5. Uçak motorları, uçuş için gereken gücü elde etmek için ateşlenir.
15. 1. b 2. a 3. b 4. c 5. a 6. c 7. b
16. 1. D Inlet 2. E Compressor 3. F Combustion Chamber 4. A Combustion Chamber
    5. B Turbine 6. C Nozzle
17. 1. T 2. F Jet engines are more common. 3. T 4. T 5. F Ambient air 6. F Later 7. T
18. 1. Inlet 2. Compressor 3. Combustion Chamber 4. Turbine 5. Exhaust Nozzle
19. 2. Inlet 3. Compressor 4. Combustion Chamber 5. Turbine 6. Inlet 7. Compressor
    8. Exhaust Nozzle 9. Compressor 10. Turbine 11. Turbine and Exhaust Nozzle 12. Compressor
    13. Combustion Chamber
20. 1. Inlet 2. Compressor 3. Combustion Chamber 4. Turbine 5. Exhaust Nozzle

21. 1. C it must slow the airflow below Mach 1 at supersonic speeds.
    2. E It compresses the incoming air and increases its pressure significantly.
    3. B Turbojets operate extremely leanly, with around 50 parts air to every one part fuel.
    4. D absorbing energy from the high-speed air which passes through it.
    5. A thrust is produced.
22. **Pros:** 1, 3, 4, 6, 7 **Cons:** 5, 2, 8
23. 1. T 2. F Turbines, a shaft and a gearbox are used to drive the propeller.
    3. T 4. T 5. T 6. F Thrust is produced by the propeller.
24.

PROS	CONS
1. They are very fuel-efficient. 2. They are not as heavy as turbojet engines 3. They can perform more efficient takeoffs 4. They are suitable for shorter distances.	1. Turboprop engines are not used in high-speed aircraft. 2. They are suitable for shorter distances. 3. Their gearing systems are heavy and can require maintenance.

25. 1. Fan 2. Intermediate pressure compressor 3. Combuster 4. Low-pressure shaft
    5. High-pressure turbine 6. Nozzle
26. 1. The fan in a turbofan engine generates additional thrust, helps the engine cool down, reduces engine noise, and makes the engine more powerful without requiring additional fuel.
    2. Both from around the engine and through the engine.
    3. No, it doesn't.
    4. The main difference between turbofan engines and other engines is that turbofan engines have a fan at the front that produces extra thrust, helping to make the engine more powerful without requiring additional fuel.
    5. Most commercial jet engines today are turbofans.
27. 1. C 2. P 3. P 4. C
28. 1. T 2. F Turboshaft engines are used in helicopters
    3. F A turboshaft engine has a large shaft at the back of the engine. 4. T
29. 1. P 2. P 3. C 4. C
30. 1. Why did you choose a career as an aeronautical engineer?
    2. Would you recommend this profession to young people? Why?
    3. What do you think about the future of the aviation industry?
    4. What do you think the heart of an aircraft is?
    5. Could you please explain jet engine technology to our students?
    6. In which planes are these engines used or suitable?
    7. What do you think about the development of unmanned aerial vehicles, and what engines are used in these vehicles?

UNIT TWO - Module Two

1. Ss' own answers
2. 1. nose 2. fuselage 3. wing 4. turbine engine 5. wheels 6. tail
3. 1. D 2. C 3. B 4. E 5. A
4. 1. machine 2. landing gear 3. wings 4. nose 5. tail 6.fuselage 7. cockpit
5. 1. An aircraft is a complex machine that consists of many parts.
   2. Landing gear
   3. Nose and tail
   4. Fuselage
   5. For safe flight
6. 1. What is the one of the most critical problems that can occur during the flight?
   2. What is another problem you commonly encounter?
   3. What would happen if this problem occurred during flight?
   4. How do you handle such a situation?
   5. What if there is a problem with the landing gear?
7. Ss' own answers
8. 1. cockpit 2. elevators 3. rudders 4. slats 5. spoilers 6.winglets 7. flaps 8.ailerons

9. vertical stabilizer 10. horizontal stabilizers
9. 1. roll 2. yaw 3. pitch 4. increases 5. increases 6. lift 7. drag 8. yaw 9. pitch 10. decreases
10. 1. Dümen, bir hava aracının/uçağın sağa ya da sola dönmesine yardımcı olur.
2.Asansör, hava aracının/uçağın eğimini kontrol ederek yukarı ve aşağı hareket etmesini sağlar.
3. Kanatçık, hava aracının/uçağın dönüşünü kontrol ederek uçağın sağa ya da sola yatmasına yardımcı olur.
11. 1. Drag 2. Lift 3. Thrust 4. Weight
12. 1-D 2-C 3-B 4-A
13. 1. The control surfaces are the movable parts that pilots use to control the aircraft's movement.
2. Three primary control surfaces are the aileron, elevator and rudder.
3. The ailerons are located on the edge of the wings.
4. The elevator is located on the tail of the aircraft.
5. The rudder moves left and right.
14. 1-F 2-T 3-T 4-F 5-F
15. 1. Aileron 2. Vertical stabilizer 3. Rudder 4. Elevator 5. Horizontal stabilizer
16.

Primary control surfaces	Aircraft movement	Axes of rotation	State of stability
Aileron	Roll	Longitudinal	Lateral
Elevator	Pitch	Lateral	Longitudinal
Rudder	Yaw	Vertical	Directional

17. 1. Yanal eksen 2. Boylamsal eksen 3. Dikey eksen 4. Dikey sabitleyici 5. Yatay sabitleyici
6. Dümen 7. Asansör/Kaldırıcı 8. Kanatçık
18. 1- E 2-B 3-D 4-C 5-H 6-A 7-F 8-G
19. Ss' own answers
20. 1. surfaces 2. direction 3. movable 4. increase 5. slower
6. located 7. between 8. panels 9. descend 10. helps
21. 1.The secondary control surfaces help the pilot in managing the movement and the direction of the aircraft. 2. They are flats, slats, spoilers and trims. 3. flaps 4. spoilers 5. spoilers.
22. Primary Control Surfaces; rudder, elevator, aileron
Secondary Control Surfaces; slat, flap, spoiler
23. 1. Aileron 2. Rudder 3. Elevator
24. A-5 B-9 C-7 D-1 E-6 F-4 G-8 H-2 I-3 J-11 K-10
25. 1. Because for safe travel aircraft maintenance before each flight is important.
2. The maintenance crew is responsible for the maintenance of the aircraft.
3. The maintenance crew includes trained and certified mechanics and technicians.
4. The maintenance crew gives a report to the flight crew.
26. 1. cockpit 2. fuselage 3. tail 4. elevators 5. rudders 6. ailerons 7. wings 8. nose 9. flaps 10. slats
27. 1-C 2-B 3-B 4-A 5-A 6-C 7-B 8-B 9-C 10-C

UNIT TWO - Module Three

1. Students' own answers
2. 1. OXYGEN 2. HYDRAULIC 3. PNEUMATIC
3. 1.D 2.A 3.J 4.B 5.C 6.E 7.G 8.I 9.H 10.F
4. PNEUMATICS
5. Suggested answer: fuel tanks, turbines
6. A
7. 1. Engine sarters 2. Air conditioning packs, 3. Thermail anti-ice systems, 4. Hydraulic reservoirs, 5. Potable water system 6. External ground source 7. APU load compressor 8. Engine bleed air.
8. 1. compressor 2. check valve
9. 1. e 2. a 3. f 4. c 5. b 6. d
10. Advantages: 1,2,4,5,7,9,10,11 Disadvantages: 3,6,8,12
11. gear, stairs, safety
12. 1. Air Conditioning Packs 2. Ground Conditioned Air 3. Recirculation System.
4. The Flight Compartment 5. Right Pack
13. Answer B

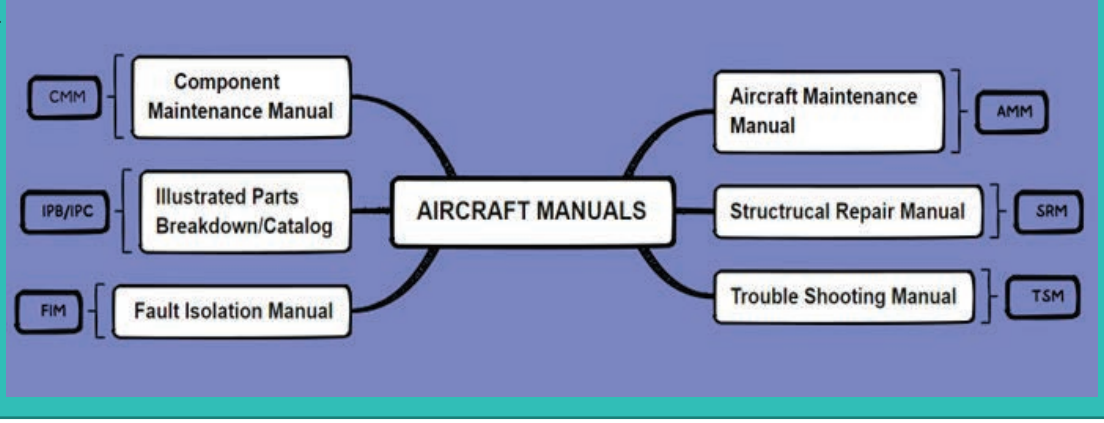
14. A. 6 B. 3 C. 2 D. 4 E. 5 F. 1
15. Students' own answers
16. 16a 1. Cockpit Compartment Heating 2. Passenger Compartment Heating
    3. Cargo Compartment Heating
    16b A.2 B.1 C.3
17. 1. department: bölüm
    2. passenger: yolcu
    3. cockpit: kokpit
    4. cargo: kargo, yük
    5. to determine: belirlemek
    6. distribution: dağıtım
    7. to heat: ısıtmak
    8. to adjust: ayarlamak
18. Students' own answers
19. 1. A pilot must know how to read and use the flight instruments in order to fly any aircraft safely.
    2. the pitot-static system and related instruments, the vacuum system and related instruments, gyroscopic instruments, and the magnetic compass.
    3. aircraft's altitude, airspeed and attitude.
20. 1.a 2.b
21. A. Altimeter Pic:4 B. Attitude Indicator Pic:3
    C. Vertical Speed Indicator Pic:1 D. Airspeed Indicator Pic:2
22. 1. direction 2. confusing 3. rotation 4. turn 5. second 6. direction
23. 1.d 2.a 3.b 4.c
24. 1. Attitude indicator 2. Altimeter 3. Airspeed indicator 4. Turn indicator 5. Vertical speed indicator (VSI)
25. Students' own answers
26. 1.F 2.T 3.T 4.F 5.F
27. 2. * Decrease aircraft speed 4. * Continuous horn 5. Fire warning * Whenever the fire warning is tested
28. 1. traffic collusion avoidance system
    2. resolution advisories
    3. traffic advisories
    4. TCAS provides no protection against aircraft
    5. reduce the risk of mid-air collisions between aircraft.
    6. a pressure altitude, radar altitude, and discrete aircraft status inputs.
    7. automatically places TCAS into Standby.
29. A. What does wind shear mean? B. What are the sources of wind shear?
    C. How do pilots cope with wind shear?
    D. What developments has the aviation industry made so far in order to get over wind shear?
30. 1.B 2.A 3.A 4.B 5.B
31. Aircraft Electrical System
32. 32a 1. electrical 2. supply 3. generators 4. circuits 5. RAT
    32b A. Auxiliary Power Unit B. Ram Air Turbine C. bus bars
33. 33a 1. monitor 2. kinetic 3. power 4. transformer 5. generator 6. high-voltage 7. external 8. APU
    33b
    1. It provides energy for functions. It also provides bleed air for air conditioning and engine start- up.
    2. It provides the necessary power for the aircraft.
    3. An External DC Power
    4. It monitors high-voltage lines across national power grids.
    5. It consists of a generator and a Constant Speed Drive (CSD).
34. AVIATION FUEL
35. 1. international 2. climates 3. extremely cold 4. private flying 5. ecologically friendly 6. short-term
36. 1.B 2.E 3.A 4.D 5.C
37. 1. viscosity 2. density 3. pump 4. reservoir 5. actuating cylinder 6. pressure relief valve
    7. heat exchanger 8. mineral based fluid 9. vegetable based fluid 10. synthetic based fluid
    11. cost-effective 12. energy efficient 13. dependable and reliable 14. quick and effective
    15. resistant to compression
38. 1. pumps 2. reservoir 3. actuating cylinder 4. pressure relief valve
39. B
40. 1.A 2.B 3.A
41. keeping the surface dry, heating water to evaporate it, heating the surface, maintaining regularly
42. 1. What does WAI stand for?
    2. When do two 125°C thermal switches shutdown valves?
    3. Is there a single control switch? If yes, where?
    4. What does the system consist of?
    5. It is to stop ice from forming on the engine nacelle's air intake port.
    6. Loose contaminants are first removed with a brush or broom, and then the affected regions are heated

to melt any ice.
7. The aircraft can be warmed by being kept in a hangar for a while, but more frequently, hot air directed from an outside heat source is utilized.
8. What do two separate Window Heat Computers do?
9. How does windscreen heating function on the ground?
10. How does windscreen heating function in flight?
11. They help the pilot to see the approach and departure paths and surrounding area clearly while maintaining a clear view of the airport while riding.
12. No, they do not.

43. Students' own answers
44. **Exterior Lights:** Tail Lights, De-ice Lights, Taxi Lights, Navigation Lights, Beacon Lights, Landing Lights, Strobe Lights
Interior Lights: Lavatory Lights, Wash Lights, Reading Lights, Emergency Lights
45. 1. taxiway 2. illuminate 3. wing 4. prevent 5. bottom 6. advertising 7. snowy
46. 1. attract attention 2. detect 3. direction 4. taxiway 5. approach 6. collision
47. 1. The taxi lights are located on the nose landing gear of the aircraft.
2. No, they are generally used for night flights.
3. These lights show the position of the aircraft in the air and on the ground.
4. They are green and red.
5. They prevent collisions and attract attention during the flight.
6. The purpose of them is that the engines are in working condition and that the ground handler should not approach the engine area after a certain distance.
7. When ground personnel see the red lights flashing, they realize that the area is not safe.
8. They are also called logo lights.
9. To see the ice formed on the wings and engine surfaces of the
10. They are tail lights.
48. 1. Emergency Lights 2. Lavatory Lights 3. Reading Lights 4. Wash Lights
49. 1. oxygen mask 2. pneumonia 3. hypoxia 4. oxygen storage container
50. 1. T 2. F 3. F 4. T
51. 1. Breathing 2. Liquid 3. Generators
52. A. LOX B. MSOG C. ABO
53. 1. PRESSURE 2. REGULATOR 3. INDICATOR 4. CONNECTIONS 5. EMERGENCY
54. **AIR CONDITIONING:** smoke detection, ambient pressure
PNEUMATIC: oil's viscosity, compressor
FLIGHT INSTRUMENT: ambient pressure, magnetic compass
SAFETY AND WARNING: magnetic compass, smoke detection
AVIATION FUEL: AC generator, fuel flow
ELECTRICAL POWER UNIT: compressor, AC generator
ICE&RAIN PROTECTION: fuel flow, engine anti-ice
HYDRAULIC: tail lights, oil's viscosity
AVIATION LIGHTS: hypoxia, tail lights
OXYGEN: engine anti-ice, hypoxia
55. Aircraft Systems are vital

UNIT TWO - Module Four

1.



2. 1. a 2. c 3. b 4. d
3. 1. False. Air Transport Association 2. True 3. False. It identifies the subject area. 4. True
   5. False An aircraft maintenance technician must know only the related ones to his job. 6. True
4. Ss' own answers
5. 1. Çeviri paragraf paragraf ve ardından cümle cümle yapılmalıdır.
   2. Verb: is placed; Subject: the verb
   3. Make
   4. Türkçe'de yüklem sonda bulunur, İngilizce'de ise yüklem özneden hemen sonra gelir.
   5. Also, any new words should be looked up in a technical dictionary to ensure you understand their meaning.
   6. Scanning the end of the sentence, identifying the main verb and subject.
6. 1. Subject: A riveted structure Verb: must be supported Purpose: in order to retain its original size, shape, and positioning
   2. Subject: Smoke Verb: is detected Means: by optical sensors in aircraft.
   3. Verb: Do not touch Object: hot parts Purpose: to avoid burning
   4. Subject: A thorough inspection Verb: must be done Means: via special devices Purpose: to determine the extent of the damage
   5. Subject: Any manoeuvre, gust, or gust plus manoeuvre outside the structural envelope Verb: can damage Object: the airplane structure
   6. Subject: An attitude indicator Verb: is used Purpose: for the position of an aircraft
7. **1. General**
   a. Corrosion **is** a process that causes the deterioration of a metal material due to chemical or electrochemical reactions. This **can lead** to the weakening of the aircraft structure as the metal is transformed into different compounds.

   1. Genel

   a. Korozyon, kimyasal veya elektrokimyasal reaksiyonlar nedeniyle metal malzemenin bozulmasına neden olan bir **süreçtir**. Bu, metalin farklı bileşiklere dönüşmesine neden olarak uçak yapısının zayıflamasına [2.] **yol açabilir**.

   b. Corrosion prevention is one of the most crucial functions to maintain the aircraft in a safe and serviceable condition. The following actions **are required** for successful corrosion control.

   b. Korozyon önleme, uçakların güvenli ve uygun hizmet durumunda tutulması için en önemli işlevlerden [3.] **biridir**. Başarılı bir korozyon kontrolü için aşağıdaki eylemler [4.] **gereklidir**.

   c. Corrosion-resistant materials and protective treatments [5.] **are used** in the construction. This [6.] **is done** to lessen the likelihood of corrosion. Special anti-corrosion treatments [7.] **are applied** to certain areas, such as underneath the galleys and restrooms.

   c. Yapım esnasında korozyona dayanıklı malzemeler ve koruyucu işlemler [5.] **kullanılır**. Bu, korozyon olasılığını azaltmak için [6.] **yapılır**. Uçak mutfağı ve tuvalet altı gibi belirli alanlara özel korozyon önleyici işlemler [7.] **uygulanır**.

   2. Causes of Corrosion

   Corrosion [8.] **is** an electrochemical process that occurs when an electrical potential difference is present between a metal and its environment, and an electrolyte is present. This reaction [9.] **can be caused** by various corrosive agents, such as acids, alkalies, salts, the atmosphere, water, and microorganisms. They **create** an environment conducive to corrosion when they come in contact with the metal surface.

   2. Korozyonun Sebepleri

   Korozyon, bir metal ile çevresi arasında bir elektriksel potansiyel farkı ve bir elektrolit mevcut olduğunda meydana gelen elektrokimyasal bir [8.] **süreçtir**. Bu reaksiyon asitler, alkaliler, tuzlar, atmosfer, su ve mikroorganizmalar gibi çeşitli aşındırıcı maddeler tarafından [9.] **neden olunabilir**. Metal yüzeyle temas ettiklerinde korozyona elverişli bir ortam [10.] **oluştururlar**.

   3. Types of Corrosion

   Corrosion [11.] **is** an electrochemical process that converts metal into oxidized, hydroiodic, or sulfatic compounds. It [12.] **involves** two electrochemical reactions:

-The metal [13.] **oxidizes** and [14.] **leads** to an anodic change.
-The corrosive agent 15. reduces and [16.] **results** in a cathodic change.
Though the initial effects of corrosion are not always visible, it typically [17.] **begins** on the surface of the material. The subsequent paragraphs [18.] **provide** examples of the various types of corrosion that can occur on aircraft structures.

3. Korozyon Türleri

Korozyon, metali oksitlenmiş, hidrojik ya da sülfatik bileşenlere dönüştüren bir elektrokimyasal [11.] **süreçtir**. İki elektrokimyasal reaksiyon [12.] **içerir**.
- Metal [13.] **oksitlenir** ve anodik bir değişime [14.] **yol açar**.
- Aşındırıcı madde [15.] **azalır** ve katodik bir değişime [16.] **neden olur**.
Korozyonun ilk etkileri her zaman görünür olmayabilir, ancak genellikle materyalin yüzeyinde [17.] **başlar**. Sonraki paragraflar, uçak yapılarında meydana gelebilecek çeşitli korozyon türlerine ilişkin örnekler [18.] **sunmaktadır**.

a. Pitting Corrosion: It [19.] **begins** on the surface of a material and then [20.] **extends** downwards into the material and [21.] **weakens** its strength. This type of corrosion [21.] **is** particularly hazardous due to the vertical nature of the corrosion.

a. Çukurcuk Korozyon: Bir malzemenin yüzeyinde [19.] **başlar** ve sonra malzemenin içine, aşağı doğru [20.] **uzanır** ve gücünü [21.] **zayıflatır**. Bu korozyon türü özellikle korozyonun dikey oluşu nedeniyle [22.] **tehlikelidir**.

b. Filiform corrosion: Clad aluminium alloy sheets [23.] **are** prone to filiform corrosion. It [24.] **appears** as thin thread-like lines that spread out sideways and remain on the surface of the sheet, without penetrating into the core. It [25.] **can** also **start** at rivets and [26.] **will** only **be** visible when the paint on the sheet breaks due to the corrosion damage.

b. Filiform Korozyon: Alüminyum alaşımlı kaplama levhaları helezon şeklinde korozyona [23.] **meyillidir**. Bu, yan yana yayılan ve çekirdeğe nüfuz etmeden levha yüzeyinde kalan ince iplik gibi çizgiler olarak [24.] **görünür**. Ayrıca, perçinlerden de [25.] **başlayabilir** ve sadece korozyon hasarı nedeniyle boya kırılırsa [26.] **görülebilir/ görünür** olur.

c. Intergranular corrosion: It [27.] **tends** to penetrate into the core of the material, often along the grain boundaries, without any signs visible on the surface. This type of corrosion [28.] **can be identified** by a network of corrosion cracks or lines on the metal. If this hazardous type of corrosion is left unchecked, it [29.] **can cause** the weakening of the structure even before any evidence is seen.

c. Taneler Arası Korozyon: Yüzeyde görünür herhangi bir belirti olmaksızın, tane sınırları boyunca boyunca, malzemenin çekirdeğine derinlemesine nüfus etme [27.] **eğilimindedir**. Bu korozyon türü, metal üzerindeki korozyon çatlakları veya çizgileri ağı tarafından [28.] **belirlenebilir/tanılabilir**. Bu tehlikeli korozyon türü göz ardı edilirse, herhangi bir belirti göstermeden yapının zayıflamasına [29.] **neden olabilir**.

8. Sts' own answers
9. 1. to be replaced 2. must be supported 3. cannot be fixed 4. is recommended 5. is damaged 6. should be consulted 7. is required 8. should be replaced 9. is needed 10. should be contacted 11. will be revised 12. must be done 13. may be damaged 14. to be replaced 15. is required 16. are attached 17. should be consulted 18. is advised.
10. 1. (yenisiyle) Değiştirilmesi 2. Desklenmelidir. 3. Tamir edilemez 4. Önerilir 5. Hasar görmüşse 6. Bakılmalıdır. 7. gerekli olduğunu 8. Değiştirilmesi gerekmektedir/ değiştirilmelidir 9. ihtiyaç duyuluyorsa 10. Iletişime geçilmelidir. 11. revize edilecektir. 12. Yapılmalıdır 13. hasar görmüş olabilir 14. (yenisiyle) değiştirilmesi 15. temin edilebilir 16. bağlantılı olmadığından 17. Bakılmalıdır/danışılmalıdır 18. Önerilir/tavsiye edilir.
11. 1. A torque wrench: Tork anahtarı - D 2. A blanking plug/cap: Kör tapa/kapak - A 3. An O-ring: conta - H 4. A clamp: Kelepçe - B 5. A duct: Boru, kanal - G 6. A check valve: Tek yönlü valf/valve - C 7. A flexible sleeve: Esnek manşon - E 8. A flange: Flanş - F
12. 1. C 2. G 3. A 4. E 5. D 6. F 7. B
13. 1. HAVA OLMADIĞINDAN EMİN OLMAK İÇİN GENEL HIDROLIK SİSTEM TAHLİYE PROSEDÜRÜNÜ UYGULAYIN. (AMM29-00-00, P. BLOCK 401). TAHLİYE PROSEDÜRÜ DOĞRU MU?
2. IS THE YELLOW SYSTEM DEFECTIVE?
3. 28GQ NO'LU RÖLEYİ DEĞİŞTİRİN. ARIZA DEVAM EDİYOR MU?
4. REPLACE ENGINE-DRIVEN PUMP L(R) YELLOW :3031 (AMM 29-13-32).

5. ARIZALI PARÇAYI DEĞİŞTİRİN.
6. RETURN IN SERVICE.

14. A. 3 B. 1 C. 2 D. 4
E. Uçakta şebeke elektriği kullandığınızda izolasyon trafosu kullanın. Sadece patlamaya dayanıklı elektrikli alet ve ekipmanları kullanmalısınız.
15. 1. Bozulma 2. Kesiti 3. Döngü 4. Doğal 5. Aşınma 6. Kazıma 7. çatlak 8. kırılması-çatlaması 9. adesyon kaybı 10. Yapıştırıcı 11. Göçük 12. kenarları 13. Oyuk 14. Oluk 15. İz 16. Çentikler 17. Çizik 18. yüzey seviyesinde

UNIT TWO - Board Game

1. Compression
2. Turboshaft
3. Ss' own answers
4. Roll again
5. Aircraft Maintenance Manual
6. Rudder
7. Aileron
8. Elevator
9. Thrust
10. Drag
11. YOU NEED A HOLIDAY! GO BACK TO START
12. Weight
13. Pressurization
14. SKIP 5 SPACES
15. Students' own answer
16. Auxiliary Power Unit
17. reduce the risk of midair collisions between aircraft
18. A Current Transformer Monitor
19. ROLL AGAIN
20. traffic collision avoidance system
21. wash lights
22. aviation gasoline
23. Jet A1, Jet B, AVGAS, Biofuel
24. Students' own answer
25. Roll Again
26. Students' own answer
27. YOU NEED A HOLIDAY! GO BACK TO START
28. Air Transport Association
29. Aşınma
30. ROLL AGAIN
31. Thunderstorm
32. Piston or Reciprocating
33. GO BACK 3 SPACES
34. propeller
35. SKIP 3 SPACES
36. Bölüm
37. Propulsion

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Notes

