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Mechanical Comprehension Tests

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INTRODUCTION

Welcome to *Mechanical Comprehension Tests*. This guide has been designed to help you prepare for any mechanical aptitude test. We feel certain that you will find the guide both a comprehensive and highly informative tool for helping you pass this type of test.

Mechanical Comprehension Tests are an assessment used for measuring a candidate's ability to perceive and understand the relationship of physical forces and mechanical elements in practical situations. This aptitude is important in jobs and training programmes that require the understanding and application of mechanical principles. The types of job which will normally require this level of ability include practical jobs such as Train Driver, Firefighter, some armed forces roles, engineering roles, and other similar jobs where an ability to work with mechanical concepts is crucial.

In addition to the tests within this guide we would also like to give you **free access** to our online psychometric testing facility.

To gain access to our suite, simply go to the following website:

www.PsychometricTestsOnline.co.uk

If you would like any further assistance with any career selection process, then we offer the following products and training courses via the website www.How2Become.com:

- How to join the Army, RAF, Royal Navy, Royal Marines and Parachute Regiment;
- How to become a Train Driver, Firefighter or Police Officer;
- How to pass Psychometric Tests, Numerical Reasoning and Verbal Comprehension Tests;
- Career training courses.

Finally, you won't achieve much in life without hard work, determination and perseverance. Work hard, stay focused and achieve your dreams!

Good luck and best wishes,

The How2Become Team

PREFACE BY RICHARD MCMUNN

Before you get your head-in-to-the-game, and start practising for your RAF Airman Tests, I thought it might be a good idea to introduce myself; explaining a little bit about myself, my background, and why I'm qualified to help you pass the selection process for joining the RAF.

At the time of writing, I am 41 years old and living in Tunbridge Wells, Kent. I left school at the usual age of 16 and joined the Royal Navy, serving on-board HMS Invincible as part of 800 Naval Air Squadron which formed part of the Fleet Air Arm. There I was, at the age of 16, travelling the world and working as an engineer on Sea Harrier jets! It was fantastic and I loved every minute of it!

After four years, I left the Royal Navy and joined Kent Fire and Rescue Service as a firefighter. Over the next 17 years, I worked my way up through the ranks to the position of Assistant Divisional Officer. During my time in the fire service, I spent a lot of time working as an instructor at the Fire Brigade Training Centre. I was also involved in the selection process for assessing candidates who wanted to become a firefighter. Therefore, my knowledge and experience gained so far in life has been invaluable in helping people like you to pass any type of selection process. I am sure you will find this guide an invaluable resource during your preparation for joining the Royal Air Force.

Over the years, I have taught many people how to prepare for career selection processes and assessment centres. The way to pass any mechanical comprehension assessment is to embark on a comprehensive period of intense preparation. I would also urge you to use an action plan during your preparation. This will allow you to focus your mind on exactly what you need to do in order to pass your test. For example, if it has been many years since you last attended a test, then you will probably have to do a lot of work in this area, in order to make yourself feel more comfortable. You can do this by trying out, and understanding, the test questions and answers within this workbook.

I have always been fortunate in the fact that I persevere in everything I set my mind to. I understand that if I keep working hard in life, then I will always be successful, or at least know that I have done my very best! This is an important lesson that I want you to take on-board.

If you work hard and persevere, then success will come your way. The same rule applies when applying for a career in the Armed Forces; if you work hard and make the most out of your preparation time, then you will be successful.

Finally, it is very important that you believe in your own abilities. It does not matter if you have no qualifications; it does not matter if you are currently weak in the area of psychometric testing. What does matter is self-belief, self-discipline, and a genuine desire to improve and become successful.

Best wishes,

Richard McMunn

ABOUT THE TESTS

Mechanical comprehension or aptitude tests have been in use for many years as a method for assessing a candidate's potential to perform a specific job. Predominantly, they are used in careers which require an ability to work with, or understand, mechanical concepts. Examples of types of careers which require this level of aptitude include:

- Train driver;
- Driving careers;
- Armed forces jobs;
- Engineering careers;
- Emergency services;
- Motor mechanic;
- Aircraft engineer.

Of course, the above list is not exhaustive and there are many other jobs which require an ability to interpret mechanical concepts.

Some mechanical comprehension tests include fault diagnosis questions which are used to select personnel for technical roles where they need to be able to find and repair faults in different operating systems. We have included some of these questions in this guide just to give you an idea of this type of question. However, for those people who wish to try these tests, and indeed different types of psychometric tests, please access the free facility at:

www.PsychometricTestsOnline.co.uk

Many mechanical comprehension tests require you to concentrate on ‘principles’ rather than on making calculations, and as such will include diagrams and pictures as part of the question.

For example, you may be shown a diagram of a series of cogs and be asked to work out which way a specific cog is turning if another one rotates either clockwise or anti-clockwise. Understanding these two very simple terms is crucial to answering mechanical comprehension test questions accurately. For those people who are unsure, here’s an explanation:

CLOCKWISE AND ANTI-CLOCKWISE

CLOCKWISE

ANTI-CLOCKWISE

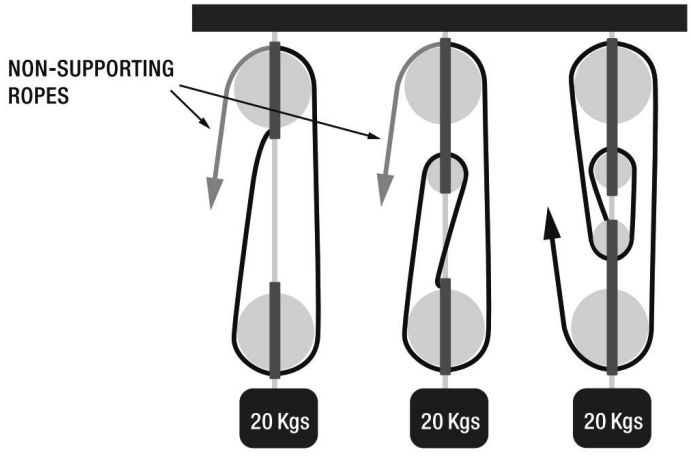
The easiest way to remember the above is to think of the way that the hands on a clock rotate; hence the phrase ‘clockwise’.

You may also find that some test questions which have been created in the USA refer to anti-clockwise as 'counter-clockwise'.

UNDERSTANDING MECHANICAL ADVANTAGE

You may find that some mechanical comprehension tests ask you to calcuate the mechanical advantage of a simple pulley system.

Here’s an explanation of how mechanical advantage works when using a simple pulley system.



EXAMPLES OF SIMPLE PULLEY SYSTEMS

If you study the three pulley systems above, you will note that each system has both supporting ropes and non-supporting ropes. Supporting ropes are ones which, as the name suggests, support the load. Only the first two pulley systems have non-supporting ropes which we have indicated.

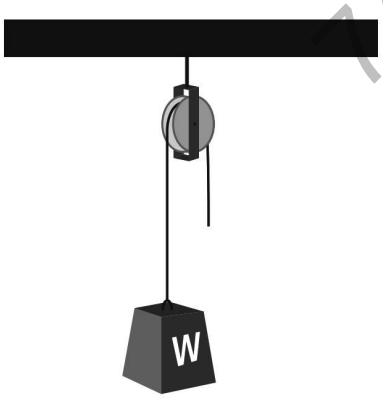
The non-supporting ropes in the first two pulley systems above simply change the direction of the force.

To calculate the mechanical advantage in a moveable pulley system, we simply have to count the number of supporting ropes. Counting the supporting ropes in the pulley systems above, the mechanical advantage of each of system is, from left to right 2, 3, and 5.

To further your understanding of mechanical advantage using simple pulley systems, try the following sample four questions to see how you get on.

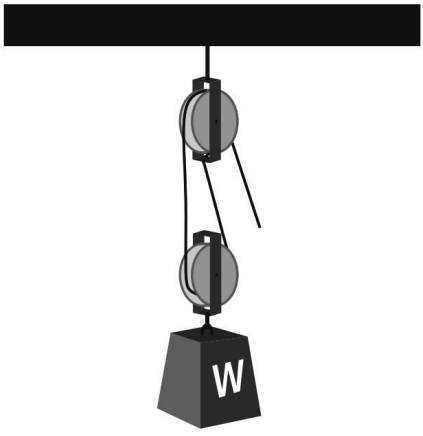
Question 1

What is the mechanical advantage?



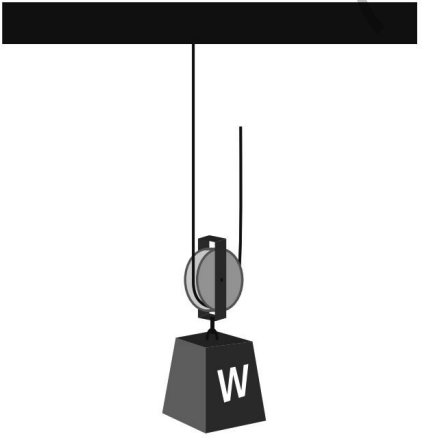
Question 2

What is the mechanical advantage?



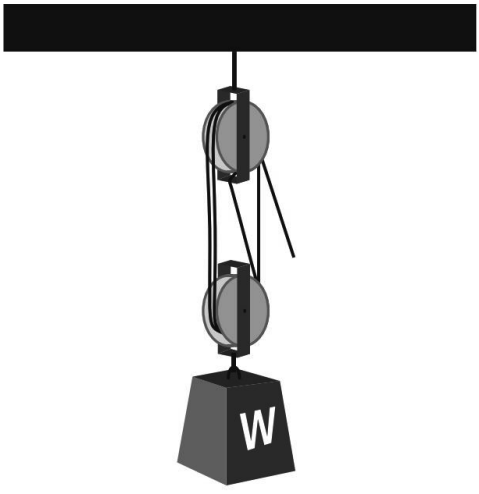
Question 3

What is the mechanical advantage?



Question 4

What is the mechanical advantage?



ANSWERS TO SAMPLE MECHANICAL ADVANTAGE QUESTIONS

Q1. For this simple pulley system there is just one supporting rope. Therefore, the mechanical advantage is 1.

Q2. In this pulley system there are two supporting ropes and the mechanical advantage is 2.

Q3. In question 3 you will notice that the pulley is not attached directly to the beam. This is known as a moveable pulley system whereby the pulley is attached to the load/weight. When the rope is pulled up, the weight/load will also move up. You will notice that the weight is supported by both the rope end attached to the upper beam and the end which will be held by the per- son. Each side of the rope is now supporting the weight; therefore, each side carries only half the weight. The mechanical advantage of this system is 2.

Q4. In question 4, there are four supporting ropes and one non-supporting rope. The mechanical advantage here is 4.

The pulley systems we have used in the example questions are called simple pulley systems. The reason for this title is because they utilise the same rope for the entire system. Pulley systems which are attached using more than one rope (not one continuous rope), are more complex. You will find that the vast majority of mechanical comprehension tests for regular jobs will use simple pulley systems.

Of course, pulley systems are only one type of question you will encounter when sitting mechanical comprehension tests. Within the sample tests sections of this workbook we have tried to provide you with a cross-section of questions to give you a better understanding of what the test questions may look like. Let's now take a look at some tips that will help you to perform to the best of your ability when sitting mechanical comprehension tests.

TIPS FOR PASSING MECHANICAL COMPREHENSION TESTS

- The majority of employers will assess you on speed and accuracy. Therefore, you are advised against random 'guessing'. Over the years, it has become common practice for test-takers to wildly guess when taking tests that are multiple-choice in nature, especially towards the end of the test when they are running out of time. In order to stop this practice, more and more test administrators are deducting marks for incorrect answers. Therefore, during your preparation for your assessment we recommend you simply practice lots of test questions, but more importantly understand how the answer is reached.

- Whilst on the subject of multiple-choice questions, you will most probably find that there are more mechanical comprehension test questions than you can answer during the allocated time given for the test. If this is the case, do not worry. Many tests are designed so that you do not finish them. Once again, simply work as fast as you can but also aim for accuracy.

- If you come up against a difficult question during your mechanical comprehension test, move on, but remember to leave a gap on the answer sheet. If you fail to leave a gap, then each of the preceding answers will be incorrect.

- In the build-up to the test, if you feel like you are struggling with basic mechanical concepts, then we recommend you study a car manual such as Haynes. This will give you an idea of how mechanical concepts work. You can obtain Haynes manuals at: www.haynes.co.uk.

- We get asked on many occasions 'what is the pass mark for the test I am sitting?' Whilst many test administrators will set a pass mark of 70% the simple answer is we do not know. This is because it is not uncommon for an employer or test administrator to set the pass mark based on an average score for the group of people

taking the test. This enables the employer or test administrator to pick the upper quartile of test takers, ensuring they get the best. The other matter to consider is that your scores in the mechanical comprehension test will normally go towards your overall score in an assessment; so, if you don't do too well in one particular test, this does not necessarily mean you will fail the entire assessment!

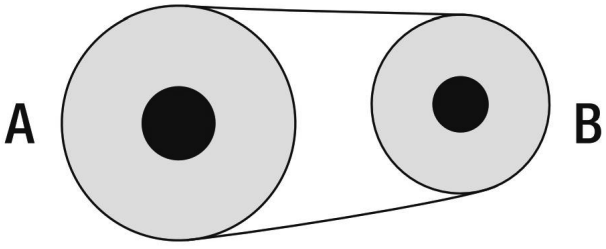
It's now time for you to try out the sample tests that I have created for you. There are twenty questions in each test and you have twenty minutes to complete each one of them. Answers are provided at the end of each test.

TEST 1

You have 20 minutes to complete this test.

Question 1

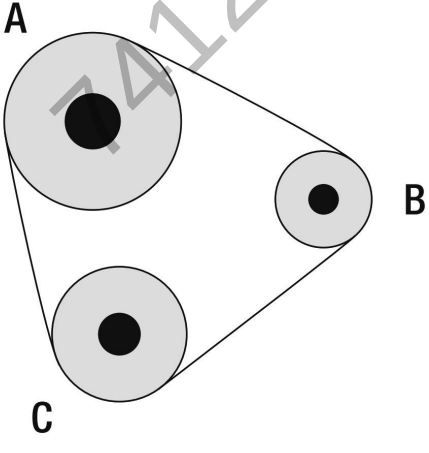
In the following cog and belt system, which cog will rotate the most number of times in an hour?



A	B	C
Cog A	Cog B	All the same

Question 2

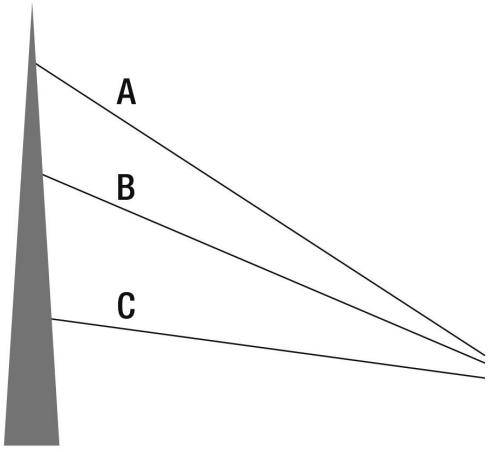
In the following cog and belt system, which cog will rotate the least number of times in thirty minutes?



A	B	C
Cog A	Cog B	Both the same

Question 3

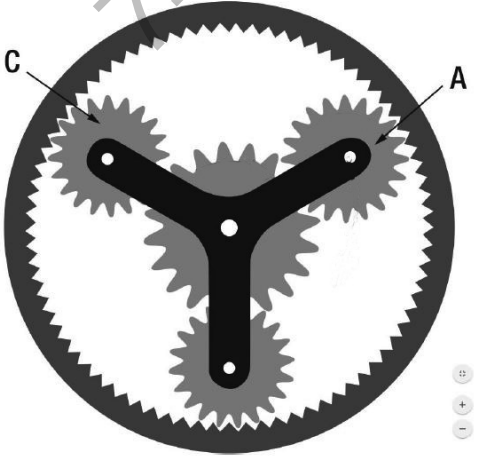
Which rope would require the most effort to pull the mast over?



A	B	C
Rope A	Rope B	Rope C

Question 4

If cog A turns anti-clockwise as indicated, which way will cog C turn?



A	B	C
Clockwise	Anti-clockwise	Backwards and forwards

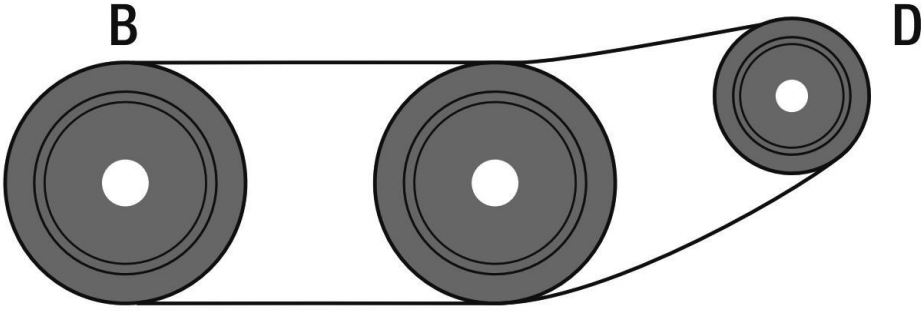
Question 5

What will happen to the air resistance on a car as the car picks up speed?

A	B	C
The air resistance will increase	The air resistance will decrease	The air resistance will stay the same

Question 6

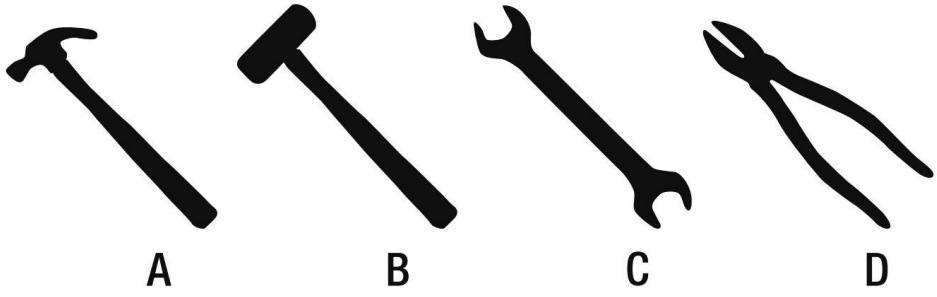
If wheel B moves clockwise at a speed of 20 rpm, how will wheel D move and at what speed?



A	B	C	D
Clockwise, more rpm	Clockwise, less rpm	Anti-clockwise, more rpm	Anti-clockwise, less rpm

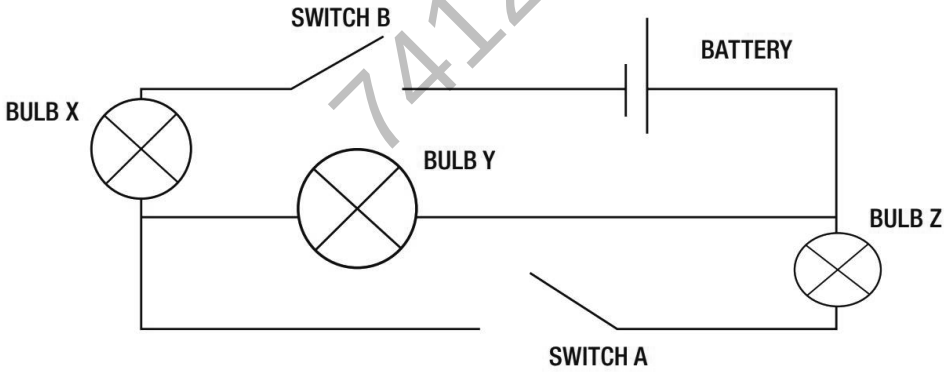
Question 7

Which is the best tool to use for breaking up concrete?



Question 8

In the following circuit, if switch A closes and switch B remains open, what will happen?



A. Bulbs X, Y and Z will illuminate.

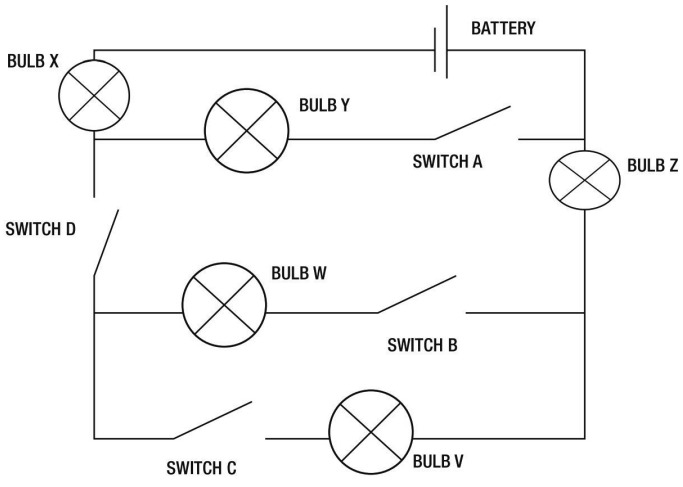
B. Bulb X will illuminate.

C. Bulbs Y and Z will illuminate.

D. No bulbs will illuminate.

Question 9

In the following circuit, if switch A closes, what will happen?



A. Bulbs V, W, X, Y and Z will illuminate.

B. Bulbs X and Y will illuminate.

C. Bulbs X, Y and Z will illuminate.

D. No bulbs will illuminate.

Question 10

Which of the following equations would you use to work out the voltage?

A. Voltage = current ÷ resistance

B. Voltage = resistance ÷ current

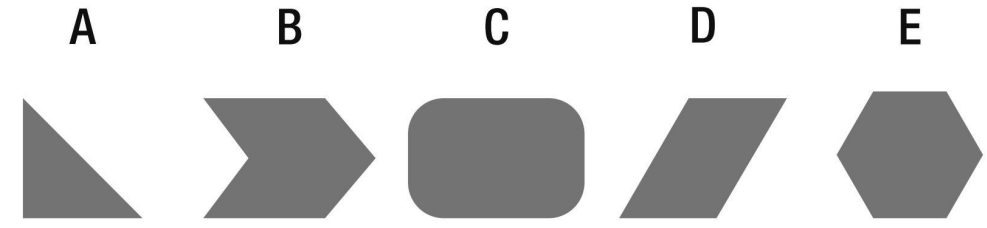
C. Voltage = current x resistance

D. Voltage = power x resistance

Question 11

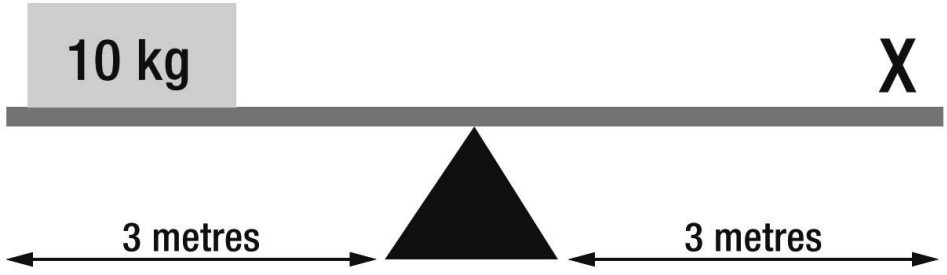
You are looking at the following objects side-on. Which is most unstable and likely to topple first?

If you think they are all the same, then please choose F for your answer.



Question 12

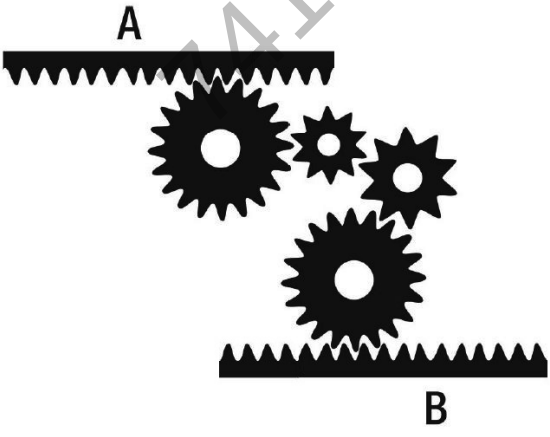
How much weight will need to be placed at point X in order to balance out the beam?



A	B	C	D
10 kg	15 kg	100 kg	20 kg

Question 13

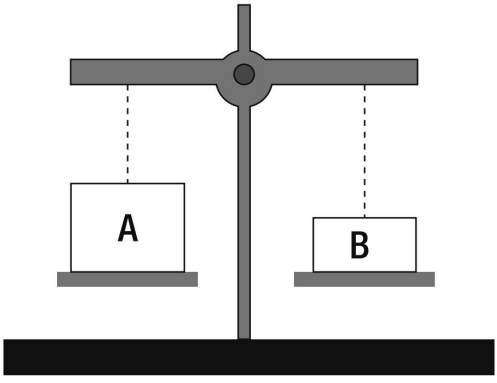
If bar A moves to the left, which way will bar B move?



A	B	C
Left	Right	It won't move

Question 14

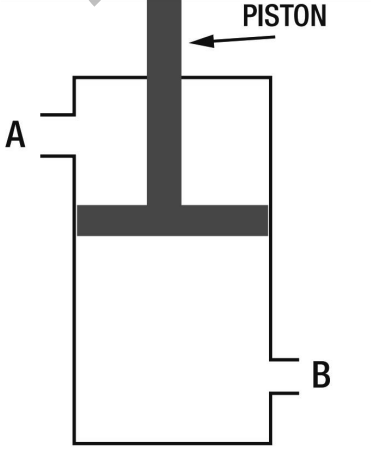
On the following weighing scales, which is the heaviest load?



A	B	C
Load A	Load B	Both the same

Question 15

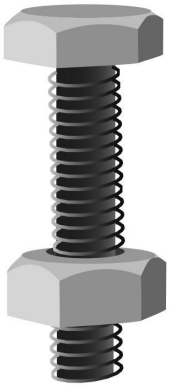
At which point should pressurised air enter the cylinder in order to force the piston downwards?



A	B	C
Point A	Point B	Both Point A and Point B

Question 16

In the following nut and bolt configuration, what will happen to the bolt if you turn the nut clockwise?

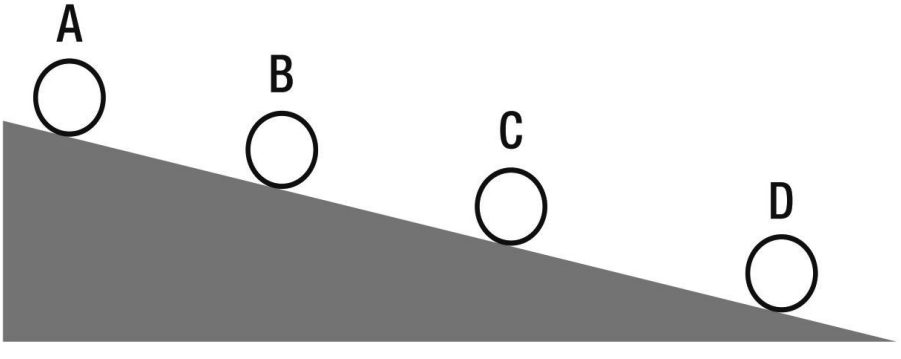


A. The nut will move upwards.

B. The nut will move downwards.

Question 17

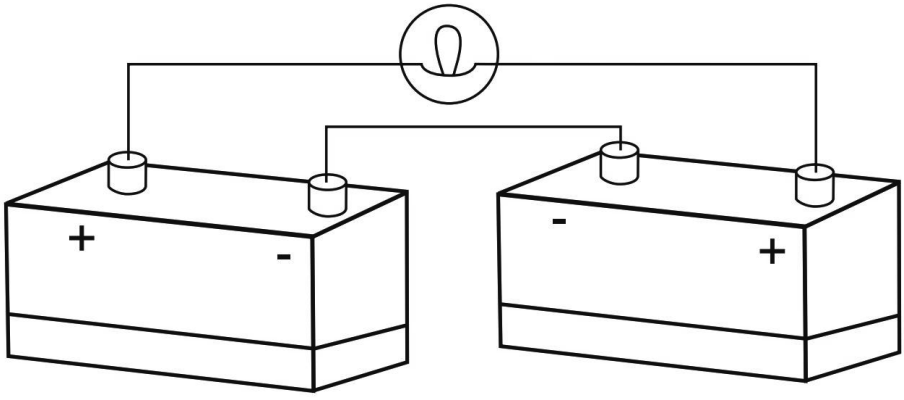
A ball is rolling down a hill. At which point will the ball be travelling the fastest?



A	B	C	D
Point A	Point B	Point C	Point D

Question 18

Will the bulb illuminate?

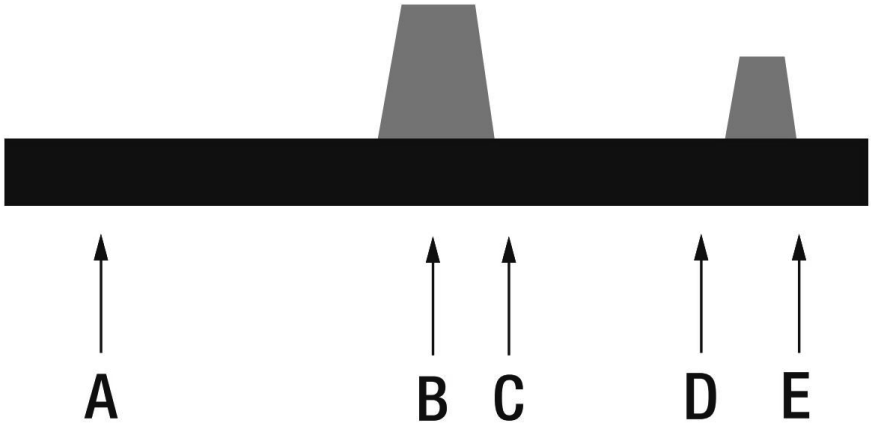


A. Yes

B. No

Question 19

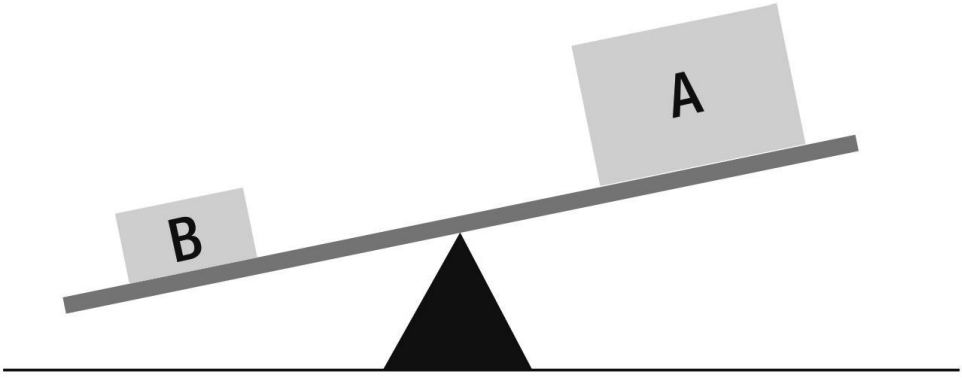
At which point will the beam most likely balance?



A	B	C	D	E
Point A	Point B	Point C	Point D	Point E

Question 20

Which is the heaviest load?



A	B	C
Load A	Load B	Both the same

ANSWERS TO MECHANICAL COMPREHENSION TEST 1

Q1. b

Cog B is smaller and therefore will rotate more times in the given timeframe.

Q2. a

Because cog A is the largest of the three cogs it will rotate fewer times for any given timeframe.

Q3. c

The higher up the mast the rope is secured, the easier it will be to pull it over. This is because there is more leverage than a rope secured towards the bottom of the mast. Therefore, rope C will require the most effort.

Q4. b

Cog C will rotate anti-clockwise.

Q5. a

As the car picks up speed, the air resistance will increase.

Q6. a

Wheel D will rotate clockwise, but because it is smaller in size it will rotate more rpm than B.

Q7. b

Both A and B are suitable for breaking up concrete, however, B (sledge hammer) is designed specifically for this purpose.

Q8. d

Because the second switch is still open, the circuit will remain broken and therefore no bulbs will illuminate.

Q9. b

Only bulbs X and Y can illuminate in this circuit because the remaining switches remain open.

Q10. c

In order to work out the voltage, you must multiply the current of the circuit by the resistance.

Q11. d

Out of the objects, D is the most unstable and likely to topple first.

Q12. a

10 Kg must be placed at point X in order to balance the beam.

Q13. a

Bar B will also move to the left.

Q14. c

Both loads weigh the same because the scales are evenly balanced.

Q15. a

Air will need to be forced in at A in order for the piston to move downwards.

Q16. a

The nut will move upwards.

Q17. d

At point D the ball will have gained the most velocity and will therefore be travelling the fastest.

Q18. b

The bulb will not illuminate because the battery is wired incorrectly. For it to illuminate, the positive (+) connection should be connected to the negative (-) connection on each battery.

Q19. c

At point C the beam will most likely balance. You need to place the fulcrum the right amount of distance to balance out the difference in weight.

Q20. b

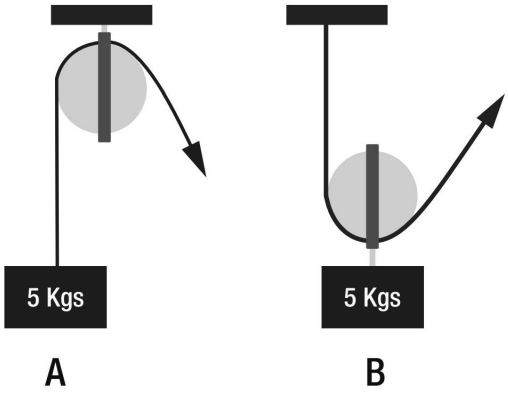
Load B is the heaviest as the beam is weighing down to the left.

TEST 2

You have 20 minutes to complete this test.

Question 1

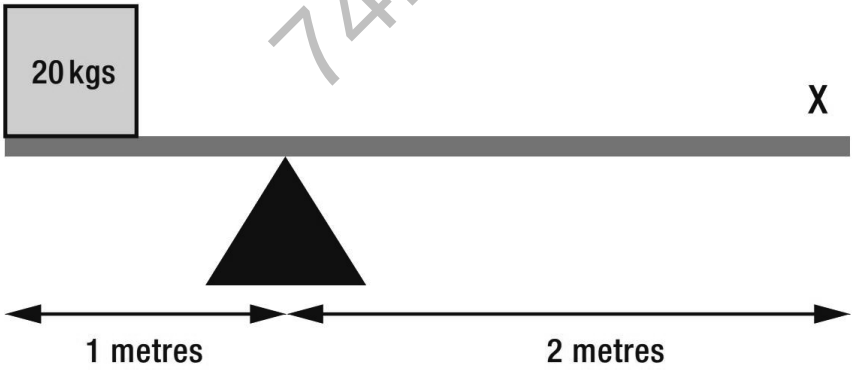
Which weight requires the most force to lift it?



A	B	C
Both the same	Weight A	Weight B

Question 2

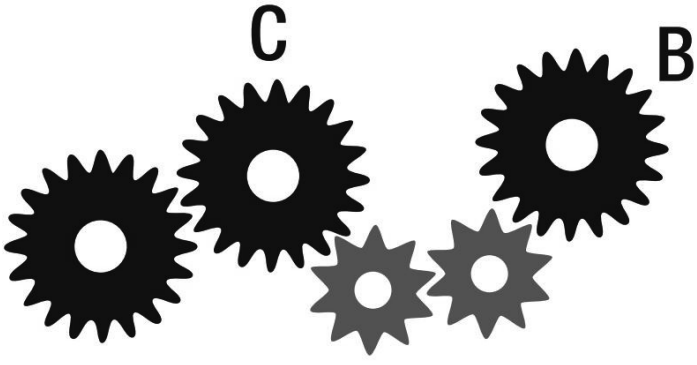
How much weight is required to balance point X?



A	B	C	D
5 kg	10 kg	15 kg	20 kg

Question 3

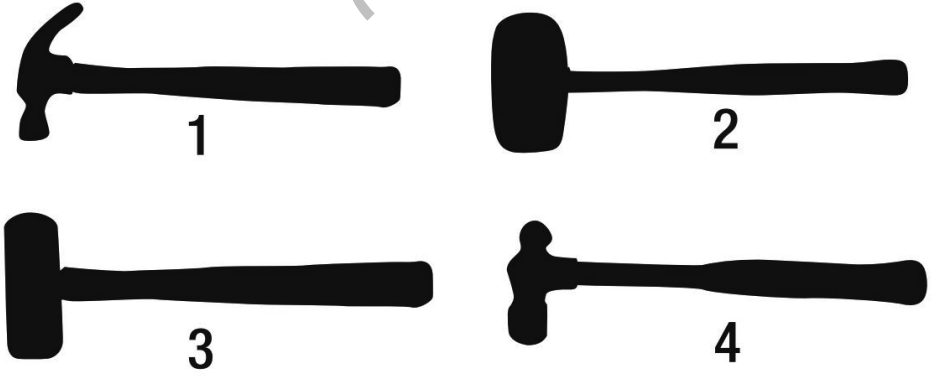
If cog C turns anti-clockwise at a speed of 10 rpm, which way, and at what speed, will cog B turn?



A	B	C	D
10 rpm / anti-clockwise	10 rpm / clockwise	20 rpm / anti-clockwise	20 rpm / clockwise

Question 4

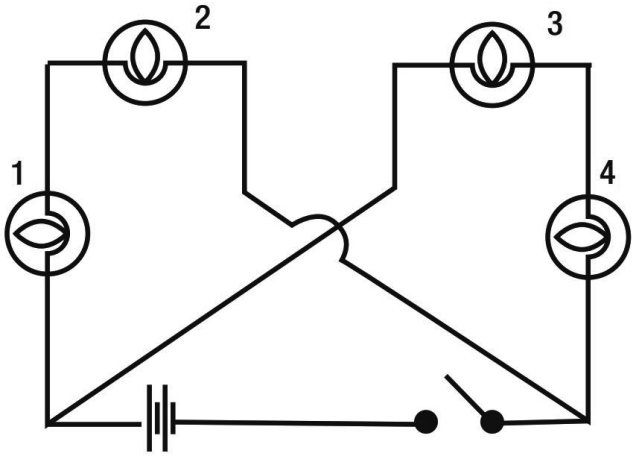
Which tool would you use to claw nails from wood?



A	B	C	D
1	2	3	4

Question 5

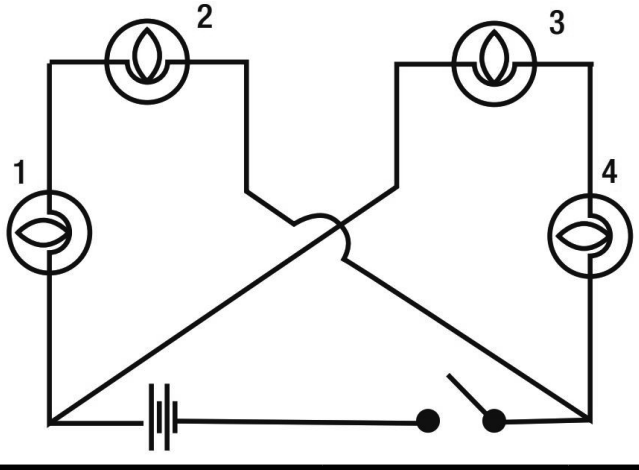
If bulb 2 is removed, how many bulbs will illuminate?



A	B	C	D
1	3	4	None

Question 6

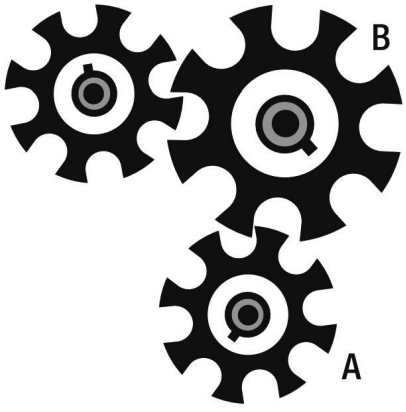
When the switch is closed, how many bulbs will illuminate when bulb 3 is removed, and replaced with cable?



A	B	C	D
None	One	Two	Three

Question 7

If cog B turns anti-clockwise, which way will cog A turn?



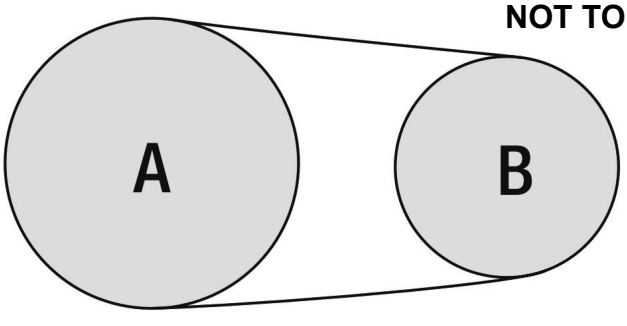
A. Clockwise

B. Anti-clockwise

Question 8

If wheel A is three times the diameter of wheel B and it rotates at 55 rpm, what speed will wheel B rotate at?

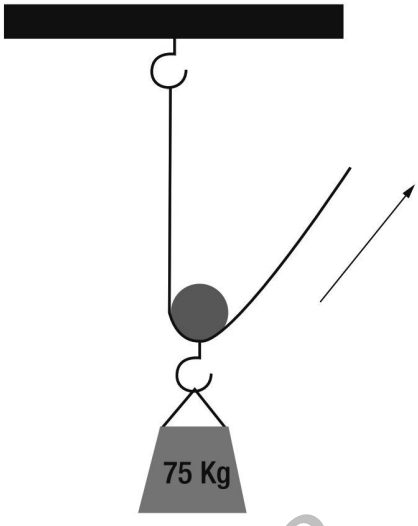
NOT TO SCALE



A	B	C
55 rpm	110 rpm	165 rpm

Question 9

How much force is required to lift the 75 kg weight?



A	B	C	D
25 kgs	37.5 kgs	75 kgs	150 kgs

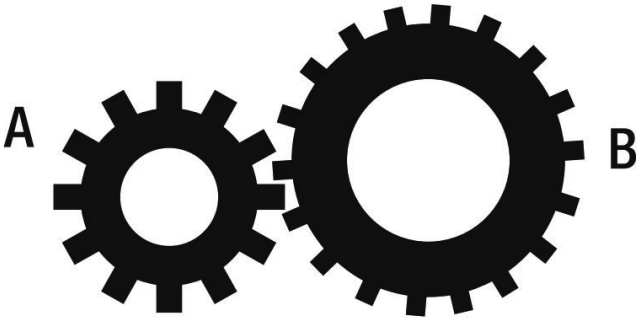
Question 10

A screw has 8 threads per inch. How many full turns are required for the nut to travel 3 inches?

A	B	C	D
8 turns	12 turns	16 turns	24 turns

Question 11

Cog A has 12 teeth and Cog B has 18 teeth. If cog B completes two full turns, how many rotations will cog A complete?



A	B	C	D
3 rotations	2 rotations	1.5 rotations	1 rotation

Question 12

Two cars are travelling in opposite directions. One of the cars is travelling at a speed of 45 m/s and the other car is travelling at a speed of 30 m/s.

What is their relative speed?

A	B	C	D
60 m/s	45 m/s	30 m/s	75 m/s

Question 13

A thick block of wood rests on an even and level surface. What mechanical principle makes it more difficult to push this block sideways if the surface is made of sandpaper than if it is made of glass?

A	B	C	D
Spring Force	Gravitational Force	Air Resistance Force	Frictional Force

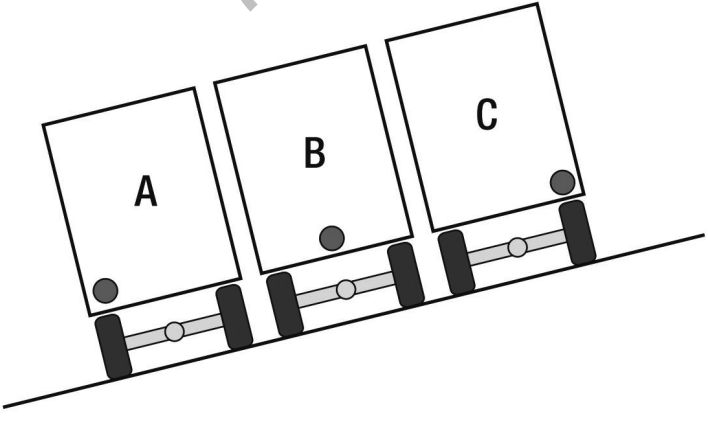
Question 14

Why does an astronaut weigh less on the Moon than on Earth?

A	B	C
The force of gravity is weaker on the Moon.	The force of gravity is weaker on Earth.	The Moon has no gravity.

Question 15

The following three HGVs are parked on an incline. Their centre of gravity is identified by a dot. Which of the three HGVs is least likely to fall over?



A	B	C
A	B	C

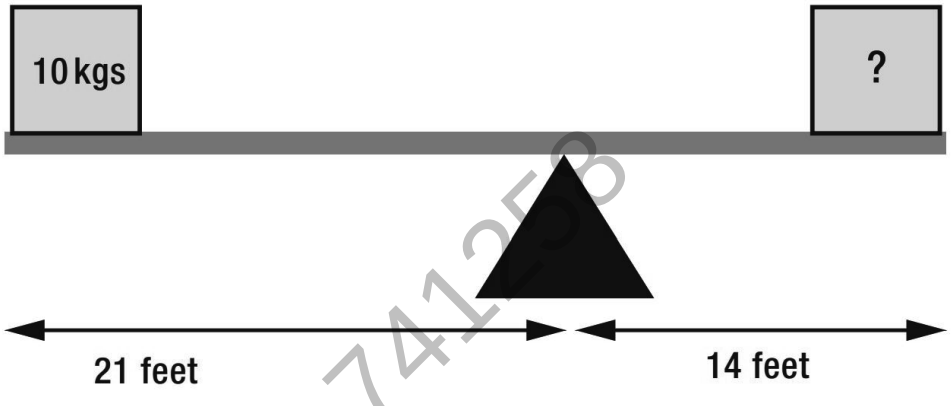
Question 16

Which of the following most resembles a lever?

A	B	C	D
Swing	Car	Elevator	Seesaw

Question 17

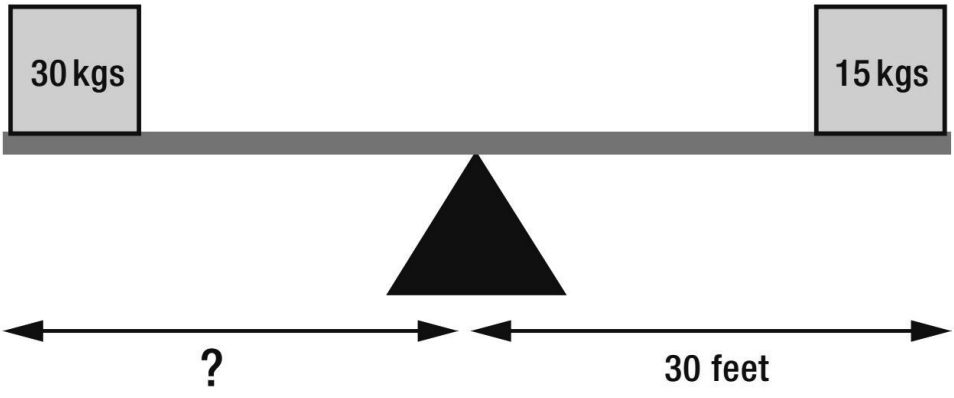
To balance the beam, how much weight should be placed on the right-hand side?



A	B	C	D
5 kg	10 kg	15 kg	30 kg

Question 18

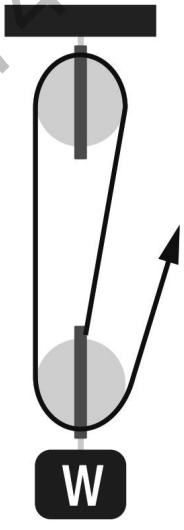
How far from the balance point should the 30 kg weight be placed to balance the beam?



A	B	C	D
5 feet	10 feet	15 feet	45 feet

Question 19

How far would you have to pull the rope up to lift the weight 5 feet?



A	B	C	D
5 feet	10 feet	15 feet	30 feet

Question 20

Friction is an example of what?

A. A contact force

B. A non-contact force

C. Both a contact and a non-contact force.

ANSWERS TO MECHANICAL COMPREHENSION TEST 2

Q1. b

When answering questions where there is a single pulley system, if the pulley is fixed, as in A, then the force required to lift the weight is the same as the weight, i.e. 5 kg. However, where the pulley system is not fixed and it moves with the weight, as is the case with pulley system B, then the weight required to lift it is half the weight. This means that the weight required to lift B is 2.5 kg. The answer to the question is therefore B as pulley system A requires the most weight to lift it.

Q2. b

Point X is twice the distance from the balance point; therefore, half the weight is required. The answer is B, 10 kg.

Q3. b

If cog C turns 10 anti-clockwise at a speed of 10 rpm, then it is relatively straight forward to determine that cog B will rotate the same speed but in a clockwise direction.

Q4. a

The only tool that you can use from the selection to claw nails from wood is claw hammer A.

Q5. d

No bulbs would illuminate because the circuit, in its current state, is not working. This is due to the switch being open.

Q6. d

Three bulbs would illuminate.

Q7. a

Cog A will turn clockwise.

Q8. c

Because wheel A is three times greater in diameter than wheel B, each revolution of A will lead to 3 times the revolution of B. Therefore, if wheel A rotates at 55 rpm, B will rotate at 55 rpm × 3 = 165 rpm.

Q9. b

This type of pulley system has a mechanical advantage of 2. Therefore, to lift the 75 kg weight will require 75 kgs ÷ 2 = 37.5 kgs.

Q10. d

There are 8 threads per inch. To move the nut 3 inches will require 8 × 3 = 24 turns.

Q11. a

Each full turn of cog B will result in 18 teeth ÷ 12 teeth = 1.5 rotations. Two turns of cog B will result in cog A completing 3 rotations.

Q12. d

The relative speed of the two cars is 45 m/s + 30 m/s = 75 m/s

Q13. d

In this particular case, frictional force is the force that must be overcome in order to slide the object from one side to another.

Q14. a

An astronaut weighs less on the Moon than Earth because the force of gravity is less on the Moon than on Earth.

Q15. c

By drawing a vertical line straight down from the centre of gravity, only the line for HGV C shows stability. Therefore, this HGV is least likely to fall over.

Q16. d

A seesaw is the only option which utilises a form of leverage to function.

Q17. c

The distance of the weight on the right hand side from the balance point is one third less than the distance on the right hand side; therefore, an additional third weight is required to balance the beam.

Q18. c.

In order to balance the beam the weight needs to be placed half the distance of the right hand side (15 feet). This is because the weight on the left is twice as heavy as the weight on the right hand side.

Q19. c

You would need to lift the rope 15 feet in order to lift the weight 5 feet.

Q20. a

Friction is an example of a contact force.

TEST 3

You have 20 minutes to complete this test.

Question 1

A block and tackle refers to a device which is used to:

A. Place under the wheel of a car to stop it from rolling backwards.

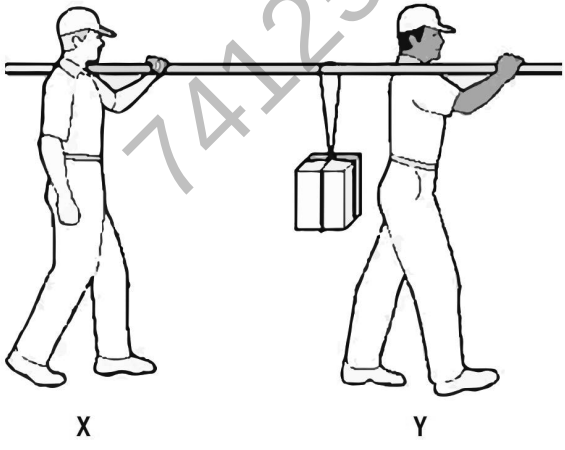
B. Catch large fish.

C. Leverage a stationary object.

D. Hoist an object upwards by means of rope and pulleys.

Question 2

Which man is carrying less weight?

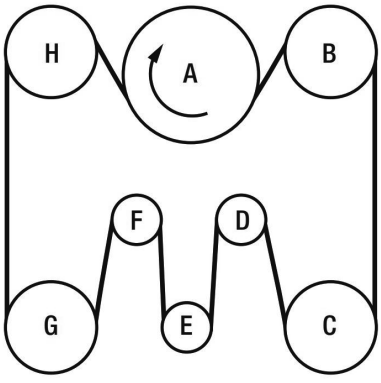


A. Man X

B. Man Y

Question 3

If wheel A rotates clockwise, which of the other wheels will also rotate clockwise?



A. All of them

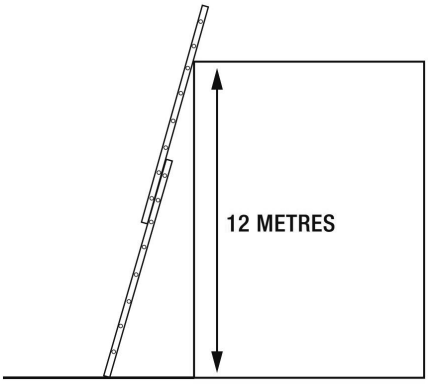
B. B, C, E, G and H

C. D and F

D. D, E and F

Question 4

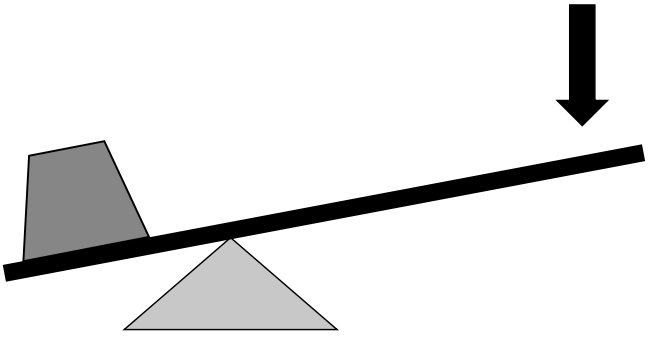
A builder is told to pitch his ladder a third of the working height away from the building below. How many metres away from the building should the foot of the ladder be placed?



A	B	C	D
36 metres	12 metres	4 metres	3 metres

Question 5

If the object on the left side of the scale is 32 ft. away from the balance point, i.e. the fulcrum, and a force is applied 8 ft. from the fulcrum on the right side, what is the mechanical advantage?



A	B	C	D
4	4.5	18	36

Question 6

A hot air balloon is able to float because:

A. The hot air is turbo-charged

B. The hot air is less dense than the external air

C. The hot air is denser than the external air

D. It is filled with helium

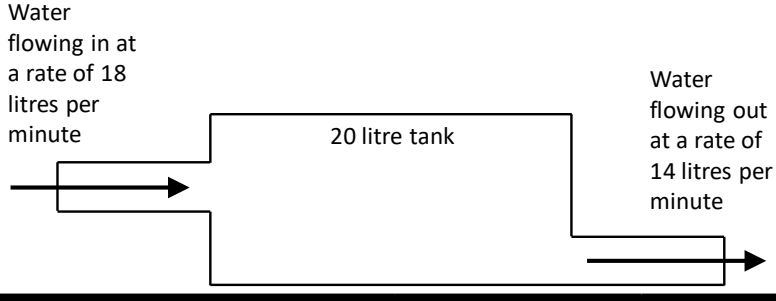
Question 7

Which of the following materials will float on water?

A	B	C	D
Balsa Wood	Concrete	Coins	Anchor

Question 8

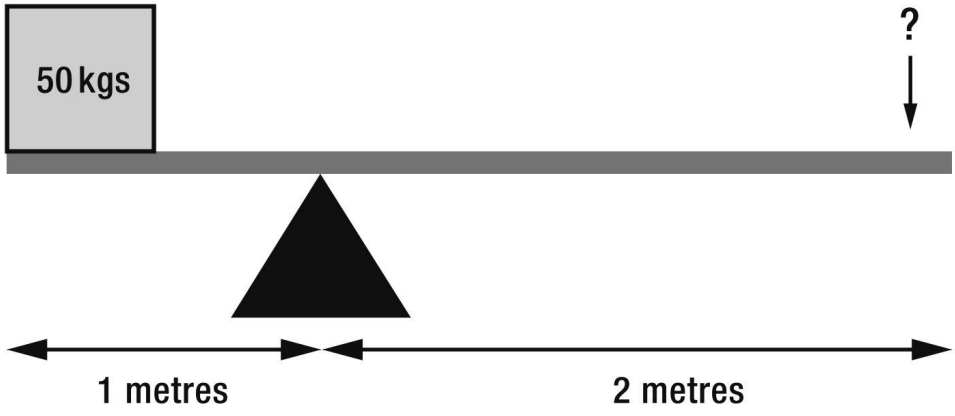
Water is flowing into the following tank through the left-hand side inlet pipe at a rate of 18 litres per minute. If the water is flowing out through the lower right-hand side outlet pipe at a rate of 14 litres per minute, approximately how much time will it take for the tank to overflow?



A	B	C	D
2 minutes	3 minutes	5 minutes	8 minutes

Question 9

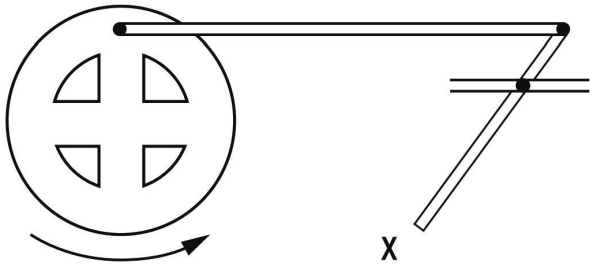
How much weight will need to be placed on the right-hand side to balance the beam?



A	B	C	D
100 kgs	200 kgs	50 kgs	25 kgs

Question 10

If the wheel rotates anticlockwise, what will happen to X?



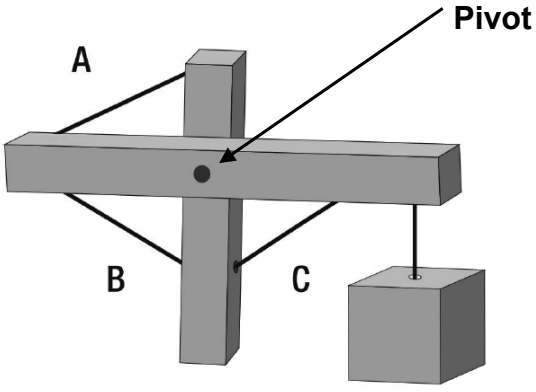
A. It will move to the right and stop.

B. It will move to the left and stop.

C. It will move left and right.

Question 11

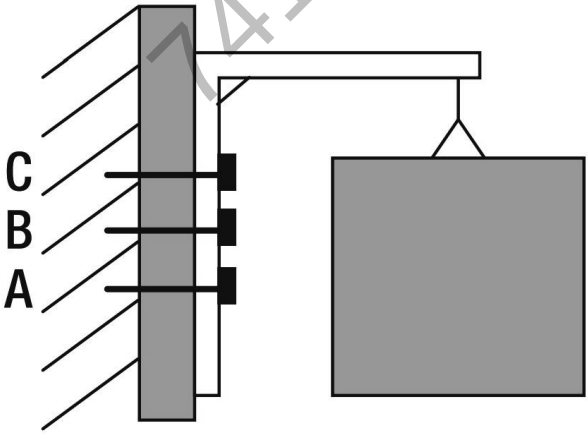
Which chain will support the load on its own?



A	B	C	D
Chain A	Chain B	Chain C	None of them

Question 12

Which nail is likely to pull out first?



A	B	C	D
Nail A	Nail B	Nail C	All together

Question 13

Computer monitors and television screens are often covered in dust because...

A. The dust is attracted by the cool air of the technological device.

B. Dust is unmanageable.

C. The dust is attracted to the microfibres of the screen.

D. The dust is attracted by the static charges compelling from the technological device.

Question 14

An aircraft with a mass of 1,600 kilograms starts at rest and accelerates along a horizontal runway. The engine of the aircraft produces a constant thrust of 4,200 N. There is a constant frictional force of 300 N which is acting on the aircraft.

What is the acceleration of the aircraft?

A. 24.75 ms^{-2}

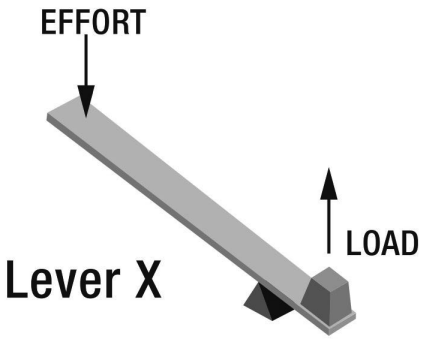
B. 4.2652 ms^{-2}

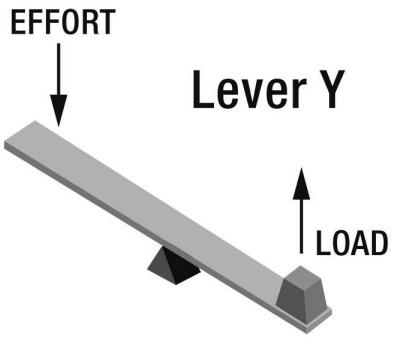
C. 2.4375 ms^{-2}

D. 3.1354 ms^{-2}

Question 15

Which lever will require more effort to lift the load?

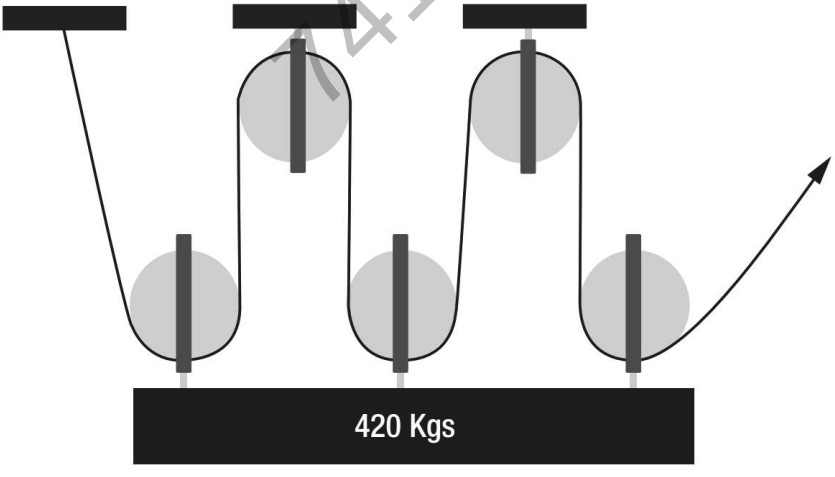




A	B	C
Lever X	Lever Y	Both the same

Question 16

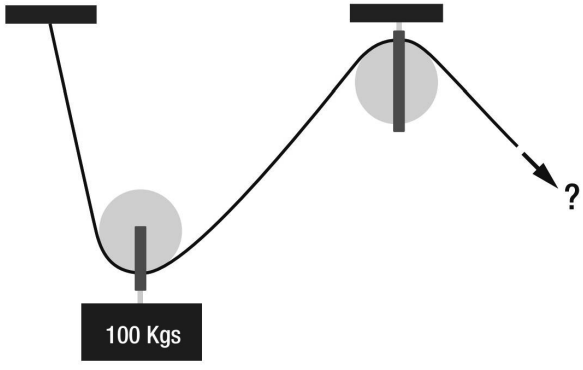
How much force is required to lift the load?



A	B	C	D
140 kgs	210 kgs	90 kgs	70 kgs

Question 17

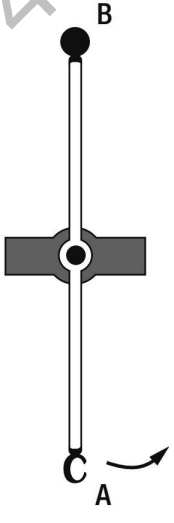
How much weight is required to hold the load?



A	B	C	D
400 kgs	200 kgs	100 kgs	50 kgs

Question 18

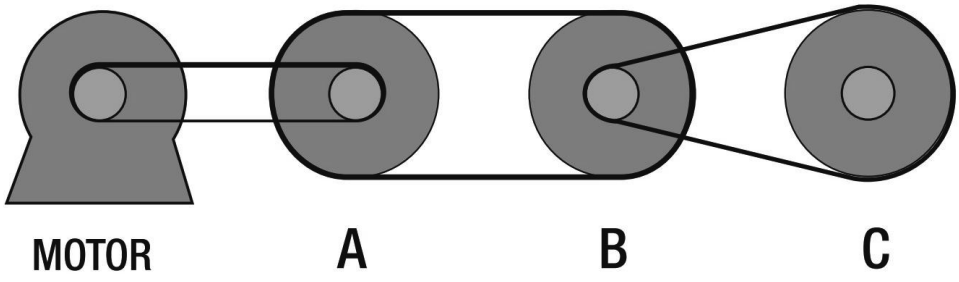
If lever A moves in the direction shown, which way will B move?



A	B	C	D
To the left	To the right	Backwards and forwards	It will not move

Question 19

If the motor wheel rotates in a clockwise direction, what happens to B and C?



A. B and C will move clockwise.

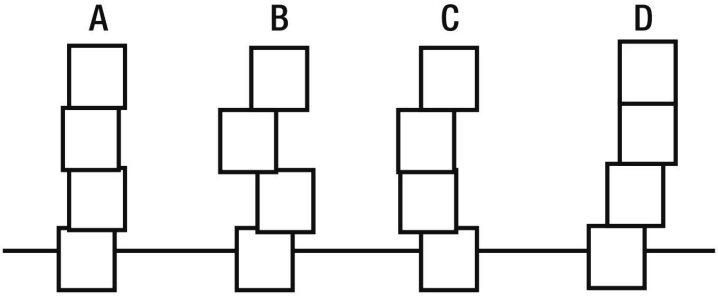
B. B and C will move anti-clockwise.

C. B will move clockwise, and C will move anti-clockwise.

D. B will move anti-clockwise, and C will move clockwise.

Question 20

If weight is placed on the top of each stack of boxes, which stack would support the most weight?



A	B	C	D
Stack A	Stack B	Stack C	Stack D

ANSWERS TO MECHANICAL COMPREHENSION TEST 3

Q1. d

A block and tackle is used to hoist an object upwards by means of rope and pulleys

Q2. a (Man X)

You will see that the object is closer to man Y than man X. Therefore, man X is carrying less weight.

Q3. c

Wheel F and D are the only other wheels which will rotate clockwise.

Q4. c

The working height is 12 metres. The foot of the ladder must be placed 4 metres away from the building. (12 ÷ 3 = 4)

Q5. a

The effort force where the weight is to be applied (where the arrow is pointing) is equal to the resistance weight of the object on the left side of the scales. To work out the mechanical advantage, you can use the following formula: divide the length of the effort by the length of the resistance. So, 32 ÷ 8 = 4. Thus, the mechanical advantage is 4.

Q6. b

The hot air inside a hot air balloon is less dense than the external air.

Q7. a

Balsa wood is the only material here that will float on water.

Q8. c

Water is flowing in at a rate of 18 litres per minute; however, because water is also leaving the tank at a rate of 14 litres per minute, this means that only 4 litres per minute is effectively filling the tank. If the tank has a capacity of 20 litres, then it will take 5 minutes for it to overflow.

Q9. d

In order to calculate the weight required in this type of situation you can make use of the following formula:

- f = (w x d1) ÷ d2
- f = force required w = weight
- d1 = distance 1 d2 = distance 2
- f = (50 x 1) ÷ 2
- (50 ÷ 2 = 25 kg)

Q10. c

It will move left and right as the wheel rotates.

Q11. b

Chain B is the only one which can support the load independently.

Q12. c

Nail C is most likely to pull out first.

Q13. d

Computer screens and television screens are often covered by dust because the dust becomes attracted by the static charges compelling from the technological device. The electrical element of statics can be demonstrated when two objects rub together and become 'electronically charged'. When you remove the dust, you often hear the static electricity 'snapping'.

Q14. c

- m = 1,600 kilograms
- Engine = 4,200 N
- Friction = 300 N
- f = (4,200 - 300) = 3,900 N
- f = ma
- 3,900 = 1,600 x a

- $a = 2.4375\ ms^{-2}$

Q15. b

Lever Y will require more effort to lift the load because the fulcrum is further away from the load than lever X.

Q16. d

The load weighs 420 kgs and there are a total of six sections of rope supporting it. In order to calculate the force required to lift the load, simply divide the weight by the number of ropes in order to reach your answer:

- 420 ÷ 6 = 70 kg

Q17. d

In this scenario the weight is suspended by two pulleys. This means the weight is split equally between the two pulleys. If you want to hold the weight you only have to apply half the weight of the load, i.e. 100 ÷ 2 = 50 kgs.

Q18. a

B will move to the left in this situation.

Q19. a

B and C will move clockwise as the motor wheel moves clockwise.

Q20. a

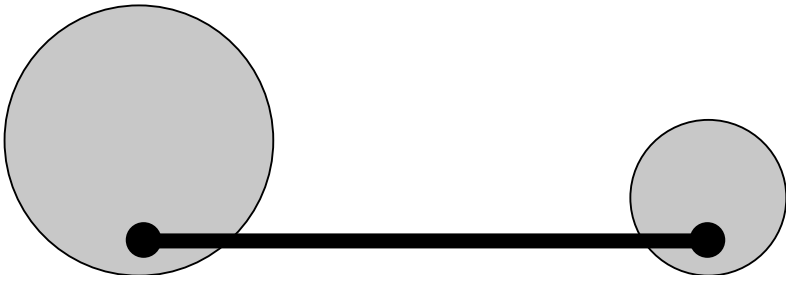
Stack A is the most stable and will therefore support the most weight.

TEST 4

You have 20 minutes to complete this test.

Question 1

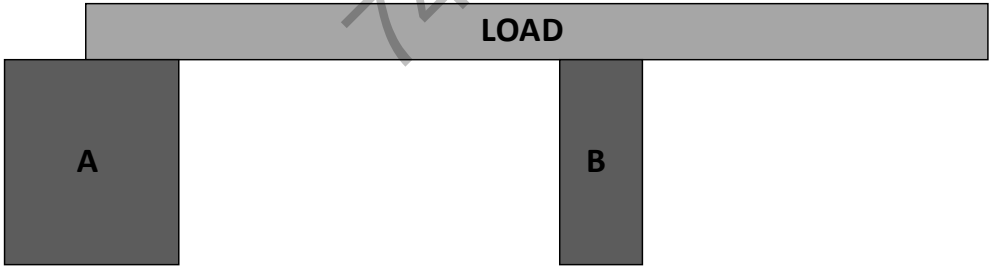
If wheel A turns in an anti-clockwise direction, which way will wheel B turn?



A	B	C	D
Clockwise	Anti-clockwise	Backwards and forwards	It won't move

Question 2

Which post is carrying the least heavy load?

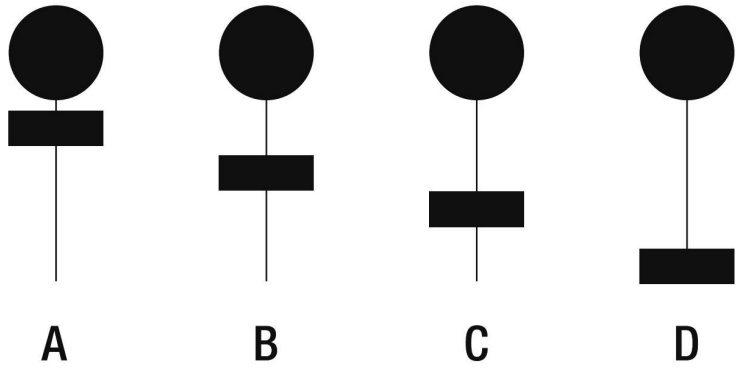


A. Post A

B. Post B

Question 3

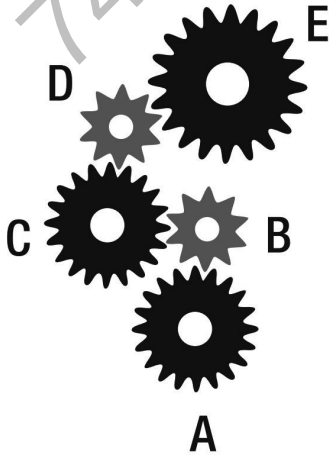
Which pendulum will swing at the fastest speed rate?



A	B	C	D
Pendulum A	Pendulum B	Pendulum C	Pendulum D

Question 4

If Cog B turns clockwise, which of the other cogs will also turn clockwise?



A	B	C	D
Cogs D and C	Cogs A, C and E	Cog D	Cogs D and E

Question 5

The use of an earth-fault loop test is to make sure that...

A. Enough current is passable to open the protective device.

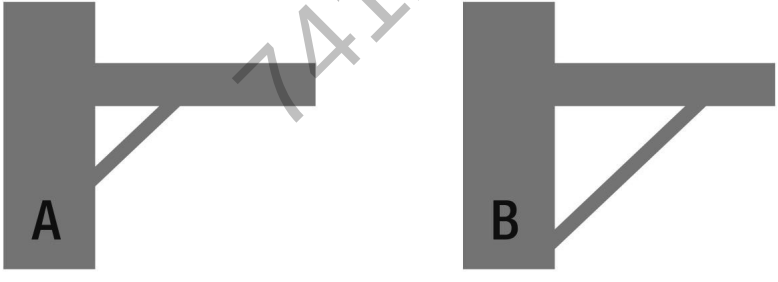
B. No charge can pass through.

C. The voltage through the circuit remains low.

D. The earth wire is connected safely and correctly.

Question 6

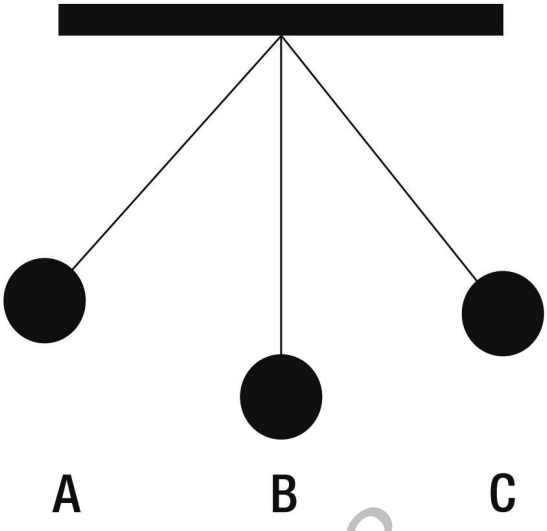
Which shelf will break first when a heavy load is placed on the whole shelf?



A	B	C
Shelf A	Shelf B	Both the same

Question 7

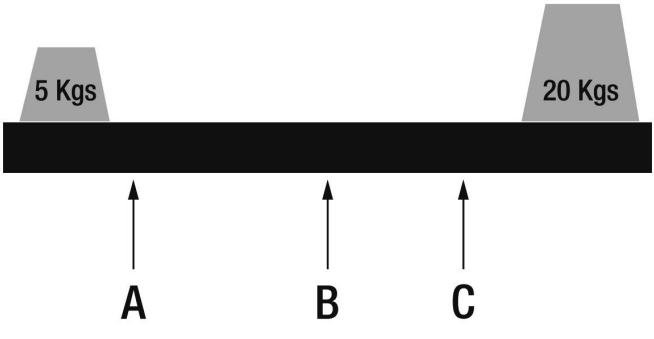
At which point will the pendulum be travelling at the fastest speed?



A	B	C
Point A and C	Point B	Point C

Question 8

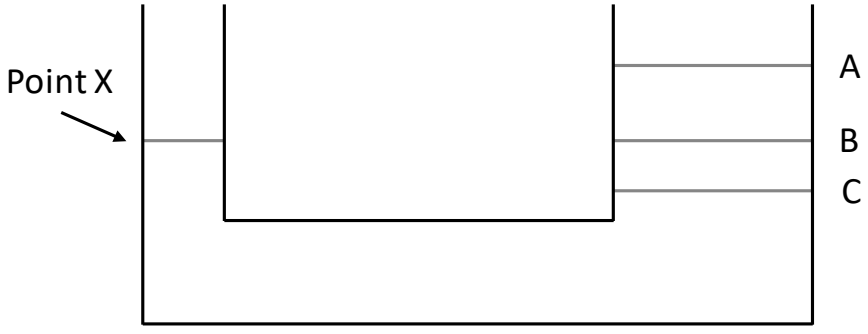
At which point will the beam balance?



A	B	C
Point A	Point B	Point C

Question 9

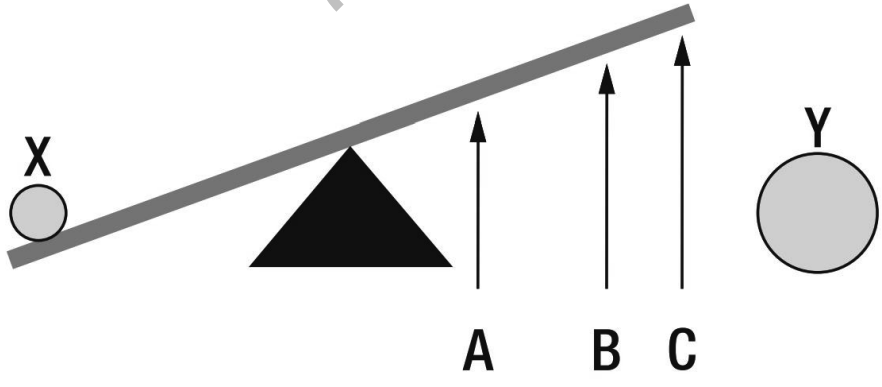
If water is poured into the narrow tube, up to point 'X', what height would it reach in the wide tube?



A	B	C
Point A	Point B	Point C

Question 10

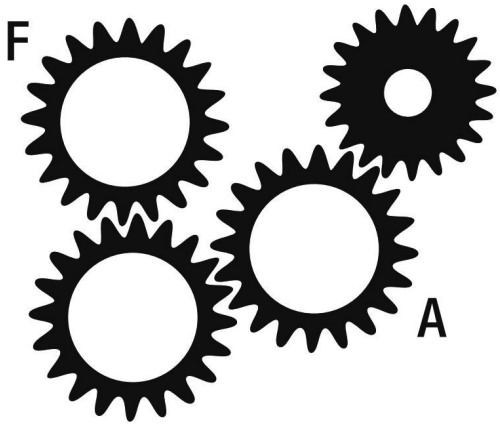
Ball X and Ball Y are both made from the same material. At which point would Ball Y have to be placed to balance Ball X?



A	B	C
Point A	Point B	Point C

Question 11

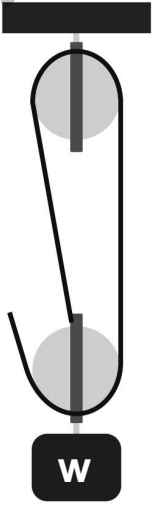
If Cog F rotates clockwise, which way will Cog A turn?



A	B	C
Cannot say	Clockwise	Anti-clockwise

Question 12

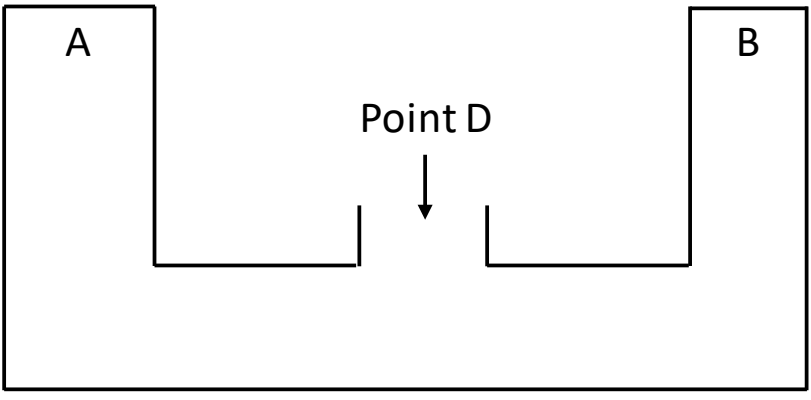
What is the mechanical advantage?



A	B	C	D
1	2	3	4

Question 13

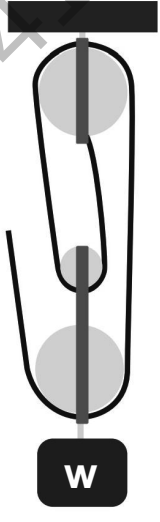
If water is poured in at Point D, which tube will overflow first?



A	B	C
Tube A	Both the same	Tube B

Question 14

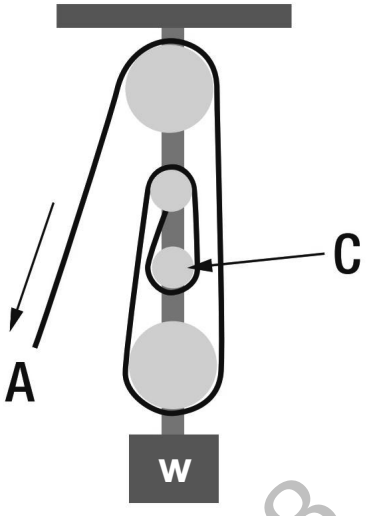
What is the mechanical advantage?



A	B	C	D
1	2	3	4

Question 15

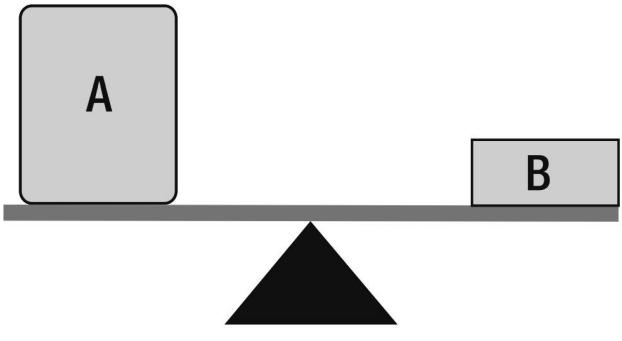
If rope A is pulled in the direction of the arrow, which way will wheel C turn?



A	B	C
Clockwise	Anti-clockwise	It will not turn

Question 16

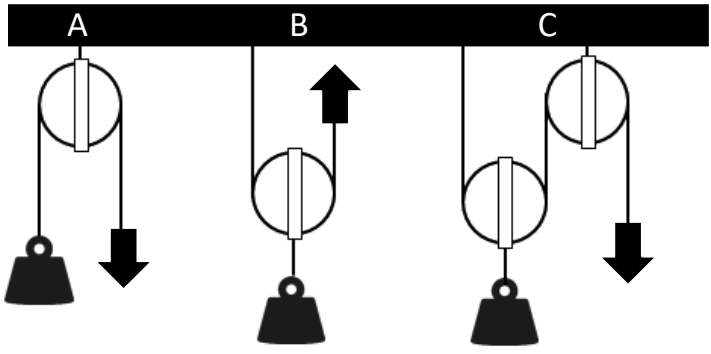
Which load is the heaviest?



A	B	C
Both the same	Load B	Load A

Question 17

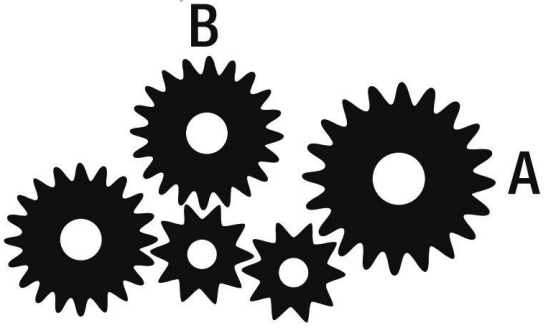
Which pulley system is a moveable pulley system?



A	B	C
Pulley A	Pulley B	Pulley C

Question 18

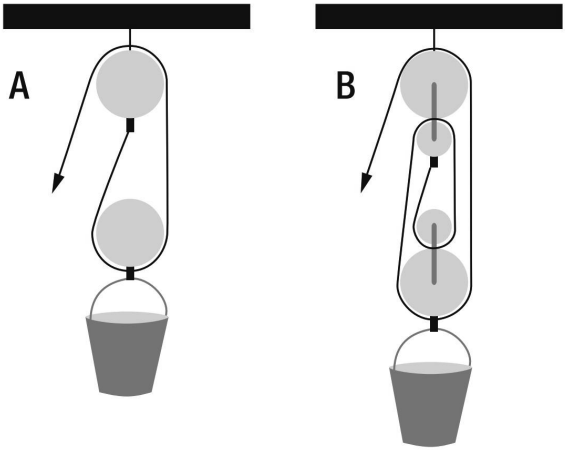
If cog A turns anticlockwise at a speed of 20 rpm (revolutions per minute), how will cog B turn?



A	B	C	D
Clockwise, 20 rpm	Anti-clockwise, 20 rpm	Clockwise, 10 rpm	Anti-clockwise, 10 rpm

Question 19

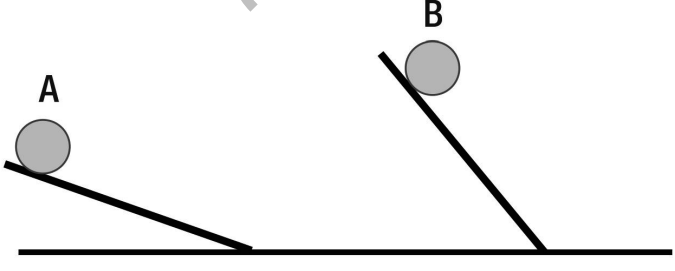
Which pulley system will be the easiest to lift the bucket of water?



A	B	C
Both the same	Pulley A	Pulley B

Question 20

Ball A and B are an identical size and weight. If they are both released at the same time, what will happen?



A. Ball A will reach the ground first.

B. Ball B will reach the ground first.

C. They will both reach the ground at the same time.

ANSWERS TO MECHANICAL COMPREHENSION TEST 4

Q1. b

Because the two wheels are joined they will rotate the same way. If A rotates anticlockwise, wheel B will also.

Q2. a

Post A is carrying the least heavy load as the majority of force is placed on post B.

Q3. a

Pendulum A will swing the fastest speed rate. The lower down the weight, the slower the pendulum will swing.

Q4. c

Cog D is the only other cog which will rotate clockwise.

Q5. a

An earth-fault loop test is used to determine the current so that is is able to flow if an earth fault arises, which allows for the protective device to be opened.

Q6. a

Shelf A will break first, simply because the supporting bar is at a shallower angle than B.

Q7. b

Point B will be the fastest speed. At points A and C the pendulum will be reaching, or have reached, its maximum velocity before falling back down.

Q8. c

In order to balance the beam the point of balance will move closer to the heavier weight. In this case the 20 Kg weight.

Q9. b

The water will rise to the same level on the opposite side as point X.

Q10. a

In order to balance the beam Ball Y will need to be placed closer to the fulcrum point.

Q11. b

Cog A will rotate clockwise.

Q12. c

The mechanical advantage of this pulley system is 3. There are three supporting ropes.

Q13. b

Both entrance and exit points of the container are level, therefore, both will overflow at the same time.

Q14. d

The mechanical advantage of this pulley system is 4. There are four supporting ropes.

Q15. b

Wheel C will rotate anti-clockwise if rope A is pulled in the direction shown.

Q16. a

Both loads are of equal weight. Do not fall in to the trap of thinking load A is heavier simply because it looks larger. The key to answering this question is to look at the balancing bar. You will see that in this case it is level, meaning that both loads weigh the same.

Q17. b

Pulley system B is a moveable pulley system.

Q18. a

Cog B will turn clockwise at a speed of 20 rpm.

Q19. c

Pulley B will be the easiest to lift the load. Pulley A has a mechanical advantage of 2 whereas pulley B has a mechanical advantage of 4.

Q20. b

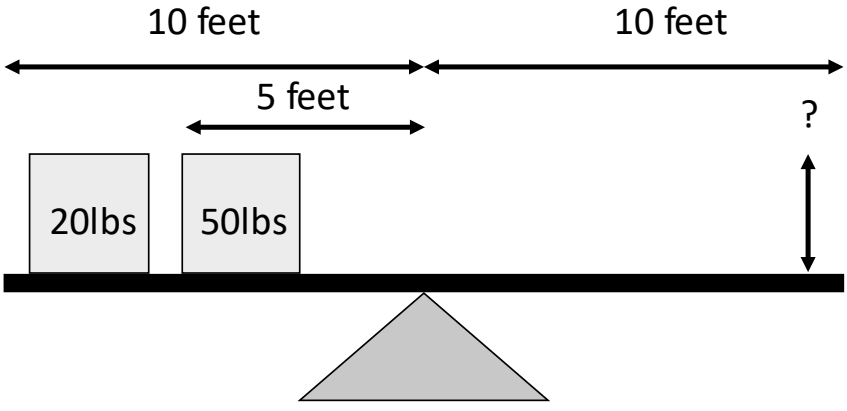
Although the distance each ball has to travel is identical, ball B will hit the ground first because the incline is steeper.

TEST 5

You have 20 minutes to complete this test.

Question 1

How much weight in kg should be placed at the location of question mark to balance the weights?



A	B	C	D
20 lbs	70 lbs	35 lbs	45 lbs

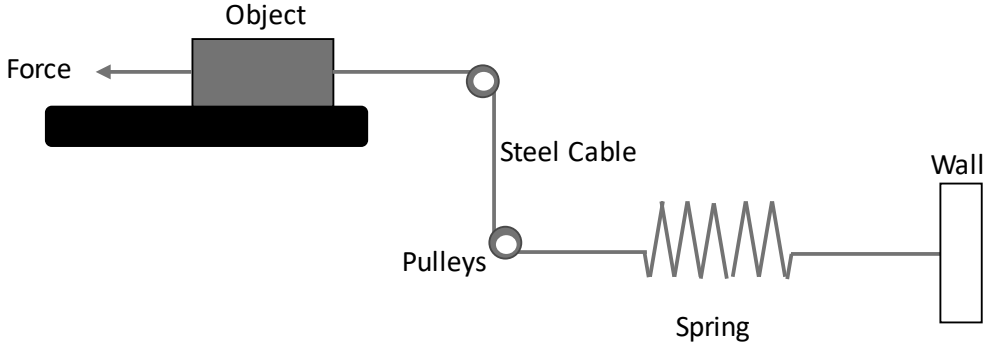
Question 2

What would happen to a balloon full of air, if you were to place it 15 feet below a water surface?

A. The volume of the balloon would increase.
B. The volume of the balloon would stay the same.
C. The balloon would explode.
D. The volume of the balloon would decrease.

Question 3

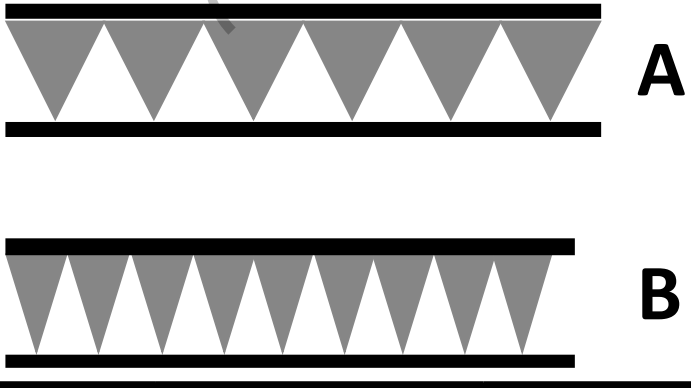
In the diagram, the spring can be stretched 1 inch by a force of 200 pounds. How much force needs to be applied to the object in order to move the object 4.5 inches to the left?



A	B	C	D
900 pounds	450 pounds	800 pounds	90 pounds

Question 4

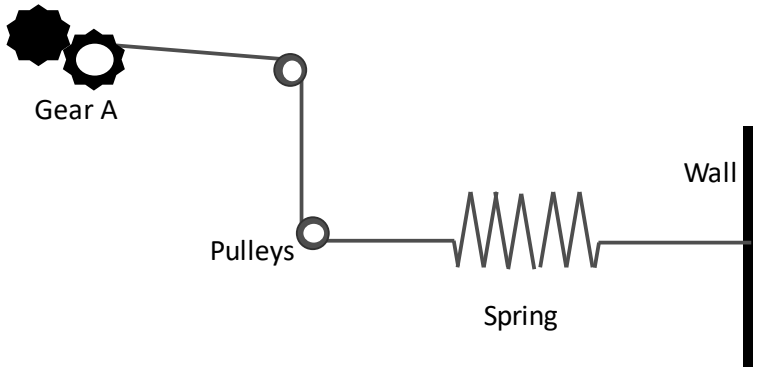
Which type of beam can take the greatest load?



A	B	C
Beam A	Beam B	Both the same

Question 5

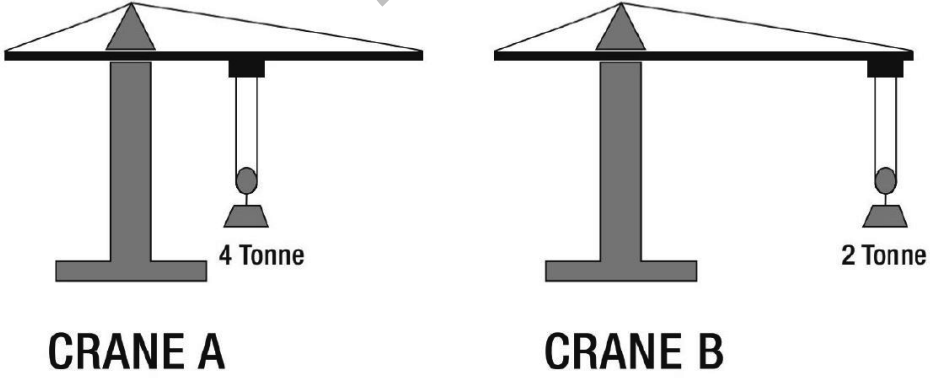
If gear A in the diagram begins spinning clockwise, what will happen to the spring that is attached to the wall?



A	B	C	D
The spring will be compressed	The spring will stretch	The spring will touch the gears	Nothing

Question 6

Which crane is working under the least tension?



A	B	C
Crane A	Crane B	Both the same

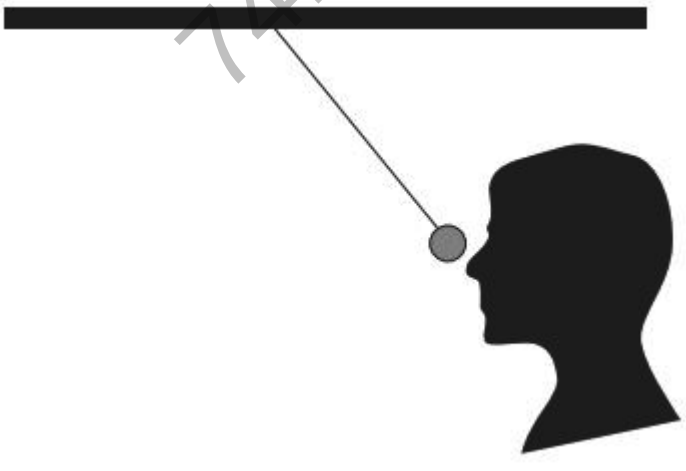
Question 7

Which of the following should be tightened by hand?

A. Bolt
B. Machine screw
C. Wing nut
D. Wood screw

Question 8

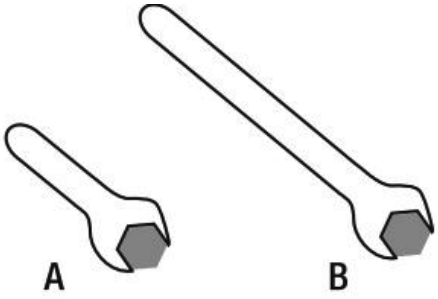
A ball is attached to a piece of string which in turn is secured to a ceiling. The ball and string are then held close to your nose but do not touch it. The ball and string are then released and allowed to swing away from you. When they swing back towards you, will they touch your face if you remain still?



A. Yes
B. No

Question 9

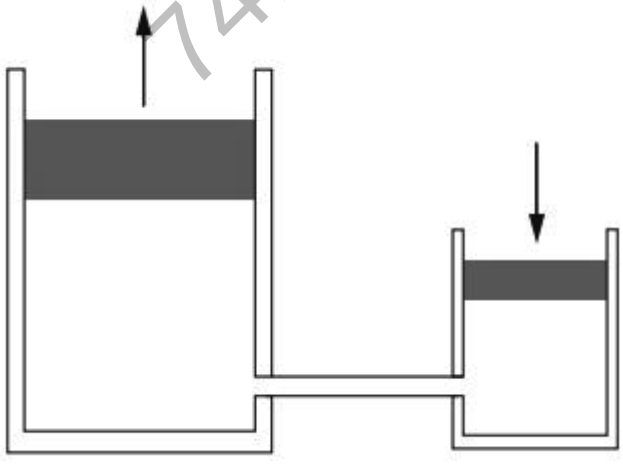
Which spanner will it be harder to tighten the bolt with?



A	B	C
Spanner A	Spanner B	Both the same

Question 10

If the large piston has 4 times the surface area of the small piston, how far must the small piston be pushed down in order to raise the large piston 1cm?



A	B	C	D
0.5cm	1cm	2cm	4cm

Question 11

At what point is the velocity of a bullet fastest?

A. When it leaves the muzzle.

B. When it reaches the top of its arc.

C. When it hits the target.

Question 12

A valve is used to perform which of the following tasks?

A. Control the flow of a liquid.

B. Increase the temperature of a liquid.

C. Facilitate the evaporation of a liquid.

D. Decrease the density of a liquid.

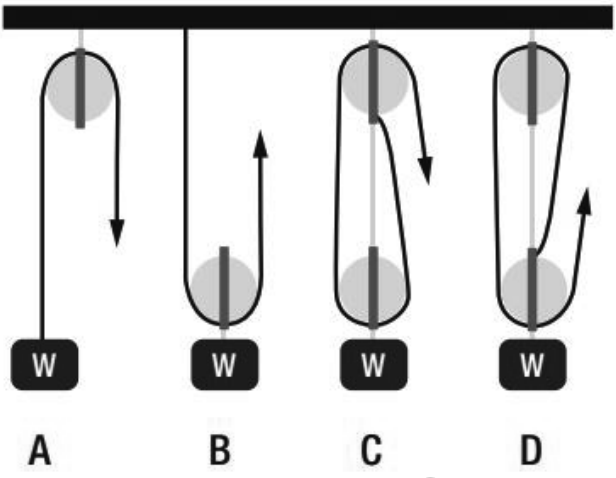
Question 13

A lift is most similar to which of the following mechanical devices?

A	B	C	D
Spring	Hydraulic jet	Lever	Crane

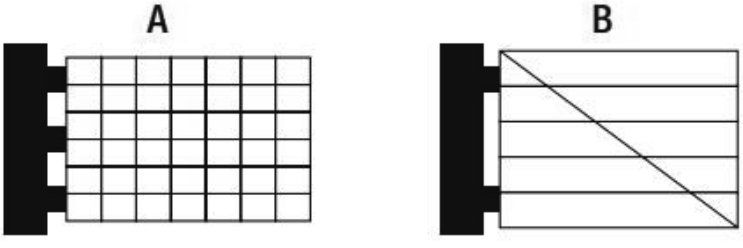
Question 14

Which of the following pulley systems has a mechanical advantage of 3?



Question 15

Which gate is the strongest?



Question 16

A cannonball is fired from a cannon horizontally. At the same time, you drop a cannon ball of the same weight from the same height.

Which will hit the ground first?

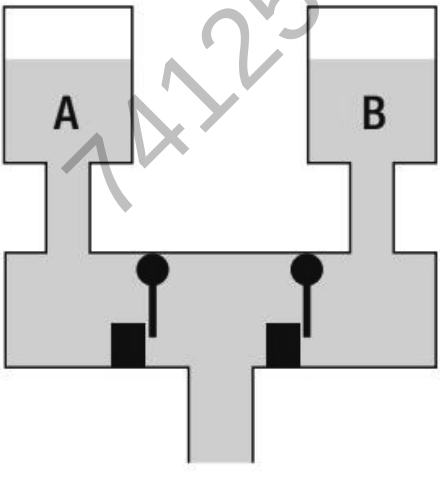
A. Dropped ball

B. Fired ball

C. Both the same

Question 17

Which tank will not empty?



A	B	C
Tank A	Tank B	Both the same

Question 18

If a drawing is not drawn to the full size, the scale of the drawing will be indicated. What does the scale '1:6' indicate?

A. 1 cm on the drawing represents 6 cm on the component.

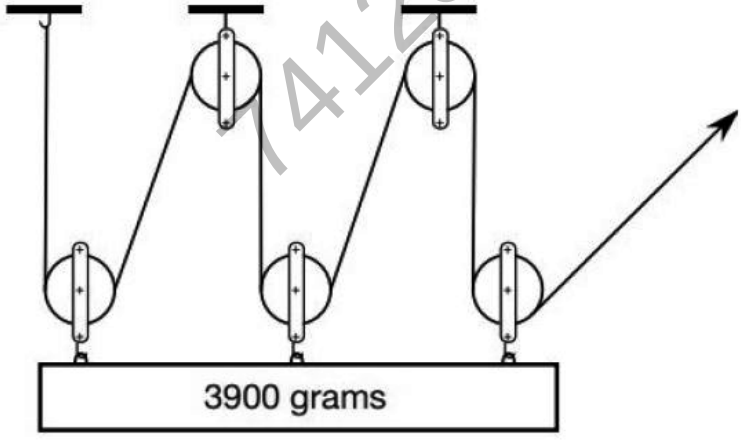
B. 1 cm on the drawing represents 6 metres on the component.

C. 6 cm on the drawing represents 1 cm on the component.

D. The drawing is 6 times the size of the full size drawing.

Question 19

How much force is required to hold the weight in its current position?



A	B	C	D
800 g	23,400 g	500 g	650 g

Question 20

What transfers from a carpet made from nylon to give off a static electrical shock?

A	B	C	D
Nucleus	Protons	Electrons	Atoms

ANSWERS TO MECHANICAL COMPREHENSION TEST 5

Q1. d

f = (20 x 10) + (50 x 5) ÷ 10

f = (200) + (250) ÷ 10

f = 450 ÷ 10 = 45 lbs

Q2. d

If you were to place a balloon full of air 15 feet under a water surface, the volume of the balloon would decrease. According to Boyle's Law, the pressure on the balloon from the water would press inwards, and therefore it would cause the balloon to shrink in size and subsequently decrease the volume of the balloon.

Q3. a

4.5 x 200 = 900 pounds

Q4. a

Beam A is the strongest because each triangular section covers a greater surface area.

Q5. a

If the gears moved in a clockwise manner, that means the cable connecting everything together is going to move right (towards the wall), and so the spring will be compressed.

Q6. c

They are both under the same tension. Although the weight lifted by crane A is double that of crane B, the distance between the weight and the centre of gravity is equal for both crane A and crane B.

Q7. c

A wing nut should be tightened by hand.

Q8. b

They will not touch your face because there is insufficient speed or force for the ball to travel further than the point of origin.

Q9. a

Spanner A will be harder to tighten the bolt with, simply because the smaller handle creates less leverage.

Q10. d

Because the larger piston is 4 times the surface area, the smaller piston will need to pushed down 4cm in order to move the large piston 1cm.

Q11. a

The bullet will be fastest when it leaves the muzzle. Thereafter, the velocity will decrease due to drag.

Q12. a

A valve is used to control the flow of liquid.

Q13. d

A crane is similar to a lift in terms of mechanical function.

Q14. d

Pulley system D has a mechanical advantage of 3.

Q15. a

Gate A is the strongest simply because there are more strengthening points in the construction of the gate. There are also three supporting hinges as opposed to two on gate B.

Q16. c

They will both hit the ground at the same time.

Q17. b

Tank B will not empty because the valve will not permit water to flow past it.

Q18. a

Engineering drawings work in centimetres. That means, for every 1cm that is drawn, this would equate to 6cm in terms of actual size.

Q19. d

The weight of the object is 3,900 grams (39 kg). There are 6 sections supporting the weight.

3,900 ÷ 6 = 650 grams

Q20. c

Electrons are transferred from a nylon carpet to give off a static electrical charge. Protons remain in the nucleus and cannot be transferred.

TEST 6

You have 20 minutes to complete this test.

Question 1

Which of the statements below defines Pascal's Law?

A. The pressure at the bottom of a container.

B. The amplification of force in a hydraulic system.

C. The mechanical advantage of a pulley system.

D. The flow of liquid from one container to another.

Question 2

LEDs are being used more and more. What logical explanation can be used to determine why this might be?

A. They have a higher resistance.

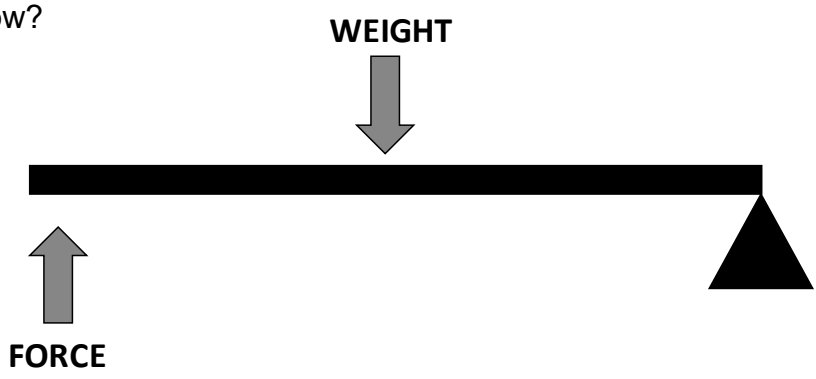
B. They require a higher voltage.

C. They are more eco-friendly.

D. They provide a smaller current.

Question 3

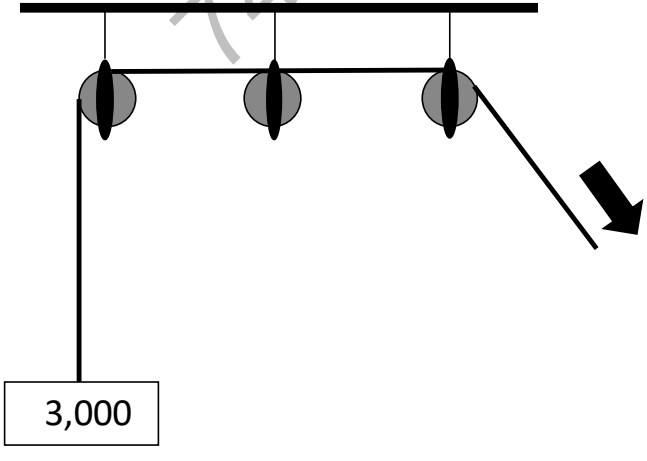
Which of the following best describes the type of machine shown below?



A	B	C	D
Third-class lever	First-class lever	Pulley system	Second-class lever

Question 4

In order to lift the 3,000-pound weight, approximately how many pounds would you need to pull down with?



A	B	C	D
1,000	500	3,000	50

Question 5

Which of the following best describes the reason why birds are able to stand on high voltage electrical power lines?

A. The potential difference between the bird's feet is high.

B. They are aware of the power lines that are 'live', and those that are not.

C. Birds are an insulator.

D. They have complete resistance to the voltage.

E. The potential difference between the bird's feet is low.

Question 6

Imagine this scenario. You live at one end of the city. A huge thunderstorm is heading your way. Lightning strikes at the other end of the city.

What do you think would experience first: hearing the thunder or seeing the lightning?

A. See the lightning.

B. Hear the thunder.

C. See and hear at the same time.

Question 7

_____ are a form of wasteful circulation currents which are observed in iron cores, which result in loss of energy.

A. Core currents

B. Hysteresis currents

C. Neutral currents

D. Eddy currents

Question 8

The opposite of a current flow in an alternating current resistive circuit is…

A	B	C	D
Resistance	Impedance	Reactance	Inductance

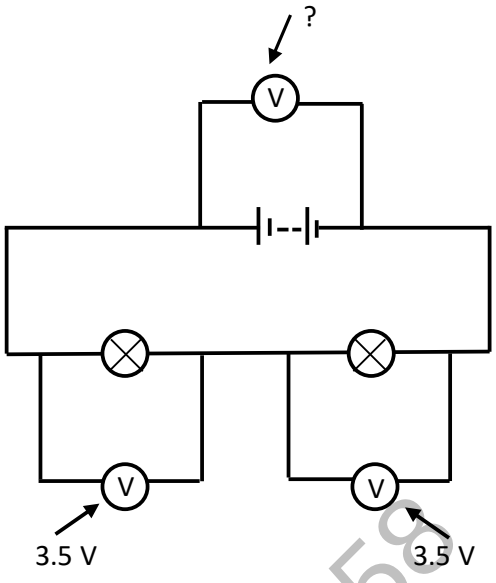
Question 9

If a person uses 500 Newtons of force across a distance of 150 metres, how many Joules of work is performed?

A	B	C	D
20	1,000	75,000	7,000

Question 10

What is the voltage across the battery?



A	B	C	D
3.5V	12.25V	7V	1.25V

Question 11

When an aeroplane is being refuelled, to avoid causing a spark which could build up from static charge…

A. The person pouring in the fuel needs to pour it in slowly.

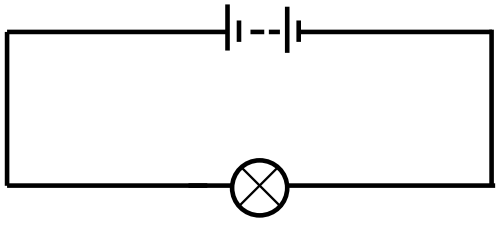
B. The aeroplane has rubber tyres which insulates the charges.

C. The refuelling tank and the aeroplane itself are earthed.

D. The person pouring in the fuel needs to pour it in fast.

Question 12

The battery shown below has an output of 4 volts. The lightbulb glows moderately. If we were to replace the 4 volt battery with a 2 volt battery, what will happen to the light?



A. The lightbulb will shine brighter.

B. The lightbulb will shine more dimer.

C. The lightbulb will have the same level of brightness.

D. The lightbulb will go out.

Question 13

When a cloth is rubbed against an object made of copper, no charge happens because…

A. Copper is a conductor.

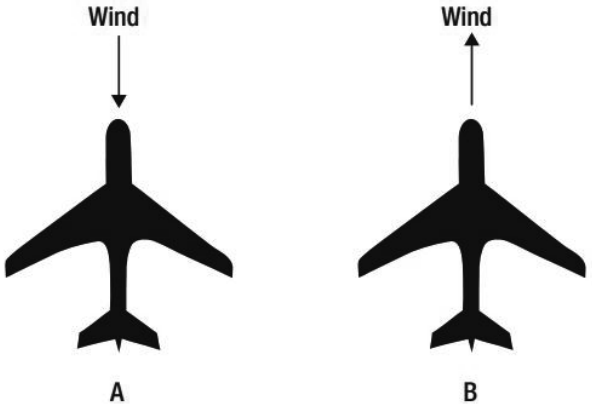
B. Copper is an insulator.

C. The cloth is not electronically charged.

D. It is a brittle metal.

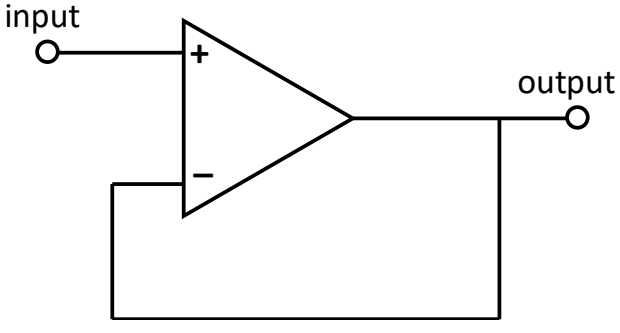
Question 14

Which direction should the wind blow in order for the plane to take off with the shortest runway?



Question 15

In the following circuit, identify what the symbol is representing.



A	B	C	D
DC amplifiers	Differential amplifiers	Voltage follower	Current amplifier

Question 16

Michael wants to connect an electrolytic capacitor in a circuit. An electrolytic capacitor is a type of capacitor that generates larger capacitance by using electrolytes. Michael is a professor in physics. He knows the important relationship of connecting an electrolytic capacitor in the correct polarity. Out of the following explanations, which best describes the probable result if an electrolytic capacitor is connected with the wrong polarity?

A. The capacitance will decrease.

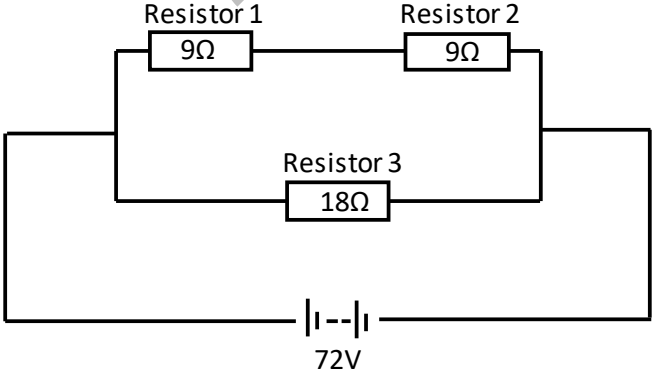
B. The capacitor will burst.

C. The capacitance will increase.

D. There will be no noticeable effect.

Question 17

The total current flowing through the circuit below is…



A	B	C	D
4A	8A	16A	18A

Question 18

If electricity costs 8p per unit and a 6 kW appliance runs for approximately 75 minutes, what is the total cost?

A	B	C	D
£3,600	£9.80	£48.00	£36.00

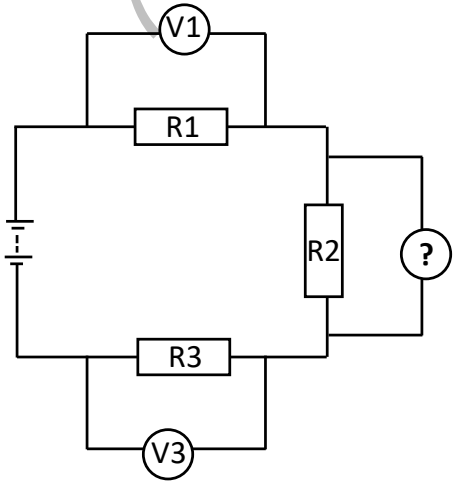
Question 19

Fossil fuels are a useful way to generate power. Which of the following is NOT needed in order to produce electrical power from a fossil fuel?

A	B	C	D
Heat	Steam	Dam	Turbine

Question 20

The diagram below shows three resistors R1, R2 and R3, connected to a 27V battery. What is the potential drop across R2, if voltmeter V1 reads 6A and V3 reads 3A?



A	B	C	D
6A	9A	18A	27A

ANSWERS TO MECHANICAL COMPREHENSION TEST 6

Q1. b

One of the principles of a hydraulic system is when pressure is applied to liquid which means the pressure is even throughout. The force is amplified within a hydraulic system.

Q2. d

LEDs, also known as light emitting diodes, are becoming increasingly used due to them using a smaller current.

Q3. d

The image shows a second-class lever. This is similar to the function of a wheel barrow, whereby one side of the object remains on the ground and the other side is raised into the air.

Q4. c

In order to pull down the weight, you would need 3,000-pounds. This is because there is only 1 supporting rope, meaning 3,000 ÷ 1 = 3,000

Q5. e

A charge can only flow between the objects if an electrical potential difference has been established. If a bird places a foot on the line and then places its other foot a few centimetres away, there is little or no difference in its potential, and therefore has no charge which makes the bird landing on the line safe.

Q6. a

Light travels at a faster speed than sound. Therefore, you will see the lightning before hearing the thunder.

Q7. d

Eddy currents lose energy due to the changes in magnetic fields in a conductor or core.

Q8. A

The definition of the opposite of a current flow in an alternating current restrictive circuit is resistance.

Q9. c

The term 'work' is defined as the force in the direction of disreplacement. If a force is used over 150 metres, the number of Joules would be 500 x 150 = 75,000

Q10. c

The circuit contains two elements that share the voltage. Therefore, the overall voltage of the battery is as follows: 3.5 + 3.5 = 7V.

Q11. c

When a tank of an aeroplane is being refuelled, the refuelling tank and the aeroplane are earthed. A bonding line is used to earth the aeroplane before it is refuelled, in order to ensure that it is safe to add fuel to the aircraft's tank.

Q12. b

If we replaced a 4 volt battery with a 2 volt battery, this means that the lightbulb in the circuit will shine more dimly. This is because a 2 volt battery only provides half as much energy as the 4 volt battery. Therefore, the lamp will convert less heat and light because there is not as much energy passing through the circuit as before.

Q13. a

Copper is a material that is a conductor, and therefore does not permit any electrical charge.

Q14. a

In order to take-off with the shortest runway the aircraft will require a head wind.

Q15. c

A voltage follower is an operational amplifier which has the voltage gain of 1. The output voltage directly follows the input voltage, meaning that the output voltage will be the same as the input voltage. It provides no amplification to the voltage, hence the reason it is often referred to as

a ‘voltage follower’.

Q16. b

If an electrolytic capacitor is connected with the incorrect polarity, it is likely that the capacitor will burst. A polarised element in a circuit needs to be connected correctly in order for the circuit to function. The component might have several pins which can only be connected to a circuit in one direction. If it is connected otherwise, this will likely cause the capacitor to smoke, swell or burst.

Q17. b

In order to work out the total current, you should use the following equations:

$$\frac{1}{R} = \frac{1}{R1+2} + \frac{1}{R3} = \frac{1}{18} + \frac{1}{18} = \frac{2}{18}$$

So, 18 ÷ 2 = 9.

72V ÷ 9 = 8A

Q18. d

In order to work out the cost, you will need to use the following equation: power × time × cost per unit = 6 × 75 × 8 = 3600p, or £36.00.

Q19. c

A dam does not produce electrical power. They are used to produce power from water.

Q20. c

To work out the potential drop across resistor 2, you should use the following method:

R1 + R3 = 6 + 3 = 9.

27 – 9 = 18A.

AN INTRODUCTION TO FAULT DIAGNOSIS

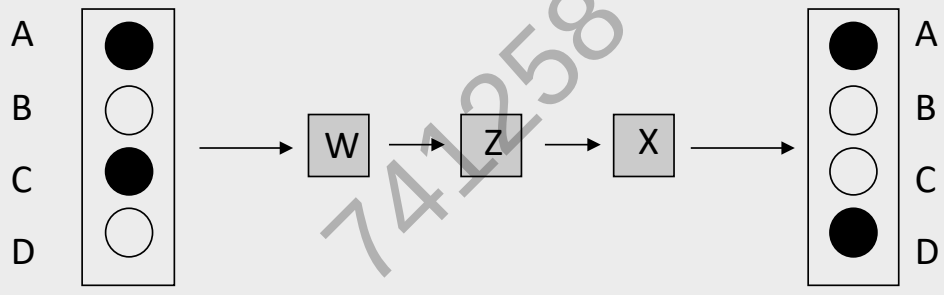
Checking tests, or fault finding diagnosis tests, are more commonly used during assessments for careers that require high levels of technical or mechanical competency.

You will normally be required to assess different dials or switches in order to identify where a particular fault lies. Alternatively, you may be required to use 'priority checking tables' to assist you during the analysis stage.

In the following question, you have to identify which of the switches is not working. The box on the left side contains four circles, each labelled A, B, C and D. A key to the switches and the function in which they perform is detailed below.

FAULT DIAGNOSIS PART 1

Which switch in the sequence is not working?



SWITCH	FUNCTION OF THE SWITCH
W	Turns A and C on/off i.e. Black to white and vice versa
X	Turns B and D on/off i.e. Black to white and vice versa
Y	Turns C and D on/off i.e. Black to white and vice versa
Z	Turns A and D on/off i.e. Black to white and vice versa

EXPLANATION

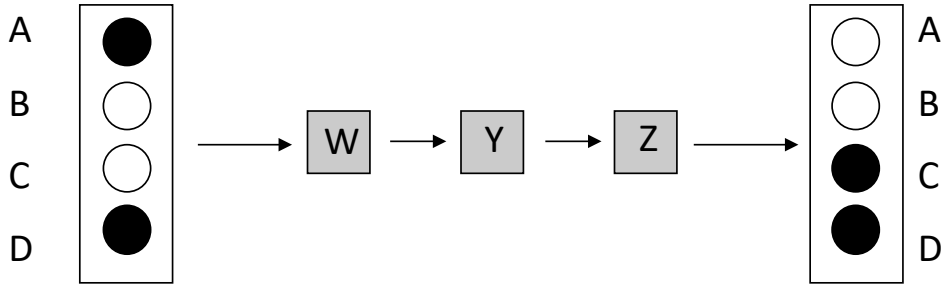
You will notice that the box on the left side contains black circles A and C, and white circled B and D at the start of the sequence. The first switch to operate is ‘W’, which has the effect of turning circles A and C from black to white, and vice versa. Once switch ‘W’ operates, the lights on the left will all be white.

The next switch to operate is switch Z, which has the effect of turning circles A and D from black to white and vice versa. Because the circles contained within the box on the left side are all white after the operation of switch W, this now means that circles A and D are black, and circles B and C are white.

You will notice that the box with the four circles located on the right side is now identical to this, which means that the next switch, switch X must be inoperative. If it was working correctly, then the box of circles on the right side would look different. Therefore, the correct answer to the question is Switch X.

Practice Question 1

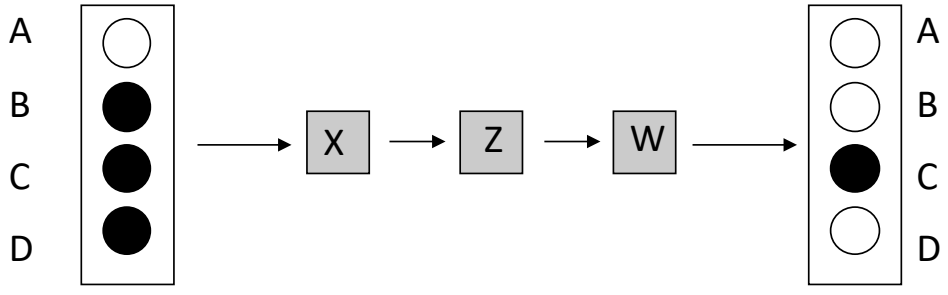
Which switch in the sequence is not working?



SWITCH	FUNCTION OF THE SWITCH
W	Turns A and C on/off i.e. Black to white and vice versa
Y	Turns C and D on/off i.e. Black to white and vice versa
Z	Turns A and D on/off i.e. Black to white and vice versa

Practice Question 2

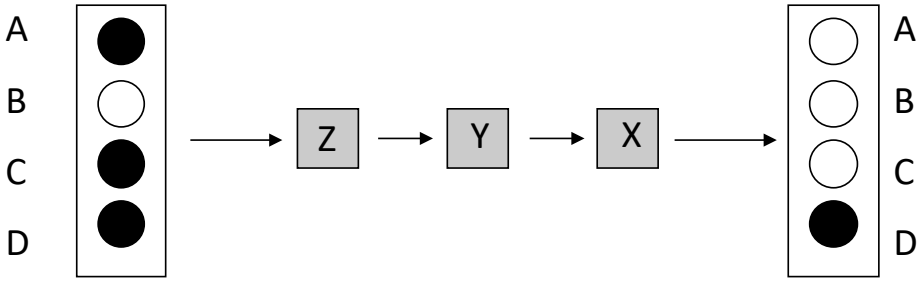
Which switch in the sequence is not working?



SWITCH	FUNCTION OF THE SWITCH
W	Turns A and C on/off i.e. Black to white and vice versa
X	Turns B and D on/off i.e. Black to white and vice versa
Z	Turns A and D on/off i.e. Black to white and vice versa

Practice Question 3

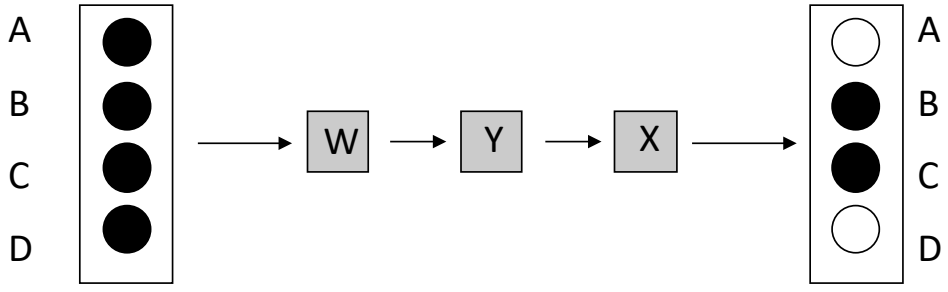
Which switch in the sequence is not working?



SWITCH	FUNCTION OF THE SWITCH
X	Turns B and D on/off i.e. Black to white and vice versa
Y	Turns C and D on/off i.e. Black to white and vice versa
Z	Turns A and D on/off i.e. Black to white and vice versa

Practice Question 4

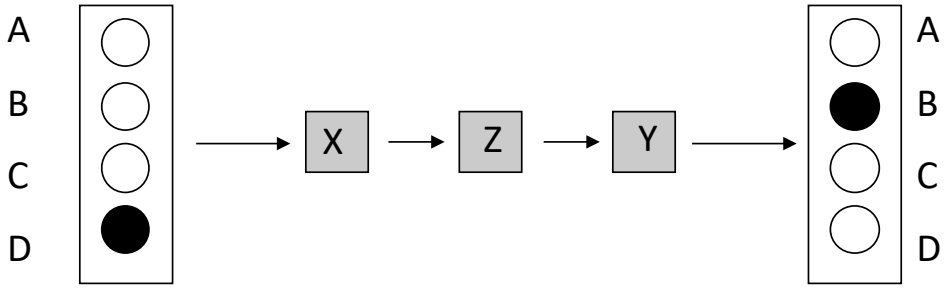
Which switch in the sequence is not working?



SWITCH	FUNCTION OF THE SWITCH
W	Turns A and C on/off i.e. Black to white and vice versa
X	Turns B and D on/off i.e. Black to white and vice versa
Y	Turns C and D on/off i.e. Black to white and vice versa

Practice Question 5

Which switch in the sequence is not working?



SWITCH	FUNCTION OF THE SWITCH
X	Turns B and D on/off i.e. Black to white and vice versa
Y	Turns C and D on/off i.e. Black to white and vice versa
Z	Turns A and D on/off i.e. Black to white and vice versa

ANSWERS TO FAULT ANALYSIS (PART 1)

Q1. Switch Y

EXPLANATION = the first switch to operate is 'W', which has the effect of turning circles A and C from black to white, and vice versa. Once switch 'W' operates, circles C and D will be black. You will notice that the box on the right side is now identical to this, which means the next switch, switch Y, must be inoperative.

Q2. Switch Z

EXPLANATION = the first switch to operate is 'X', which has the effect of turning circles B and D from black to white, and vice versa. Once switch 'X' operates, circle B changes from black to white, and circle D changes from black to white. (This gives you the image on the right). You will notice that the box on the right side is now identical to this, which means the next switch, switch Z, must be inoperative.

Q3. Switch X

EXPLANATION = the first switch to operate is 'Z', which has the effect of turning circles A and D from black to white, and vice versa. Once switch 'Z' operates, only circle C will be black. The next switch to operate is switch Y, which has the effect of turning circles C and D from black to white and vice versa. Once switch Y operates, only circle D will be black. You will notice that the box on the right side is now identical to this, which means the next switch, switch X, must be inoperative.

Q4. Switch X

EXPLANATION = the first switch to operate is 'W', which has the effect of turning circles A and C from black to white, and vice versa. Once switch 'W' operates, only circles B and D will be black. The next switch to operate is switch Y, which has the effect of turning circles C and D from black to white, and vice versa. Once switch Y operates, only circles B and C will be black. You will notice that the box on the right side is now identical to this, which means the next switch, switch X, must be inoperative.

Q5. Switch Z

EXPLANATION = the first switch to operate is 'X', which has the effect of turning circles B and D from black to white, and vice versa. Once

switch ‘X’ operates, only circle B will be black. You will notice that the box on the right side is now identical to this, which means the next switch, switch Z, must me inoperative.

FAULT DIAGNOSIS PART 2

In order to answer the following questions, you must become familiar with the structure and format. You will need to apply rules and instructions to the questions in order to assess the error that is present. During these practice questions, you will be given a set of diagrams for which you need to find the errors, using the Error Code Chart provided. The Error Code Chart are the codes that you will need to use to answer all of the questions.

The Error Code Chart will remain the same throughout the test, and is shown below:

Error Code Chart

Front Tyre	Rear Tyre	Brake Pads	Lights
FT	RT	BP	L

You will then be given 5 questions based on an Error Reference Chart. This will need to be used and remembered to determine which errors the bicycles have. The bicycles may have one or more errors. You will be able to work out the errors based on the reference codes and whether they are the same. If the bicycle does not have the same reference code, then there is an error.

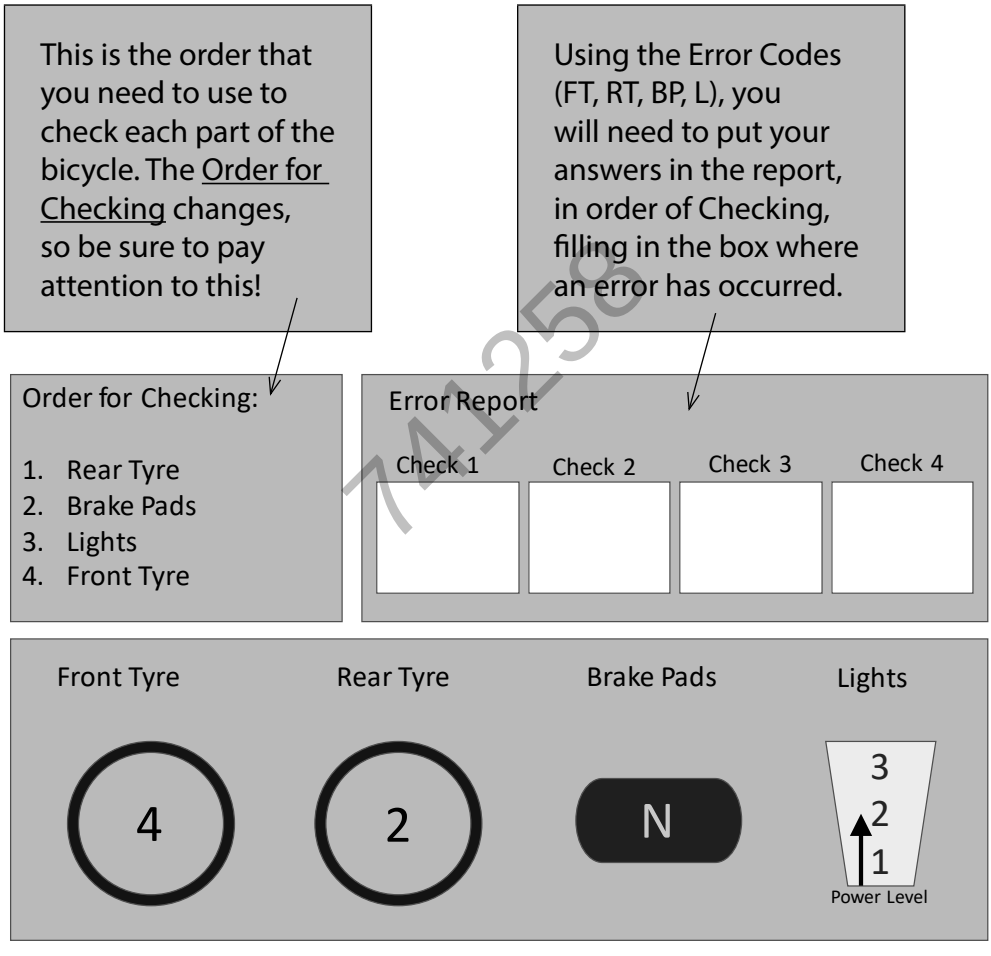
Error Reference Chart

Front Tyre	Rear Tyre	Brake Pads	Lights
4	3	N	3 2 1 Power Level

The Error Reference Chart is formulated above.

Using the Error Reference Chart, you must place the correct error code for each question. For Each Reference Chart, it will contain 5 questions. You will need to work out where the errors lie in the diagram.

Using the above Error Reference Chart, and using the Error Codes, find the error in the following diagram.



This set of diagrams need to be analysed carefully. You will have been given a Reference Chart to study before the question. Your task is to use that Reference Chart and cross-reference any errors in this set of diagrams. If a reference is different in the question, compared to that found on the Reference Chart, that means there is an error, and you would need to write it in the correct box in your report.

EXPLANATION

Error Report			
Check 1	Check 2	Check 3	Check 4
RT	—	L	—

- For Check 1, using the order for checking, you need to check the Rear Tyre. Using the Reference Chart, the Rear Tyre is referenced '3', whereas in the question it is referenced '2'. This shows an error, because the references do not match. Therefore, you would need to write RT in the Check 1 box.
- For Check 2, using the order for checking, you would need to check the Brake Pads. Using the Reference Chart, the Brake Pads are referenced 'N'; in the question, the Brake Pads are also referenced 'N', therefore shows no error. In order to mark no error in the box', simply put a line through the box.
- For Check 3, using the order for checking, you would need to check the Lights. Using the Reference Chart, the Lights are referenced with the power '1-3'; in the question the Lights are only powered to '2'. This shows an error, because the references do not match. Therefore, you would to write L in the Check 3 box.
- For Check 4, using the order for checking, you would need to check the Front Tyre. Using the Reference Chart, the Front Tyre is referenced '4;' in the question, the Front Tyre is also referenced '4'. This shows no error, and you should draw a line through the box, indicating that there is no error.

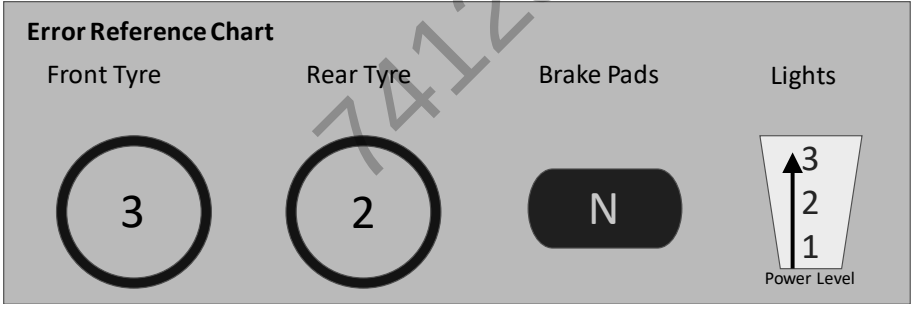
Using the above system, work through the questions as quickly and as effectively as you can. Remember, the point of these types of questions is to measure speed, as well as accuracy.

Make sure that you read all the information on the Reference Chart, before attempting to answer the six questions that relate. For each question, it is vitally important that you check what order you need to assess first. You will lose easy marks for lack of attention to detail.

Error Code Chart

Front Tyre	Rear Tyre	Brake Pads	Lights
FT	RT	BP	L

The above Chart is a reminder of the Error Codes that you will need to insert into the Error Report for each error you find.



For the next 5 questions, use the above Error Reference Chart to determine which errors the bicycle have. If the bicycle does not have the same reference, then there is an error.

Only enter a code if there is an error present! If an error is not present, draw a line through the box. .

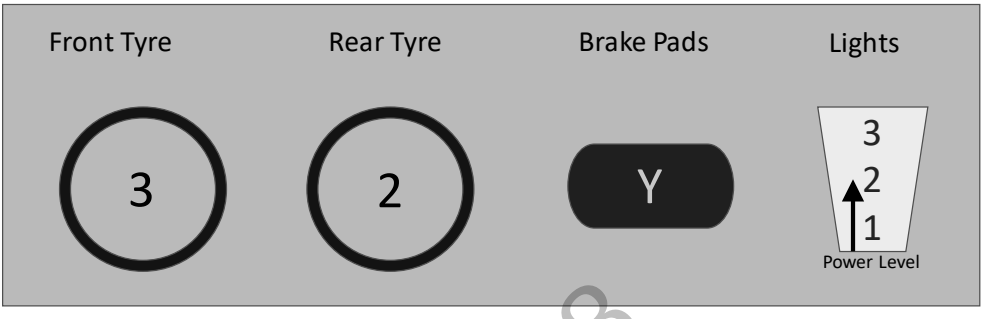
Question 1

Order for Checking:

1. Rear Tyre
2. Brake Pads
3. Lights
4. Front Tyre

Error Report

Check 1	Check 2	Check 3	Check 4



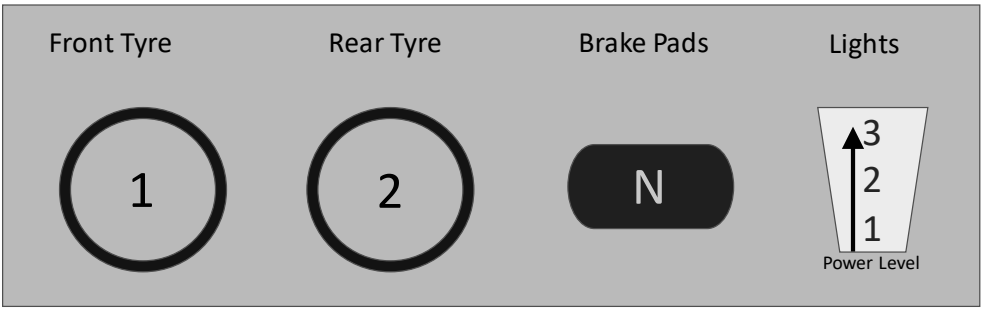
Question 2

Order for Checking:

1. Brake Pads
2. Rear Tyre
3. Lights
4. Front Tyre

Error Report

Check 1	Check 2	Check 3	Check 4



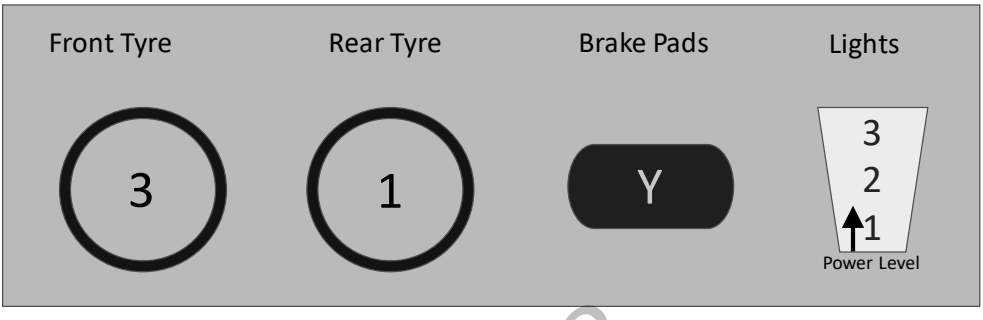
Question 3

Order for Checking:

1. Brake Pads
2. Front Tyre
3. Rear Tyre
4. Lights

Error Report

Check 1	Check 2	Check 3	Check 4



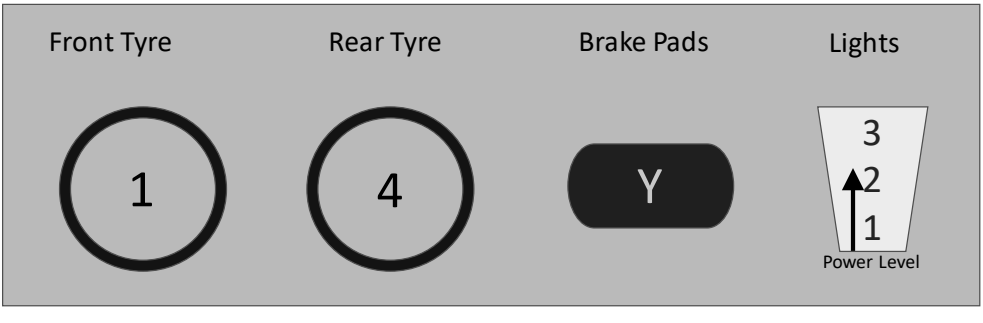
Question 4

Order for Checking:

1. Lights
2. Front Tyre
3. Rear Tyre
4. Brake Pads

Error Report

Check 1	Check 2	Check 3	Check 4



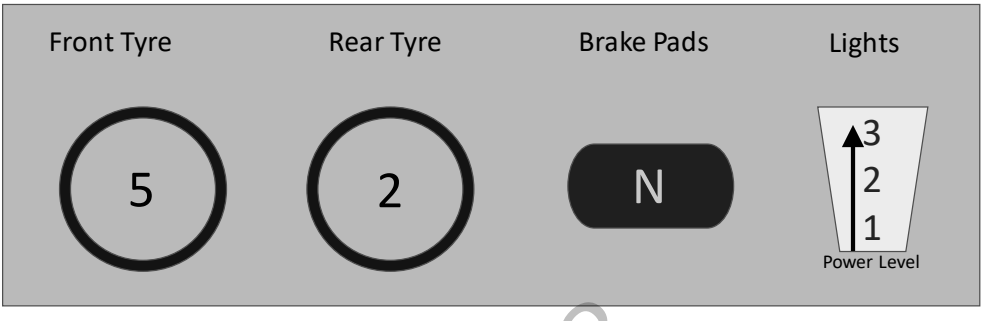
Question 5

Order for Checking:

1. Rear Tyre
2. Lights
3. Front Tyre
4. Brake Pads

Error Report

Check 1	Check 2	Check 3	Check 4



ANSWERS TO FAULT ANALYSIS (PART 2)

Q1.

Error Report			
Check 1	Check 2	Check 3	Check 4
—	BP	L	—

Q2.

Error Report			
Check 1	Check 2	Check 3	Check 4
—	—	—	FT

Q3.

Error Report			
Check 1	Check 2	Check 3	Check 4
BP	—	RT	L

Q4.

Error Report			
Check 1	Check 2	Check 3	Check 4
L	FT	RT	BP

Q5.

Error Report			
Check 1	Check 2	Check 3	Check 4
—	—	FT	—

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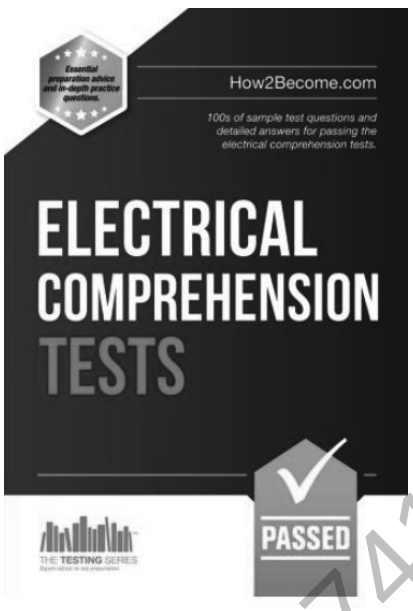

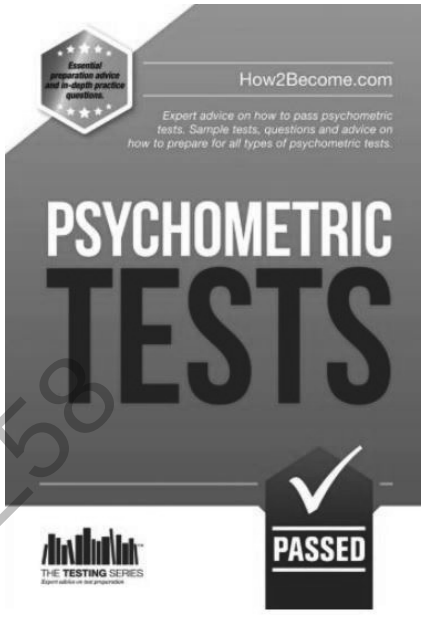

Each guide is packed full of examples and practice questions, to ensure that you make the most out of your revision time and can aim to achieve 100%!

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