

Defence Aptitude Assessment Mechanical Comprehension

30 Practice Questions with Answers and Explanations

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1. Calculate the work done in the below action.

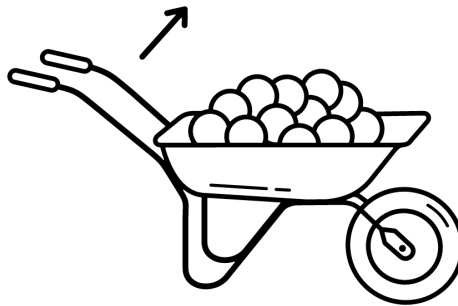
15N moves a box 4 metres.

2. A vacuum cleaner uses 45,000 J of energy in 2.5 minutes. What is the power rating of the vacuum cleaner?

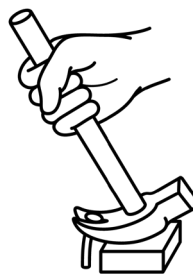
3. Which of the following is not a type of motion?

- a) Rotary
- b) Reciprocating
- c) Oscillating
- d) Magnetic

4. A wheelbarrow is an example of a second-class lever. Which component of the lever does the arrow represent?



5. Which type of lever is illustrated below?



- a) First-class
- b) Second-class
- c) Third-class
- d) All of the above

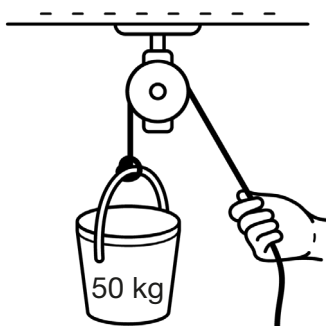
6. A liquid exerts a force of 350 N over an area which is 5 m². What is the pressure on the surface?

7. What is the spring constant in the following situation? A spring stretches reversibly by 25 cm when a force of 6 N is applied.

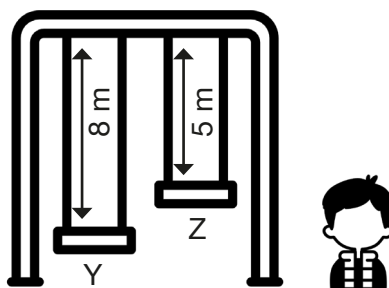
12. Which tool is used for setting and adjusting the tightness of nuts and bolts?

- a) Curved-nose pliers
- b) Phillips screwdriver
- c) Calipers
- d) Torque wrench

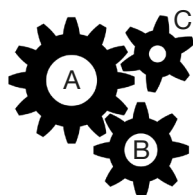
13. How much force is required to lift the bucket?



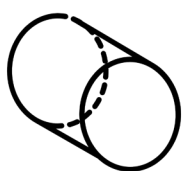
14. Which swing should the child to use to gain the fastest speed?



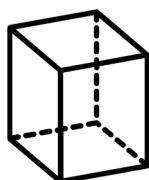
15. How many revolutions will Cog B make if Cog A makes two full revolutions?



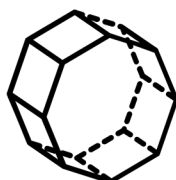
16. Which shape would be hardest to push over?



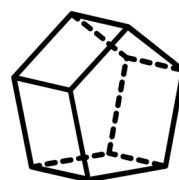
A



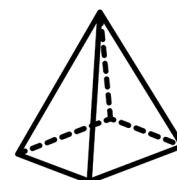
B



C

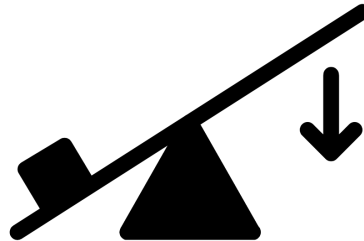


D



E

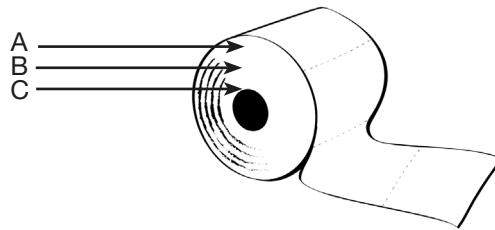
17. If a 12 kg weight is placed 5 metres from the fulcrum to balance the beam, what is the mass of the box if it is 3 metres from the fulcrum?



18. How is momentum measured?

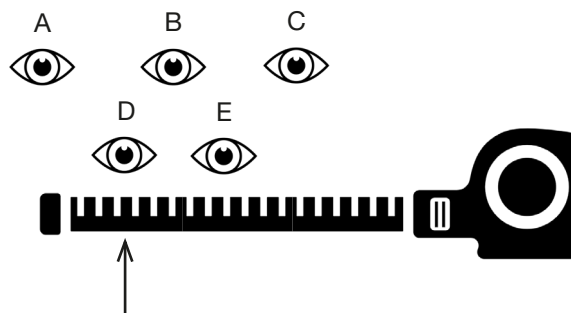
- a) $N \times kg$
- b) m / s
- c) $kg \times \pi^2$
- d) kg / ms

19. When a piece of kitchen roll is pulled, which part of the roll will rotate the fastest?

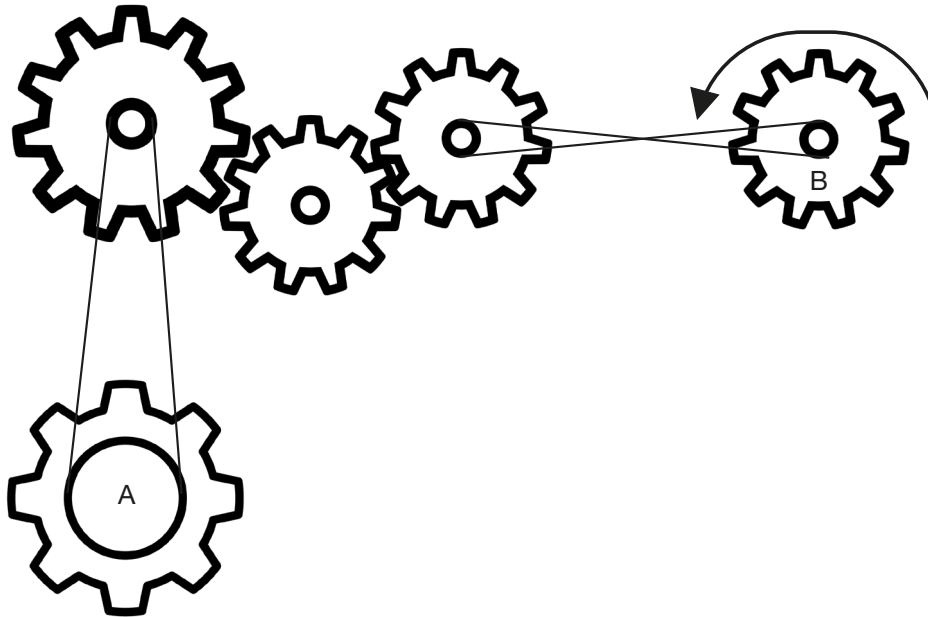


- a) A
- b) B
- c) C
- d) They will rotate at the same speed.

20. Which position would provide the least margin for error when noting the measurement marked by the arrow?

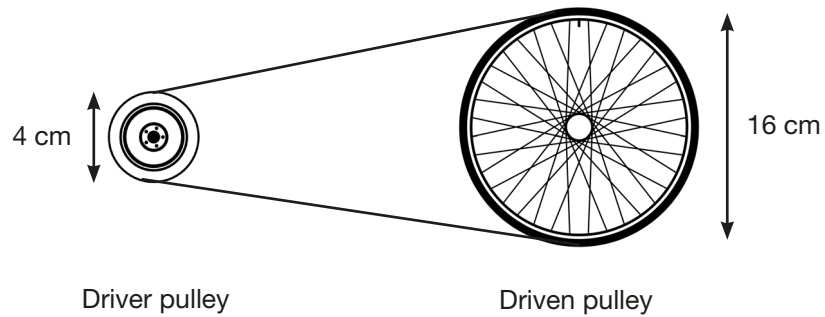


21. Which direction will Cog A rotate if Cog B rotates in the direction shown?

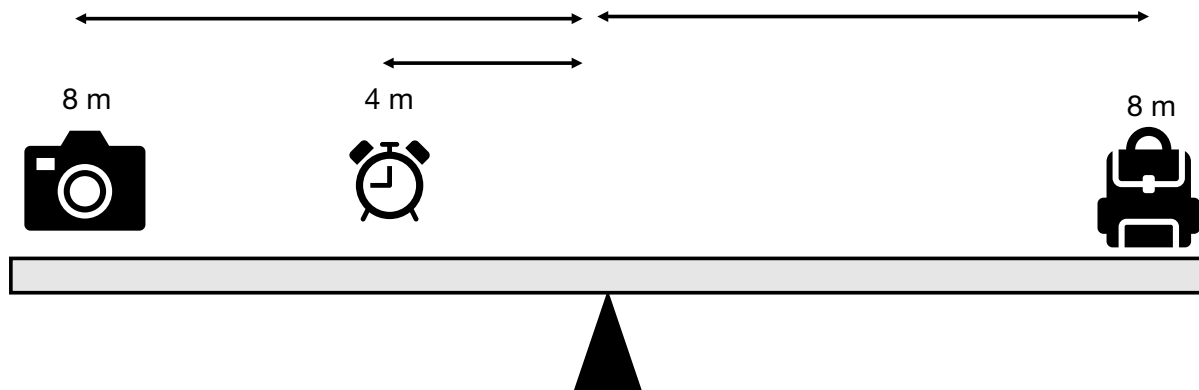


22. What is the output speed of the driven pulley on the below belt system?

Input speed = 500 rpm



23. The camera weighs 5 kg and the clock weighs 2.5 kg. What is the weight of the rucksack if the beam is balanced?



24. Which of the following has the highest boiling point?

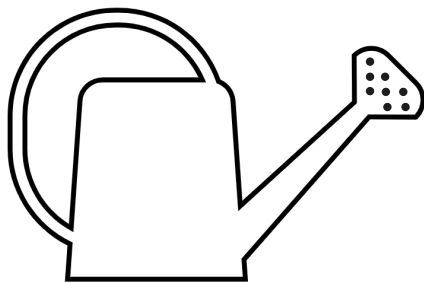
- a) Ethanol (79 °C)
- b) Water (100 °C)
- c) Nitrogen (-195.8 °C)
- d) Petroleum (210°C)

25. Which tool is shown?

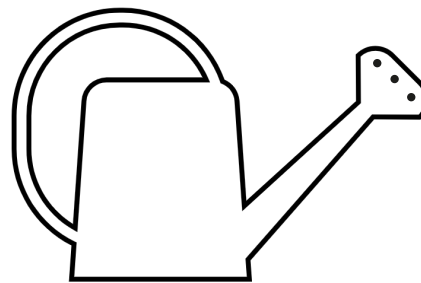
- a) Allen key
- b) Socket Wrench
- c) Callipers
- d) Box wrench



26. When poured from the same angle, which watering can would empty first?

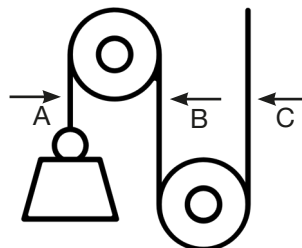


A



B

27. The rope in this pulley system does not stretch. Which part of the rope has the highest tension applied?

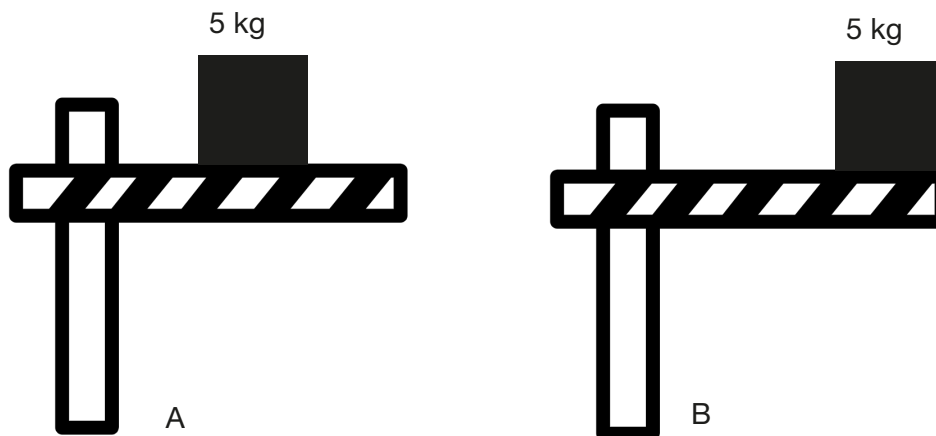


- a) A
- b) B
- c) C
- d) All parts of the rope have equal tension applied.

28. If a tennis ball is dropped vertically 5 metres, and an identical tennis ball is thrown horizontally from the same height, which ball will land on the ground first assuming air resistance is negligible?

- a) The tennis ball which was dropped.
- b) The tennis ball which was thrown horizontally.
- c) Both tennis balls will land at the same time.
- d) Impossible to know from the information provided.

29. Which load will be easier to lift?



30. What is the mechanical advantage of the fixed pulley system?

- a) None
- b) One
- c) Two
- d) Three



Answers

1. 60 N
 $15 \times 4 = 60$
2. 300W
 $45,000 \div 150 = 300$
3. d)
 The four types of motion are: rotary, reciprocating, oscillating, and linear.
4. Effort
 The wheel is the pivot.
 The contents of the wheelbarrow is the load.
 The handles (being lifted) is the effort.
5. a) First-class lever
 The order of a first-class lever is: Effort - Fulcrum - Load
6. 70 Pa

$$P = \frac{F}{A}$$

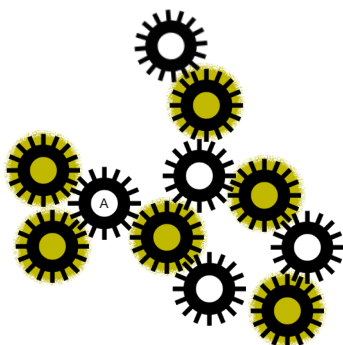
$$P = \frac{350}{5}$$

$$P = 70 Pa$$
7. 0.025 N/m
 $F = k \times e$

$$k = \frac{F}{e}$$

$$k = \frac{6}{0.025}$$

$$k = 240 N / m$$
8. 37.5 N
 $45 \times 2.5 = 112.5$
 $112.5 \div 3 = 37.5$
9. c) 33,000 kg m/s
 Momentum = mass \times velocity
 Momentum = 1,100 \times 33 = 33,000 kg m/s
10. 6
 The highlighted cogs will rotate anti-clockwise when cog A rotates clockwise.



11. b) Carburetor
Carburetors and fuel injection are two different systems that deliver fuel and air to the combustion chamber. A vehicle will use one or the other, but never both.
12. d) Torque wrench
A torque wrench is used to apply a specific torque to fasteners like nuts and bolts.
13. 50 kg
The pulley system only has one supporting rope so the mechanical advantage is one.
14. Z
Swings act as pendulums, and as longer pendulums swing with a lower frequency than shorter pendulums they have a longer period.
 $T = 2\pi\sqrt{l/g}$,
 $T = 6.28 \times \sqrt{(8 / 9.8)}$
 $T = 5.67$
 $T = 6.28 \times \sqrt{(5 / 9.8)}$
 $T = 4.48$
15. 3 revolutions
 $12 \times 2 = 24$
 $24 \div 8 = 3$
16. E
17. 20 kg
 $12 \times 5 = 60$
 $60 \div 3 = 20$
18. d) kg / ms
Momentum is measured in kilogram meters per second
19. d) They will rotate at the same speed.
20. D
The most accurate reading will be taken from an angle close to the measurement.
21. Clockwise
22. 125 rpm
Output speed = input speed \div velocity ratio
Velocity ratio = $16 \div 4$
Velocity ratio = 4
Output speed = $500 \div 4 = 125$ rpm
23. 6.25 kg
 $(8 \times 5) + (4 \times 2.5) = 50$
 $50 \div 8 = 6.25$
24. d) Petroleum
Ethanol: 79°C
Water: 100°C
Nitrogen: -196°C
Petroleum: 210°C
25. b) Socket wrench
26. A

27. d) All parts of the rope have equal tension applied.
As the rope does not stretch all parts will have equal tension forces acting on it.
28. c) Both tennis balls will land at the same time.
The force of gravity will bring both tennis balls to the ground at the same speed so, whilst they will be far apart, they will land at the same time.
29. A
The closer the load is to the fulcrum the easier the load is to lift.
30. a) None
The fixed pulley does not have any supporting ropes so there is no mechanical advantage.