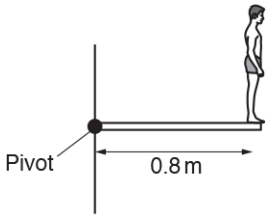
Forces in Action (H)

1. A diver stands on a diving board. He weighs 400 N.

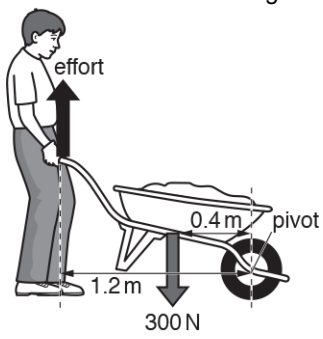


What is the moment of the force provided by the diver around the pivot?

A 320 Nm anti-clockwise
B 320 Nm clockwise
C 500 Nm anti-clockwise
D 500 Nm clockwise

Your answer ☐ **[1]**

2. A man lifts a load using a wheelbarrow.



What is the effort needed to lift the load using the wheelbarrow?

A 100 N
B 120 N
C 250 N
D 144 N

Your answer ☐ **[1]**

3. Which one of the following uses of forces causes a rotation?

A Lowering a book vertically from a shelf
B Opening a door
C Lifting a book vertically onto a shelf
D Sitting in the centre of a see-saw

Your answer ☐ **[1]**

4. On the Moon, a 10 kg mass has a weight of 16 N.

What is the gravitational field strength on the Moon?

A 1.6 N / kg
B 6.0 N / kg
C 26 N / kg
D 160 N / kg

Your answer ☐ **[1]**

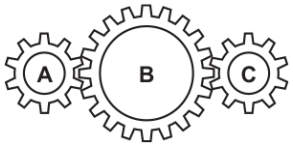
5. Which object has the **most** gravitational potential energy?

A 1 kg bag on a shelf 1 m above the ground
B 2 kg bag on a shelf 1 m above the ground
C 2 kg bag on a shelf 2 m above the ground
D 1 kg bag on a shelf 2 m above the ground

Your answer ☐ **[1]**

6. A student investigates cogs and gears.

Cogs **A** and **C** have 10 teeth. Cog **B** has 20 teeth.



Cog **A** is turned 5 times.

How many times does cog **C** turn?

A 5 times
B 10 times
C 20 times
D 50 times

Your answer ☐ **[1]**

7. A spring stretches by 2.0 cm when a force is added.

The spring constant is 60 N / m.

Calculate the energy transferred to the spring when it is stretched.

A 0.012 J
B 0.024 J
C 120 J
D 240 J

Your answer ☐ **[1]**

8. An elephant has a weight of 60 kN. Its four feet have a total area of 0.75 m^2 in contact with the ground.

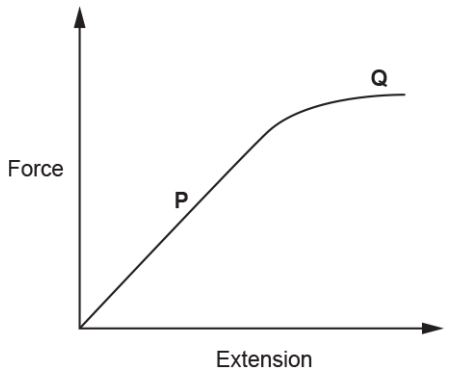
Calculate the total pressure the elephant exerts on the ground.

Use the equation: pressure = force normal to a surface / area of that surface

A 45 Pa
B 80 Pa
C 45 000 Pa
D 80 000 Pa

Your answer ☐ **[1]**

9. A student plots a force-extension graph for a material.



Which row in the table correctly identifies part **P** and part **Q** of the graph?

	Part P	**Part Q**
A	Elastic	Elastic
B	Elastic	Plastic
C	Plastic	Elastic
D	Plastic	Plastic

Your answer ☐ **[1]**

10. An astronaut on the Moon lifts a 5.5 kg object a vertical distance of 50 cm.

Calculate the potential energy gained by the object.

Gravitational field strength on the Moon = 1.6 N / kg.

A 4.4 J
B 8.8 J
C 17.6 J
D 440 J

Your answer ☐ **[1]**

11. A boy kicks a football.

The football has a mass of 400 g.

What is the potential energy of the football when it is 0.8 m above the ground?

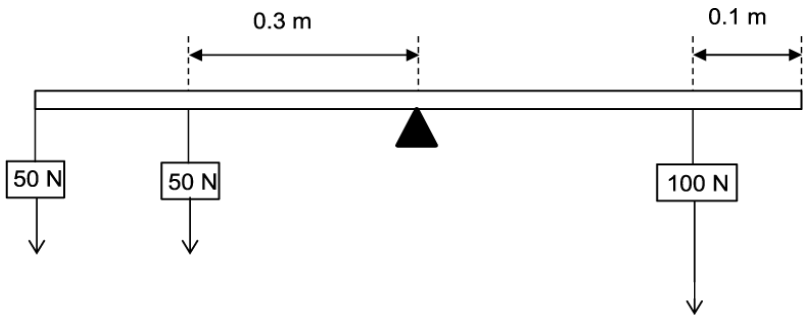
Use the constant: gravitational field strength (g) = 10 N/kg.

A. 0.032 J
B. 3.2 J
C. 320 J
D. 3 200 J

Your answer ☐

[1]

12. A uniform 1.0 m rod is pivoted at its centre.



The rod is in equilibrium.

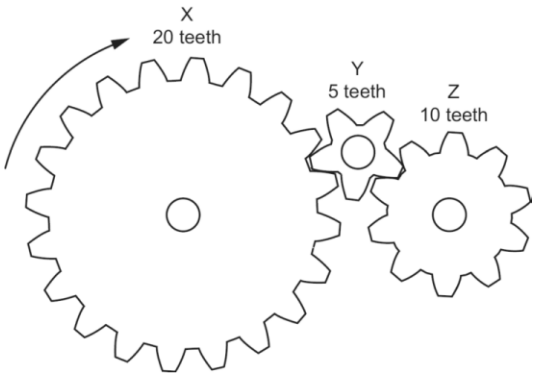
What is the value of the anti-clockwise moment about the pivot?

A. 10 Nm
B. 15 Nm
C. 40 Nm
D. 100 Nm

Your answer ☐

[1]

13. The diagram shows 3 gears.



Gear **X** is rotated clockwise at 1.0 rotations per second.

Which row is the correct description of the movement of gear **Z**?

	direction of rotation	rotations per second
A	anticlockwise	0.5
B	anticlockwise	2.0
C	clockwise	0.5
D	clockwise	2.0

Your answer ☐

[1]

14. How much work is done on a spring, of spring constant 16 N/m, when it is stretched 50 cm?

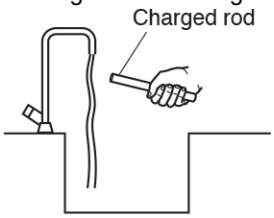
A. 2.0 J
B. 8.0 J
C. 12.5 J
D. 25.0 J

Your answer ☐

[1]

15. This question is about electrostatic charges.

A charged rod is brought towards a gentle stream of water from a tap.



Explain how the charged rod affects the stream of water.

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[3]

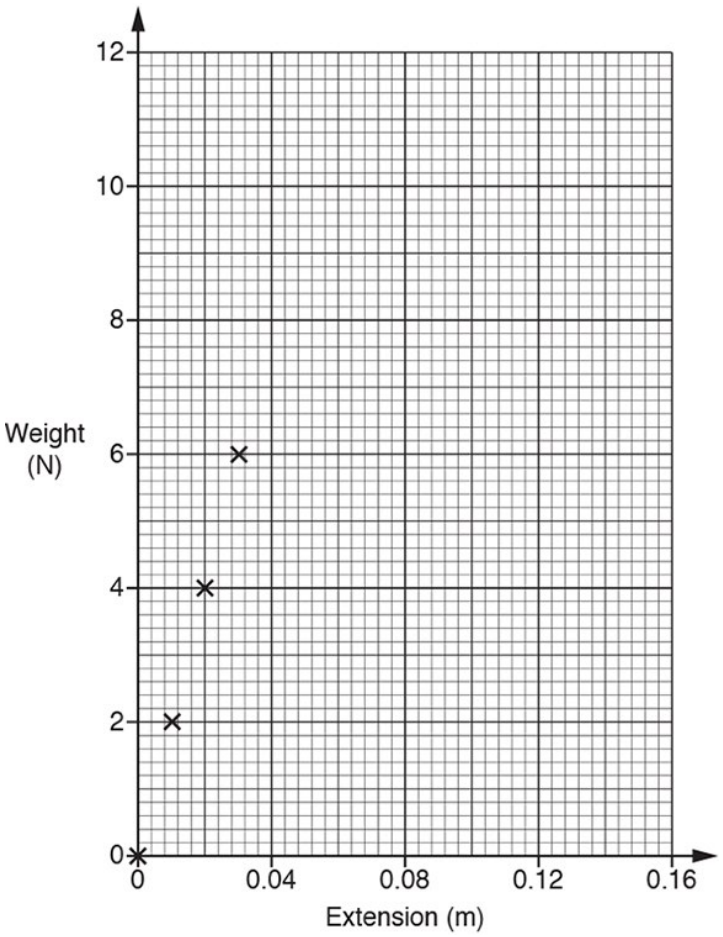
16 (a). A student hangs a length of copper wire from the ceiling.

She adds weights to the bottom of the wire and measures the extension of the wire.

Look at a table of some of her results.

Weight (N)	Extension (m)
0	0
2	0.01
4	0.02
6	0.03
8	0.04
10	0.08
12	0.16

i. Plot the values on the graph. Some have been done for you.



[2]

ii. Draw a line of best-fit on the graph.

[1]

iii. Describe **and** explain the shape of the graph.

_____

_____

_____

_____ **[3]**

(b). Calculate the spring constant for the 0 – 6 N part of the graph.

Use the equation: Force = Spring constant × Extension

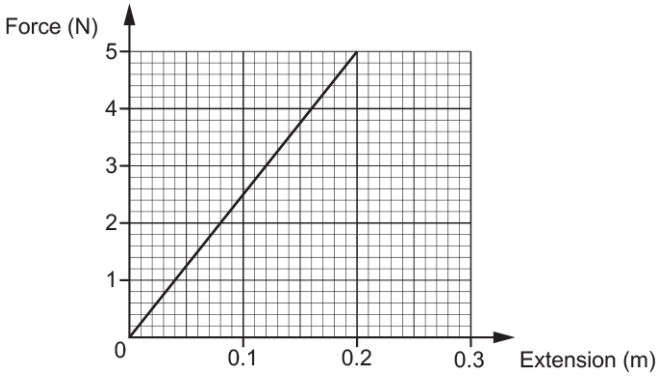
Answer = ... N/m **[3]**

(c). Calculate the work done in stretching the wire to 0.04 m.

Answer = ... J **[2]**

17 (a). A student investigates how a spring stretches when a force is added.

Look at a graph of his results.



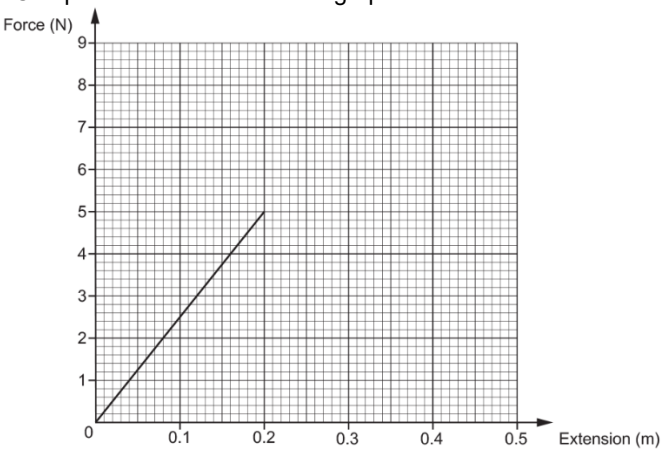
Calculate the spring constant of the spring.

Spring constant = ... N / m **[3]**

(b). A student investigates how a spring stretches when a force is added.

The student continues to load the spring until it passes its elastic limit.

Complete the force-extension graph and label the elastic limit.



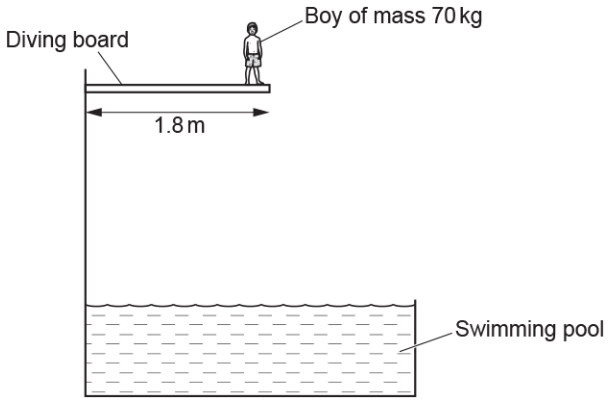
[2]

(c). The student puts a small load on the spring. It is in equilibrium.

Draw and label a free body force diagram for the load at the end of the spring.

[3]

18. A boy of mass 70 kg stands on the end of a diving board at a distance of 1.8 m from the wall.



Calculate the moment of the boy standing on the diving board.
Gravitational field strength on Earth = 10 N / kg.

Moment = ... N m **[4]**

END OF QUESTION PAPER