Forces – 2022 Nov O Level 5054
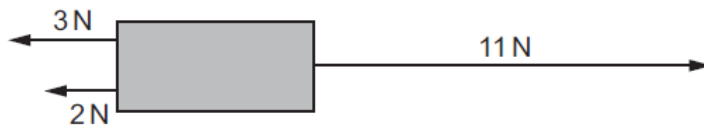
1. Nov/2022/Paper_11/No.1

The diagram shows three forces acting on a block. The resultant force is 6 N to the right.

Which additional force produces a resultant force of 3 N to the left?

A   3 N to the left

B   9 N to the left

C   6 N to the right

D   13 N to the right

2. Nov/2022/Paper_11/No.3

A car of mass 1000 kg is travelling down a steep hill. The brakes fail and the driver uses a horizontal sand-filled safety road to stop the car.

The car enters the sand at a speed of 10 m/s and experiences a constant stopping force of 2500 N.

How far does the car travel in the sand before coming to rest?

A   2.0 m   B   4.0 m   C   20 m   D   40 m
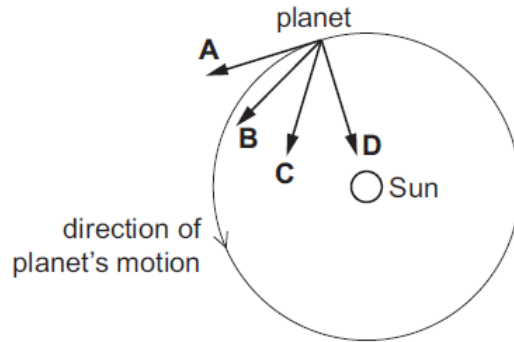
3. Nov/2022/Paper_11/No.6

What causes the frictional effects experienced by a cyclist to increase?

A   using a lighter bicycle

B   travelling at greater speed

C   a smoother tyre surface

D   a road surface covered in oil
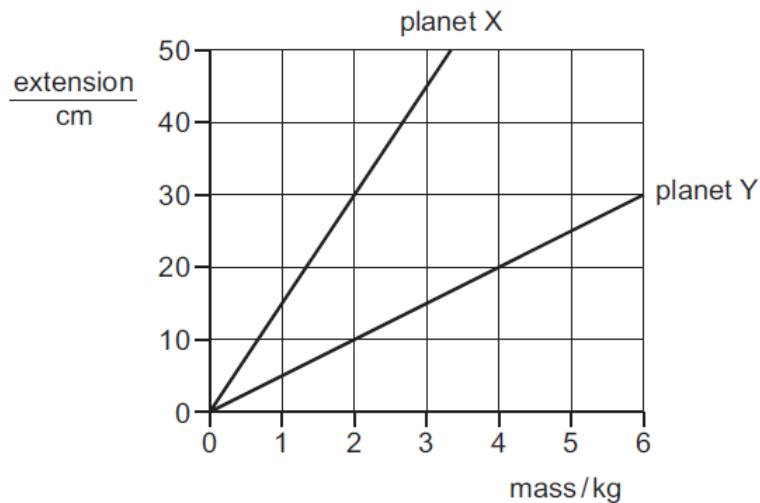
4. Nov/2022/Paper_11/No.8

A planet orbits the Sun. The planet moves in a circular path at constant speed, but is accelerating because it is changing direction.

In which direction does the resultant force act to cause this acceleration?

5. Nov/2022/Paper_11/No.10

The graph shows how the extension of a spring changes with the masses suspended from it when the spring is on planet X and when the spring is on planet Y.

Which conclusion can be drawn from these graphs?

A It is not possible to compare the gravitational field strengths on planets X and Y.

B The gravitational field strength on planet X is equal to the gravitational field strength on planet Y.

C The gravitational field strength on planet X is one third of the gravitational field strength on planet Y.

D The gravitational field strength on planet X is three times the gravitational field strength on planet Y.

6. Nov/2022/Paper_11/No.11

A uniform beam is pivoted at its centre. Two weights are placed on the beam in the positions shown and the beam is balanced by an upward force *F*.
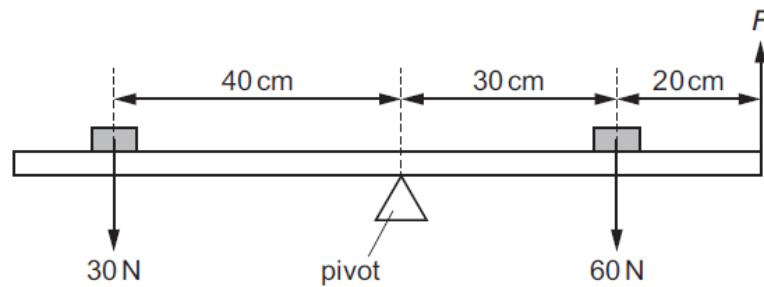
What is the size of *F*?

A   6.0N   **B**   12N   **C**   30N   **D**   60N

7. Nov/2022/Paper_11/No.12

Four objects of equal mass rest on a table. The centre of mass of each object is labelled G.

Which object is the least stable?
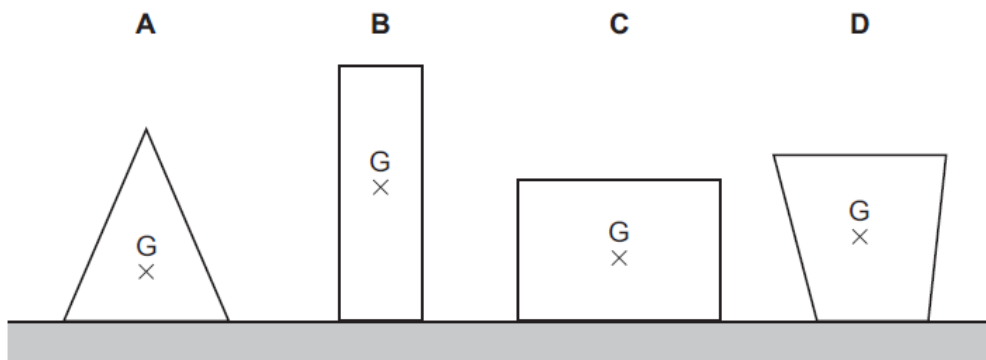
8. Nov/2022/Paper_12/No.1

The diagram shows three forces acting on a block. The resultant force is 6N to the right.

Which additional force produces a resultant force of 3N to the left?

A   3N to the left

B   9N to the left

C   6N to the right

D   13N to the right

9. Nov/2022/Paper_12/No.4

A car of mass 1000 kg is travelling down a steep hill. The brakes fail and the driver uses a horizontal sand-filled safety road to stop the car.
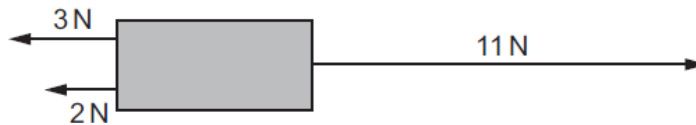
The car enters the sand at a speed of 10 m/s and experiences a constant stopping force of 2500 N.

How far does the car travel in the sand before coming to rest?

A   2.0 m   B   4.0 m   C   20 m   D   40 m

10. Nov/2022/Paper_12/No.6

A block of wood is placed on a table. External forces act on the block but the block remains stationary.

A student suggests three conditions for the block to remain stationary.

condition P   The resultant force on the block **must** equal zero.

condition Q   The resultant moment on the block **must** equal zero.

condition R   The external forces **must** act through the centre of mass of the block.

Which conditions are necessary for the block to remain stationary?

A   P and Q only   B   P and R only   C   Q and R only   D   P, Q and R
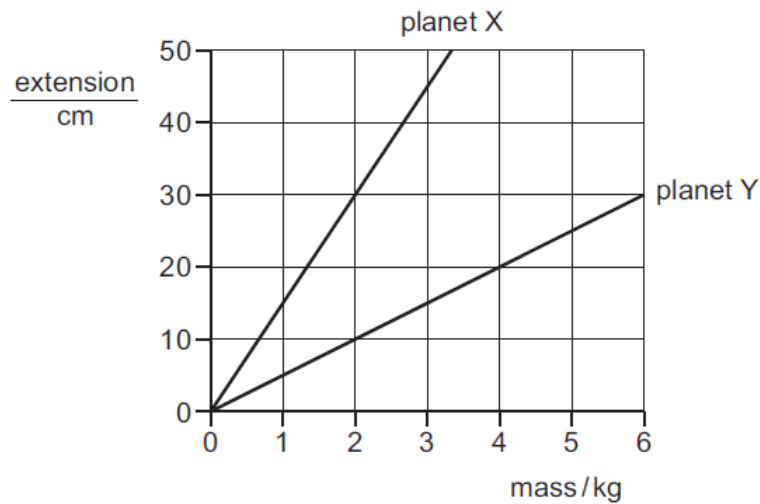
11. Nov/2022/Paper_12/No.8

A car travels on a horizontal road around a bend at constant speed.

What is the direction of the resultant force on the car?

A   backwards

B   forwards

C   towards the centre of the bend

D   towards the road

12. Nov/2022/Paper_12/No.10

The graph shows how the extension of a spring changes with the masses suspended from it when the spring is on planet X and when the spring is on planet Y.

Which conclusion can be drawn from these graphs?

A It is not possible to compare the gravitational field strengths on planets X and Y.

B The gravitational field strength on planet X is equal to the gravitational field strength on planet Y.

C The gravitational field strength on planet X is one third of the gravitational field strength on planet Y.

D The gravitational field strength on planet X is three times the gravitational field strength on planet Y.

13. Nov/2022/Paper_12/No.12

A uniform beam is pivoted at its centre. Two weights are placed on the beam in the positions shown and the beam is balanced by an upward force F.
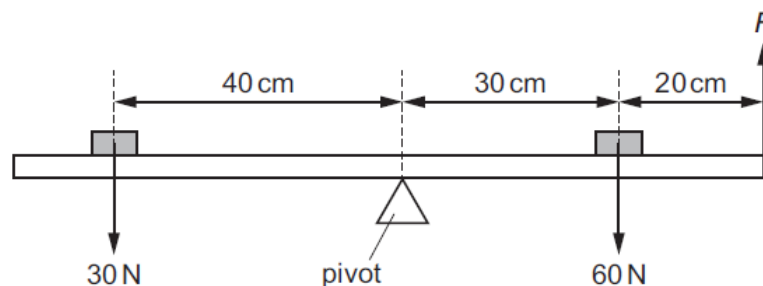
What is the size of F?

A 6.0 N   **B** 12 N   **C** 30 N   **D** 60 N

14. Nov/2022/Paper_12/No.13

Four objects of equal mass rest on a table. The centre of mass of each object is labelled G.

Which object is the least stable?

15. Nov/2022/Paper_21/No.1

Fig. 1.1 shows a steel spring.
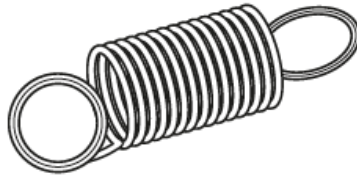
Fig. 1.1

(a) Describe an experimental procedure for obtaining the results needed to plot an extension–load graph for this spring.

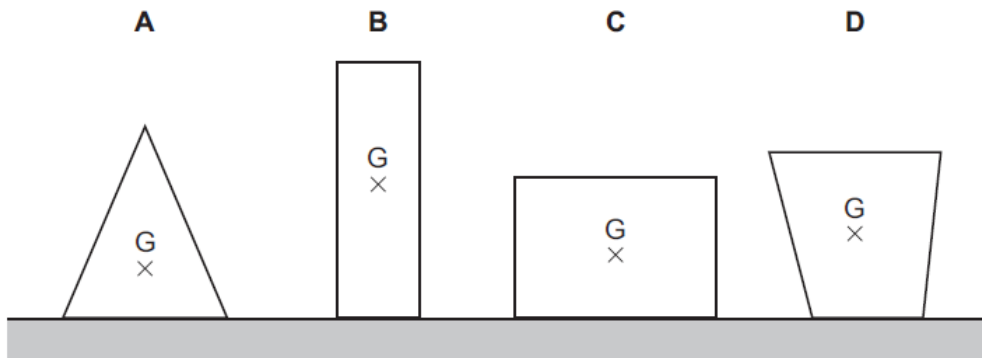..

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.... [3]

(b) In an experiment to obtain results for an extension–load graph, a spring is stretched beyond its limit of proportionality.

(i) On Fig. 1.2, sketch the extension–load graph for this spring.

Fig. 1.2

[2]

(ii) On your graph in Fig. 1.2, mark and label with a P the limit of proportionality. [1]

(c) The limit of proportionality for this spring occurs at a load of 8.5 N.

The extension of the spring is equal to 0.014 m when the load is equal to 3.5 N.

Calculate the extension for a load of 5.5 N.
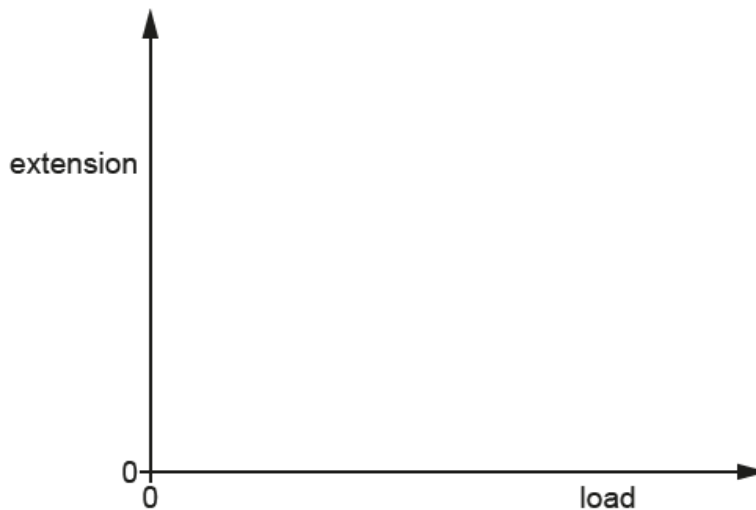
extension = ... [2]

[Total: 8]

16. Nov/2022/Paper_21/No.7(c, d)

(c) At $t = 26\,s$, the child and sledge begin to decelerate.

    (i) Determine the size of the deceleration.

deceleration = ... [3]

    (ii) The mass of the child is 46 kg and the mass of the sledge is 9.0 kg.

        Calculate the resultant force on the child and sledge as they decelerate.

resultant force = ... [2]

    (iii) State the energy transfer that is taking place as the child and sledge decelerate.

....

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.... [2]

(d) At $t = 26\,s$, when the brake is first applied, the child jerks forwards on the sledge.

Explain why.

....

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.... [2]

17. Nov/2022/Paper_22/No.1(b)

(b) The mass of the train is 3.8×10^5 kg.

    (i) Determine the deceleration of the train in the 70 s before it stops at station Q.

deceleration = ... [2]

    (ii) Calculate the resultant force on the train as it decelerates.

resultant force = ... [2]