Uganda Certificate of Education
TOPICAL REVISION QUESTIONS SET 4
OLEVEL PHYSICS
Paper 1
Topic: Moments & Equilibrium

NAME: _____ STREAM: _____

INSTRUCTIONS:

Answer all questions in this paper.

Mathematical tables, side rulers and silent non-programmable calculators may be used.

These values of physical quantities may be useful to you.

Acceleration due to gravity	=	10 m s^{-2}
Specific heat capacity of water	=	$4200 \text{ J kg}^{-1} \text{ K}^{-1}$

*Answer **all** questions in this section.*

Question 1:

A spanner of length 20 cm is used to tighten a nut. If a force of 50 N is applied at right angles to the end of the spanner, find the moment of the applied force.

A. (20×50) N m

B. $\left(\dfrac{20 \times 50}{100}\right)$ N m

C. $\left(\dfrac{100 \times 50}{20}\right)$ N m

D. $\left(\dfrac{100 \times 20}{50}\right)$ N m

Question 2:

Figure 5 shows a metre rule balancing on a knife edge when a mass, M, is hanged at one end.

Which one of the following is true if the mass, M, is moved towards the knife edge?
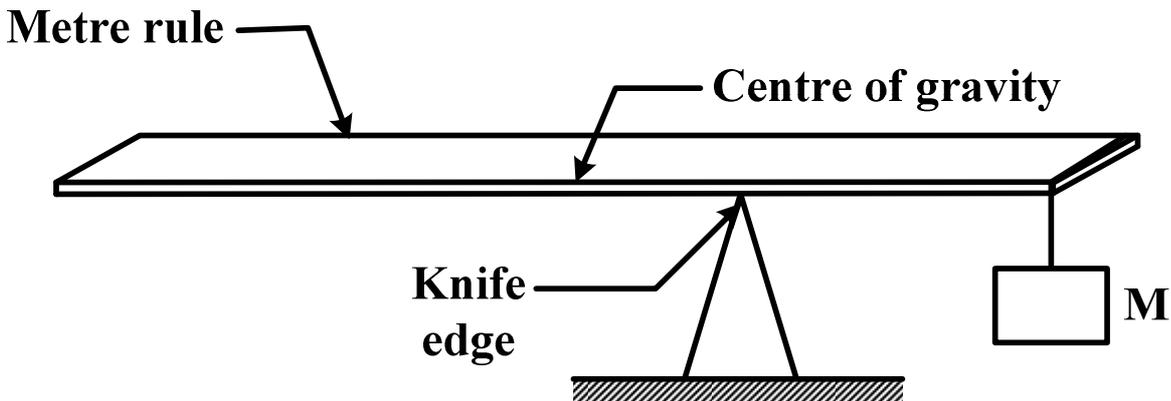
Fig. 5

A.   The metre rule turns in anti-clockwise direction.
B.   The centre of gravity changes to another position.
C.   The metre rule turns in a clockwise direction.
D.   The metre rule remains balancing.

Question 3:

Figure 4 shows a uniform metre rule of weight W acted upon by forces R_1 and R_2, and pivoted at the 25 cm mark.

Fig. 4
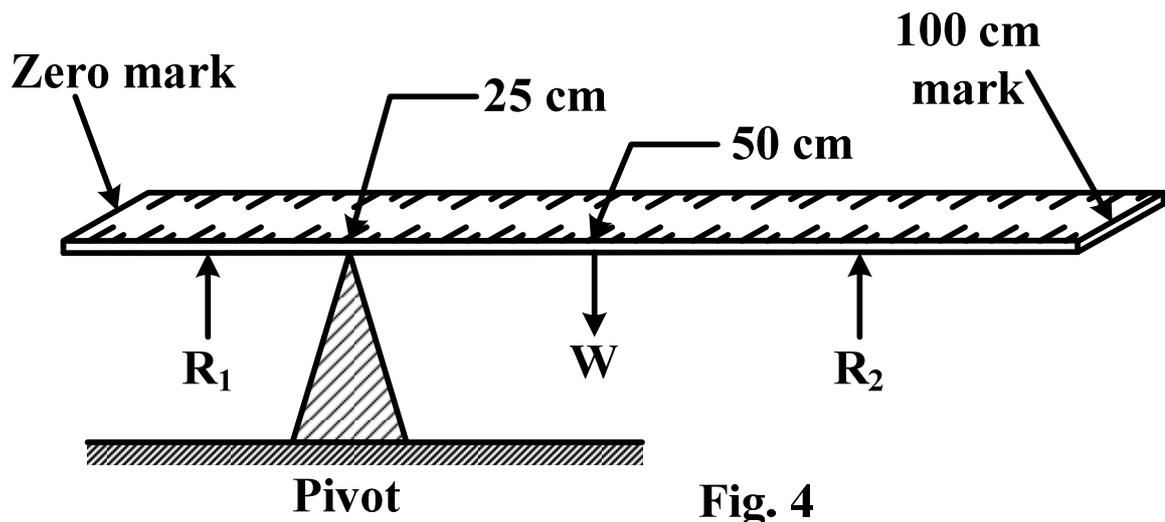
Identify forces which produce clockwise moments.
- A. R_1 and R_2.
- B. R_1 and W.
- C. R_2 and W.
- D. R_1, R_2 and W.
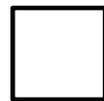
Question 4:

Figure 2 shows a rigid body pivoted at S.

Fig. 2
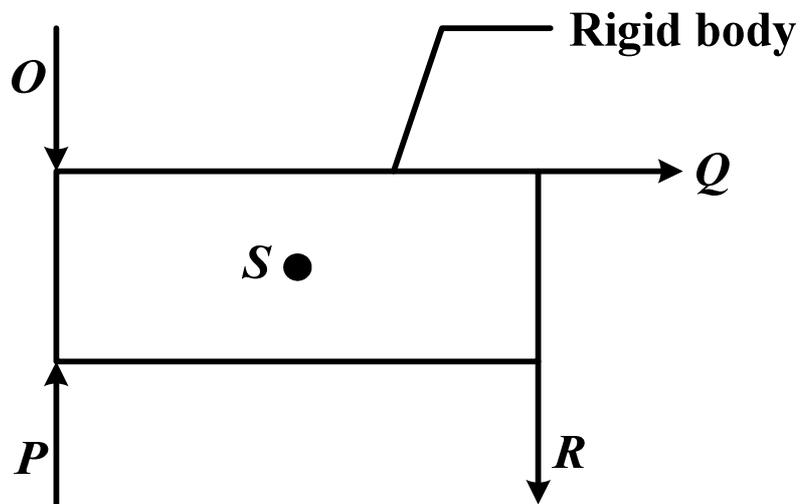
Which of the forces **O**, **P**, **Q** and **R** gives the body an anti-clockwise moment?
- A. **R**
- B. **Q**
- C. **P**
- D. **O**
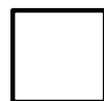
Question 5:

Which of the following increase the stability of a body?

(i).   Raising its centre of gravity.
(ii).   Lowering its centre of gravity.
(iii). Making its base narrow.
(iv).   Making its base wide.

     A.   (i) and (iv) only.
     B.   (ii) and (iv) only.
     C.   (i) and (iii) only.
     D.   (ii) and (iii) only.

Question 6:

Figure 8 shows a beam balanced horizontally by weights M_1 and M_2.
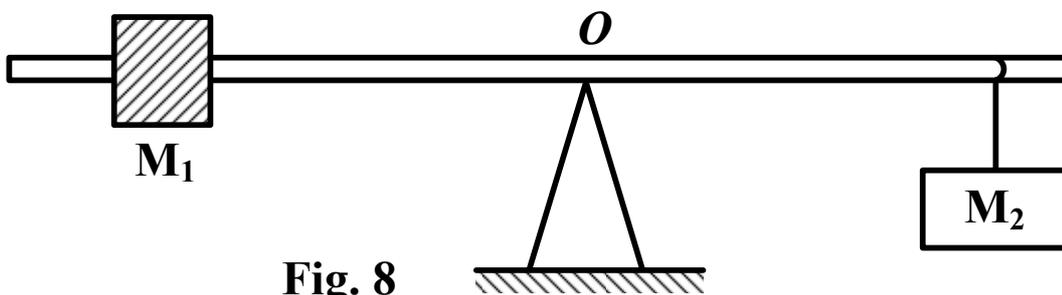
Fig. 8

If M_2 is increased and M_1 remains the same, what adjustments should be made to balance the beam horizontally?

     A. M_1 should be moved towards O.
     B. M_2 should be moved away from O.
     C.   Point O should be moved towards M_1.
     D. M_1 should be moved away from O.

Question 7:

A body is in neutral equilibrium if
(i).   it returns to its original position after a small displacement.
(ii).   its centre of gravity remains at the same height when slightly displaced.
(iii). it overturns when slightly displaced.

     A.   (i) only.
     B.   (ii) only.
     C.   (i) and (ii).
     D.   (ii) and (iii).

Question 8:

Forces of 40 N, 20 N and 50 N are applied on a metre rule supported on a knife edge as shown in figure 4.

20 cm

40 cm

10 cm

40 N

Fig. 4

20 N   50 N
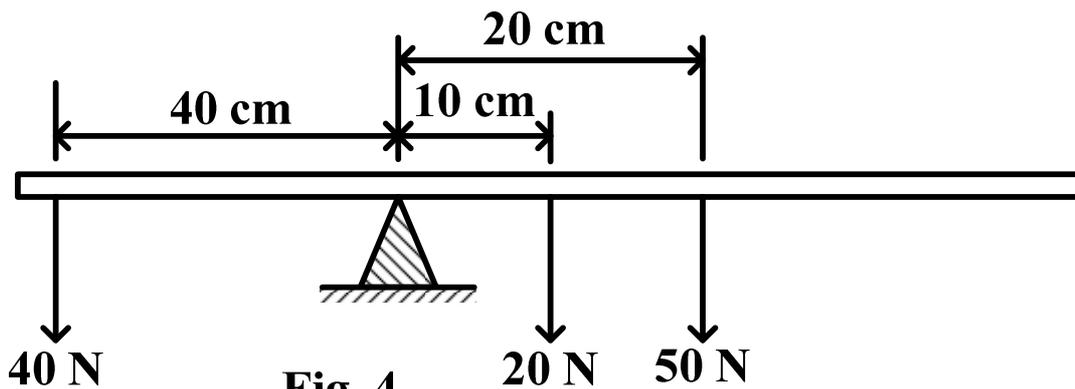
The metre rule will

    A.   balance.

    B.   oscillate.

    C.   turn in a clockwise direction.

    D.   turn in anti clockwise direction.

Question 9:

30 cm   10 cm   20 cm

2 N   2 N   P
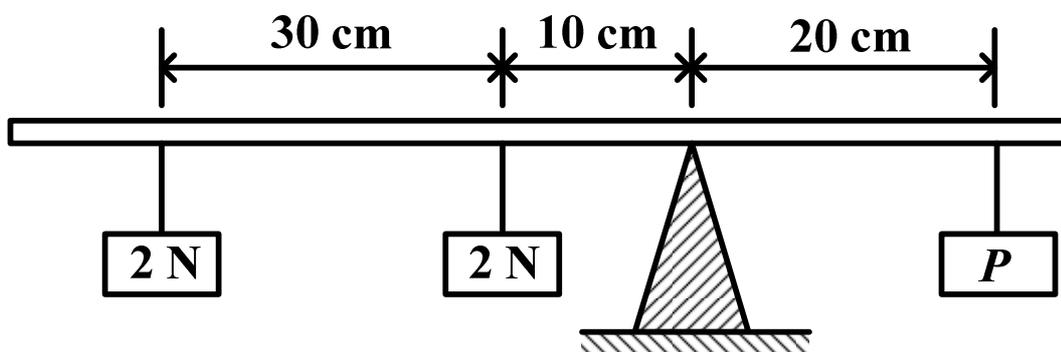
Fig. 4

A light beam AB is in equilibrium when forces of 2 N, 2 N and P act on it as shown in figure 4. Find the magnitude of P.

    A.   5 N

    B.   4 N

    C.   2 N

    D.   1 N

Question 10:
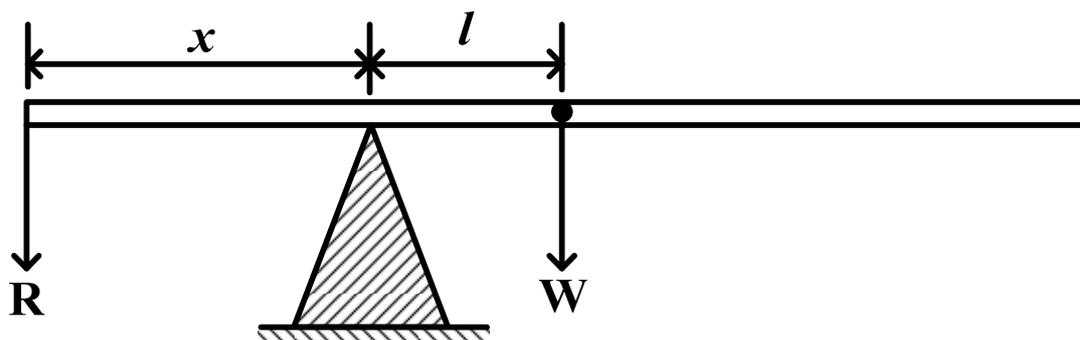
Fig. 5

Figure 5 shows a uniform beam in equilibrium when a force **R** acts on it at one end. Find the weight, **W** of the beam.

A. $\dfrac{x}{Rl}$

B. $\dfrac{Rl}{x}$

C. $\dfrac{l}{Rx}$

D. $\dfrac{Rx}{l}$

Question 11:

A load of 500 N is placed at 2 m from a pivot of a seesaw. At what distance from the pivot should a weight of 250 N be placed to balance the see saw?

A. 0.5 m

B. 1.0 m

C. 2.0 m

D. 4.0 m

Question 12:

The diagram in figure 1 shows a uniform half-meter rule suspended at point C.
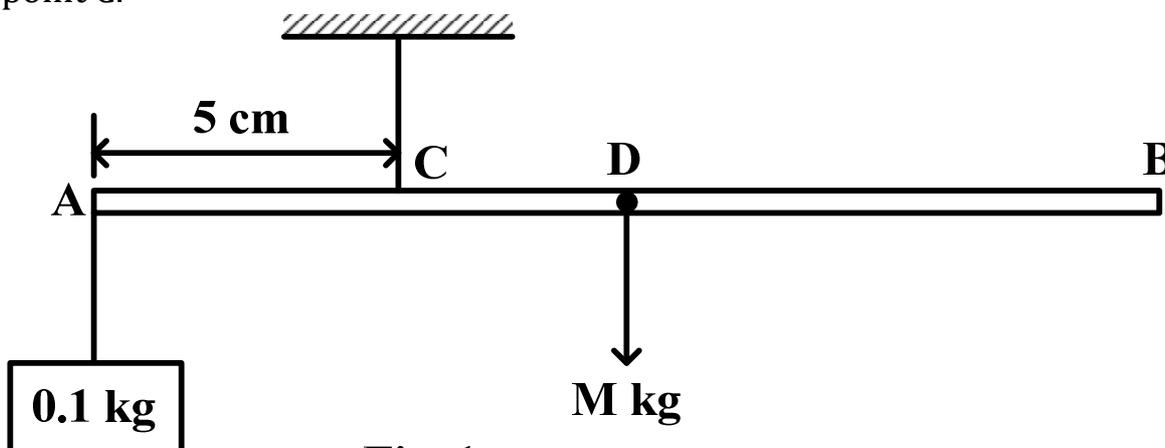
Fig. 1

The mass of the rule is

A. 0.020 kg

B.   0.025 kg
C.   0.100 kg
D.   0.125 kg

Question 13:

5 N

A

B

4 N   **Fig. 3**   **W**
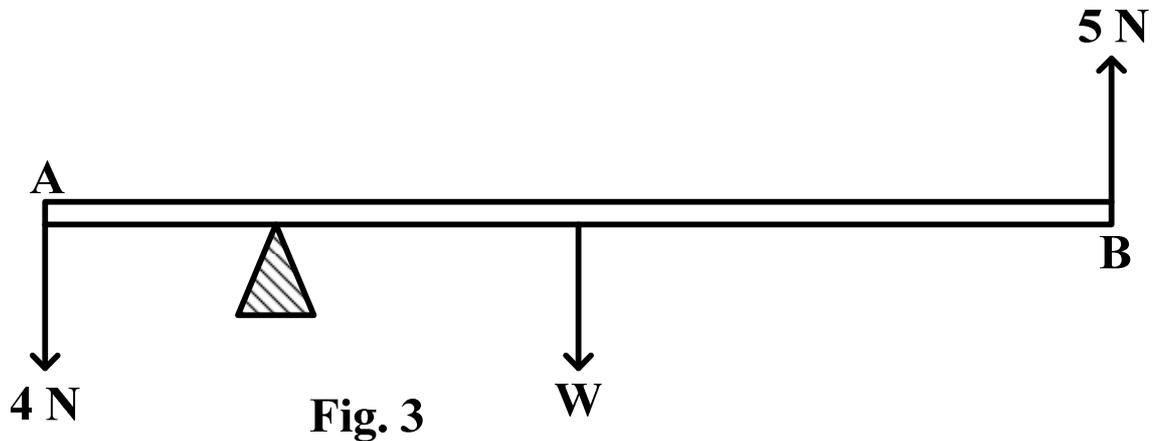
A uniform wooden beam of weight W is pivoted at a distance $\frac{1}{5}$ of its length from the end A and kept in equilibrium by applying forces of 4 N and 5 N as shown in figure 3. The force exerted by the pivot on the beam is
A.   16
B.   15
C.   10
D.   8

Question 14:
The number of complete oscillations made per second is referred to as
A.   periodic time
B.   amplitude
C.   wave length
D.   frequency

Question 15:

0   **90 cm**   **100 cm**
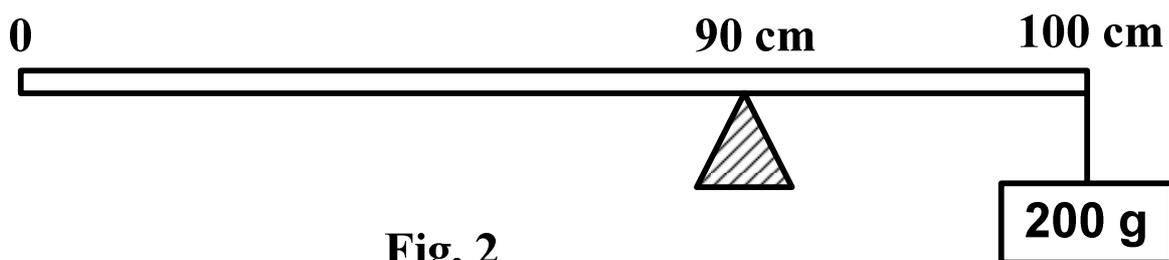
200 g

Fig. 2

A uniform rod 100 cm long pivoted at the 90 cm mark, balances horizontally when a mass of 200 g is suspended at the 100 cm mark as shown in figure 2. The mass of the rod is

    A.   40 g
    B.   50 g
    C.   400 g
    D.   800 g

Question 16:

Which of the following statements are true about two equal forces F acting on a bar of length l, shown in figure 2?

F

l

Fig. 2

F
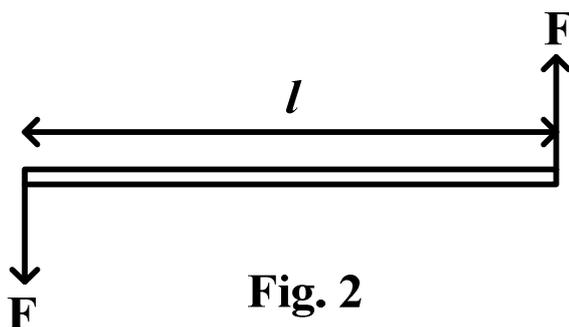
(i).   The resultant force on the bar is zero.
(ii).   The forces cause a rotational effect.
(iii). The forces act in opposite directions.
(iv). The forces produce different turning effects.

    A.   (i) only
    B.   (i) and (ii) only.
    C.   (i), (ii) and (iii) only.
    D.   (i), (ii) and (iv) only.

Question 17:

Figure 5 shows a uniform metre rule of mass 0.1 kg pivoted at the 80 cm mark. It balances horizontally when a mass P is hang at the 95 cm mark. Find the value of P.

80 cm   **95 cm**

Fig. 5

P
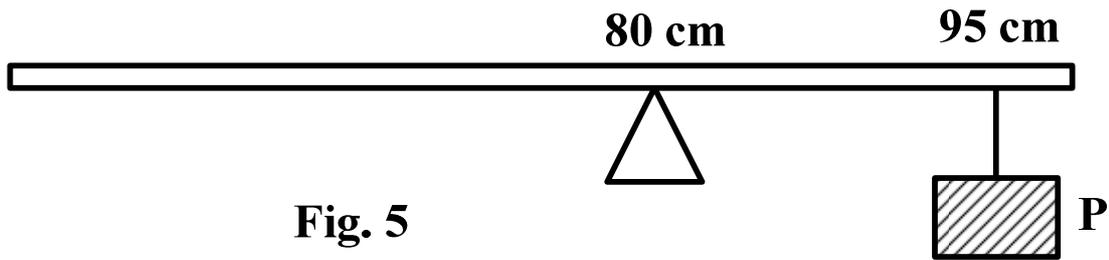
A. 0.08 kg
B. 0.2 kg
C. 0.4 kg
D. 1 kg
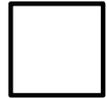
Question 18:

A uniform metre-rule is pivoted at its centre as shown in figure 2.

20 cm

20 N   **Fig. 2**   **F**
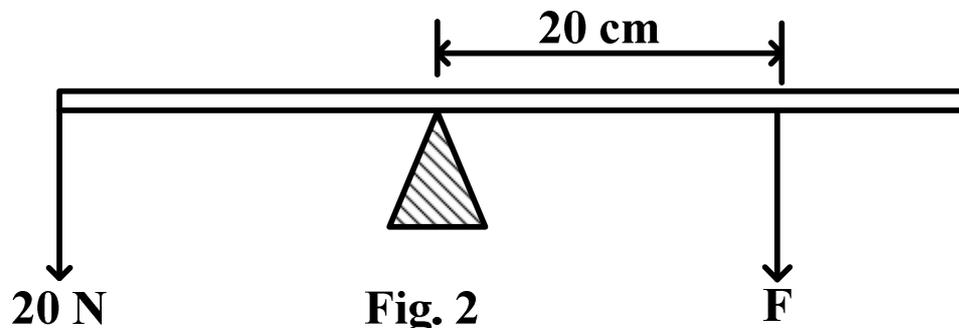
If the rule is in equilibrium, find the value F.

    A. 4 N
    B. 33.3 N
    C. 50 N
    D. 100 N
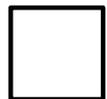
Question 19:

The shaft in an engine is subjected to two parallel but opposite forces of 500 N each as shown in figure 3.
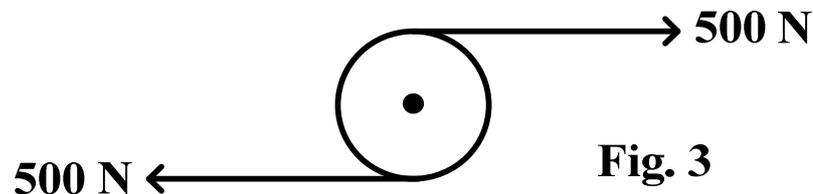
500 N

Fig. 3

500 N

The rotation is best stopped by applying

    A. two forces of 500 N acting at right angles to each other.

B. two parallel but opposite forces of 500 N.
C. a single force of 100 N.
D. a single force of 250 N.

Question 20:
The time period of a simple pendulum
    A. decreases as the length of the pendulum decreases.
    B. increases as the mass of the pendulum bob decreases.
    C. increases as the mass of the pendulum bob increases.
    D. decreases as the length of the pendulum increases.

Question 21:

Fig. 6   W   60 N

30 cm   20 cm
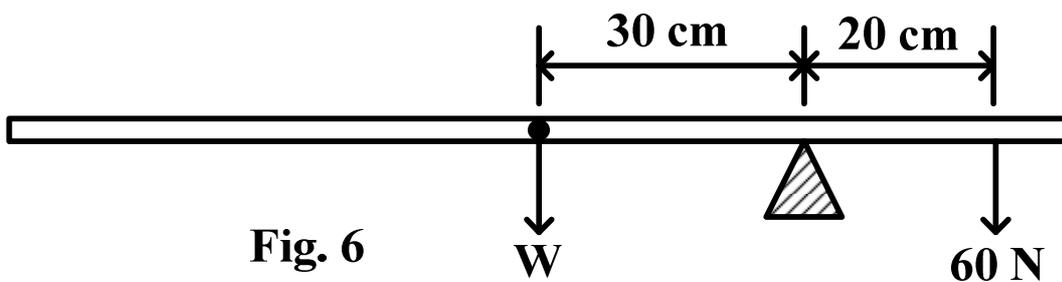
Find the weight W, of a uniform metre rule if a force of 60 N at one end balances it as shown in figure 6.
    A. 24 N
    B. 40 N
    C. 90 N
    D. 100 N

Question 22:
If the system in figure 3 is in equilibrium, find the value of X

30 N

4 m **6 m**

2 m

60 N **Fig. 3** **X**
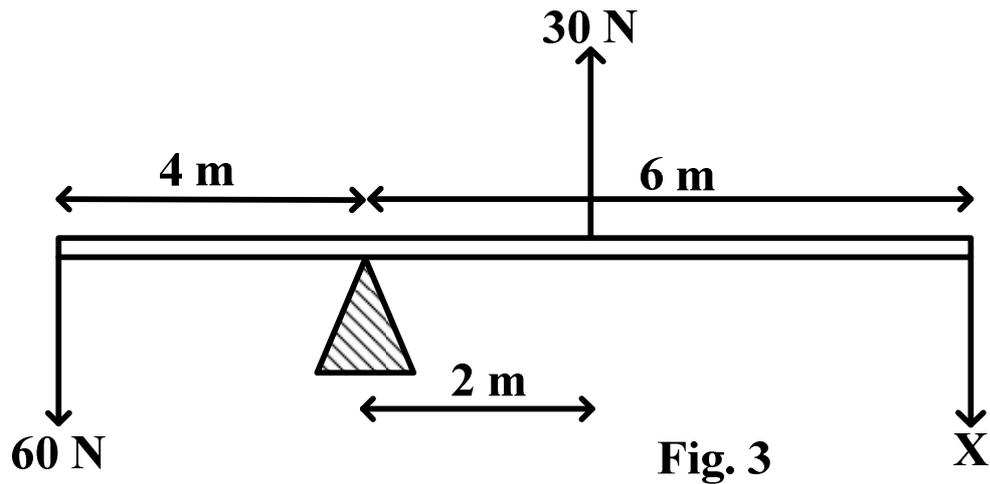
A. 30 N
B. 50 N
C. 60 N
D. 90 N

Question 23:

The stability of a bus is reduced when a heavy load is placed on its root rack because

A. the total weight is increased
B. the pressure upon the tyres is increased
C. the maximum speed is reduced
D. the centre of gravity is raised

Question 24:

10 cm **20 cm**

5 N **Fig. 9** **W**
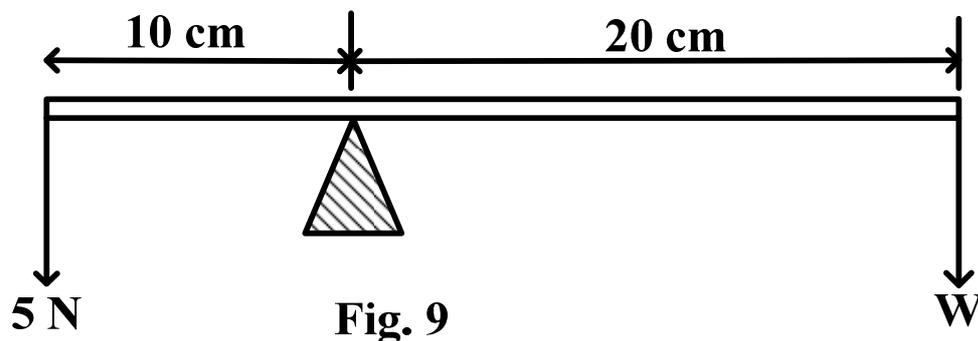
Two weights are balanced on a rule of negligible mass as shown figure 9. What is the value of W?

A. 2.5 N
B. 10 N
C. 30 N

D.   40 N

Question 25:

A uniform metre rule pivoted at the 25 cm mark balances when a mass of 0.15 kg is hung at the 8 cm mark. Calculate the mass of the metre rule
   A.   0.020 kg
   B.   0.048 kg
   C.   0.102 kg
   D.   1.020 kg

Question 26:

40 cm

P   **Fig. 2**   **4 N**
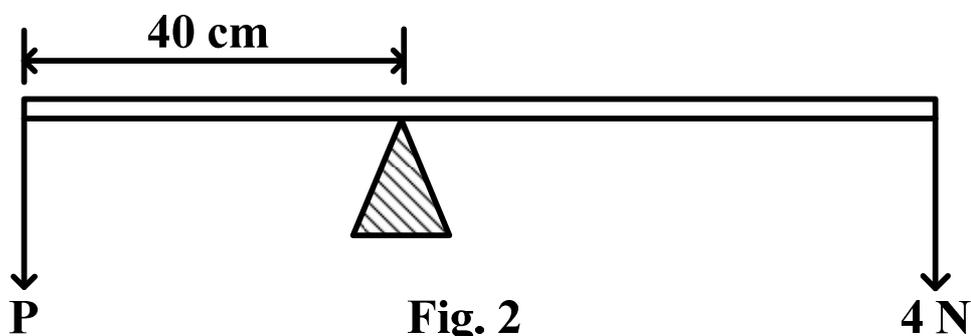
A uniform metre rule of weight 2 N is pivoted at the 40 cm mark. Find the value of the force, P required to keep the metre rule in equilibrium if a force of 4 N acts at the end of the metre rule as in the diagram above
   A.   2.5 N
   B.   5.5 N
   C.   6 N
   D.   6.5 N

Question 27:

An object in unstable equilibrium continues to fall when slightly displaced because
   1.   centre of gravity is lowered
   2.   centre of gravity is raised
   3.   potential energy is reduced
   4.   potential energy is increased

   A.   1, 2, 3 only are correct
   B.   1,3 only are correct
   C.   2,4 only are correct

D.   4 only is correct

Question 28:
A bus carrying a heavy load on its rack is more unstable when moving because
    A.   its centre of gravity is raised
    B.   the friction on the ground increases
    C.   its total weight is increased
    D.   the pressure on the tyres is increased

Question 29:
When a body in stable equilibrium is tilted slightly
    A.   the position of its centre of gravity is lowered
    B.   the position of its centre of gravity is raised
    C.   the position of its centre of gravity doesn't change
    D.   it topples over

Question 30:
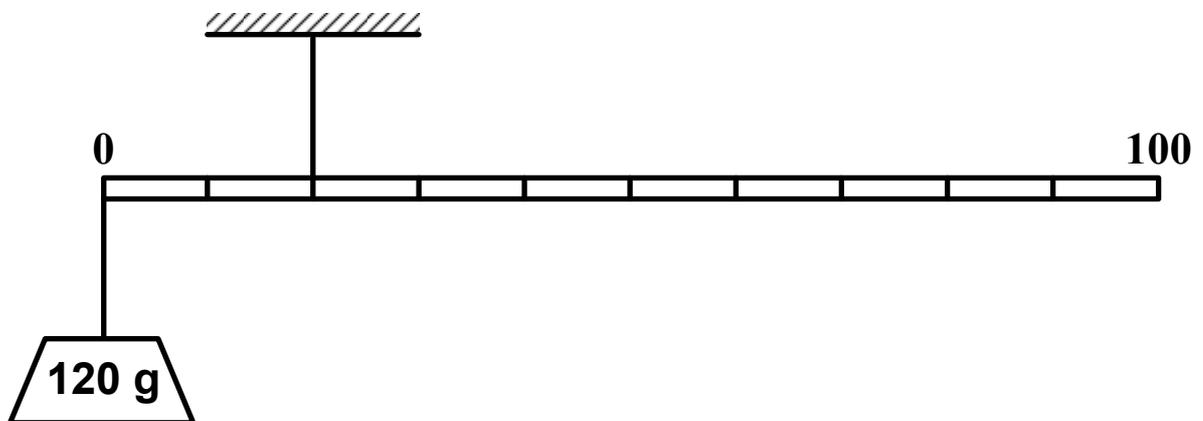
A uniform metre rule is suspended with a string at the 20 cm mark and is kept horizontal by a mass of 120 g from one end as shown above. Find the mass of the metre rule
    A.   80 g
    B.   30 g
    C.   24 g
    D.   120 g

SECTION B: (51 Marks)
*Answer **all** questions in this section.*

Question 31:

(a). Explain why it is dangerous to overload vehicles with goods on the roof-rack. [1]

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(b). A uniform metre rule of weight 0.8 N is loaded by suspending 1 N weight 10 cm from 0.0 cm mark.

    (i). Sketch the diagram for the set-up. [1]

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    (ii). Determine where the loaded metre rule will balance. [2]

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Question 32:

(a). State the **principle of moments**. [1]

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(b). A hand cart of length 1.5 m, has the centre of gravity at length 0.5 m from the wheel when loaded with 50 kg as shown in fiugre 10.
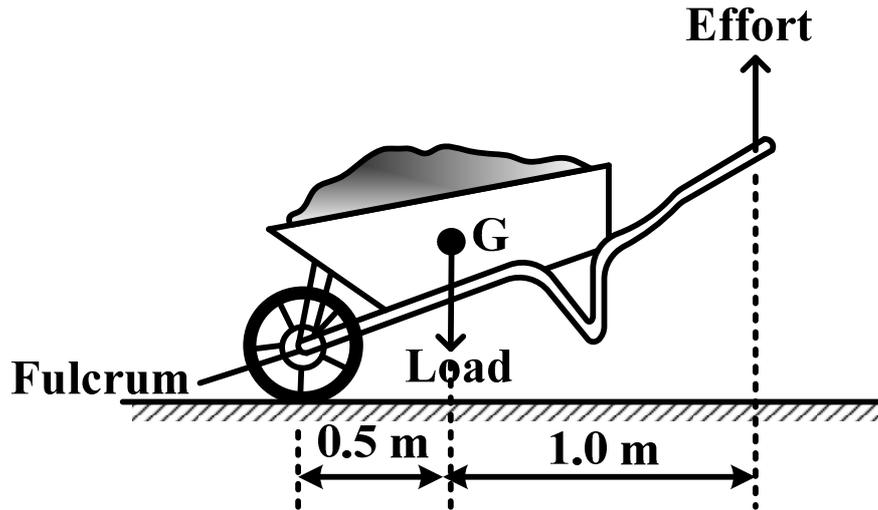
Fig. 10

If the mass of the hand cart is 10 kg, find the effort needed to lift the hand cart. [3]

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Question 33:
(a). What is meant by
(i). **centre of gravity**? [1]

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(ii). **moment of a force**? [1]

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(b)
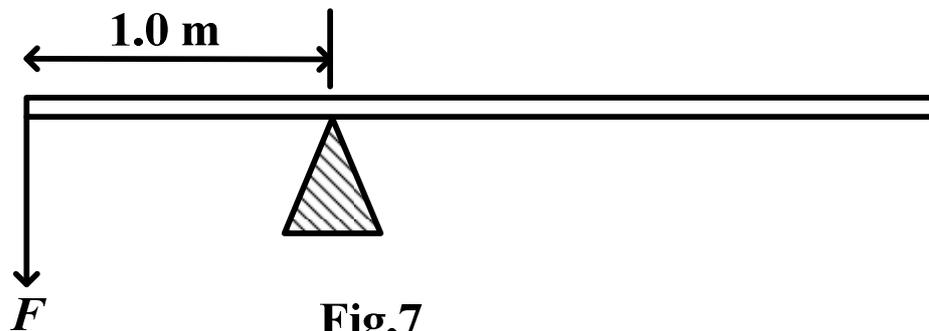
Fig.7

Figure 7 shows a uniform rod of length 4.0 m pivoted at 1.0 m from one end. If the weight of the rod is 120 N, find the force F which keeps the rod horizontal. [2]

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Question 34:

(a).   (i).   Define **moment of a force**.   [1]

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      (ii).   State the **principle of moments**.   [1]

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(b).
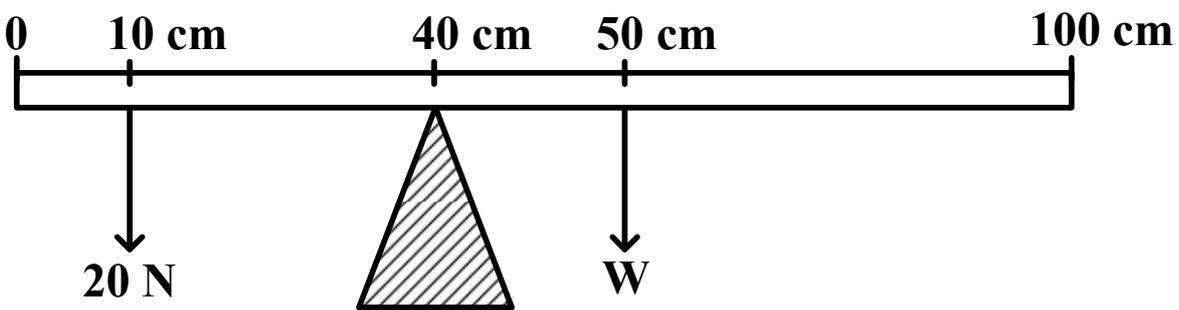
Fig. 9

A uniform meter ruler is pivoted at the 40 cm mark as shown in the figure 9. The meter ruler is the equilibrium under its weight W and a 20 N force acting at the 10 cm mark. Calculate W. [2]

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Question 35:

(a).   State the principle of moments.   [1]

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(b).
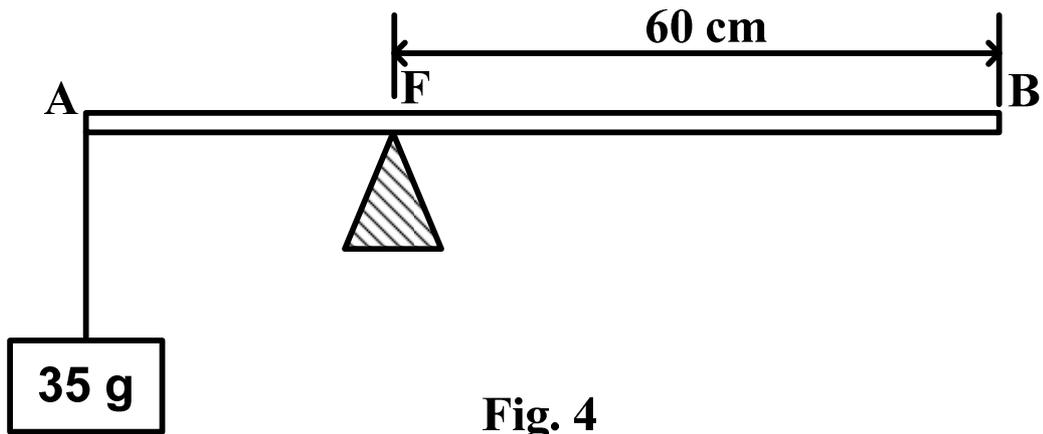
Fig. 4

In figure 4, a uniform metre rule AB balances at **F** when the mass at A is 35 g. Calculate the mass of the meter rule. [3]

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Question 36:

(a). State the principle of moments. [1]

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(b). A uniform beam of weight 2.5 N is pivoted at its mid-point P, as shown in figure 8.
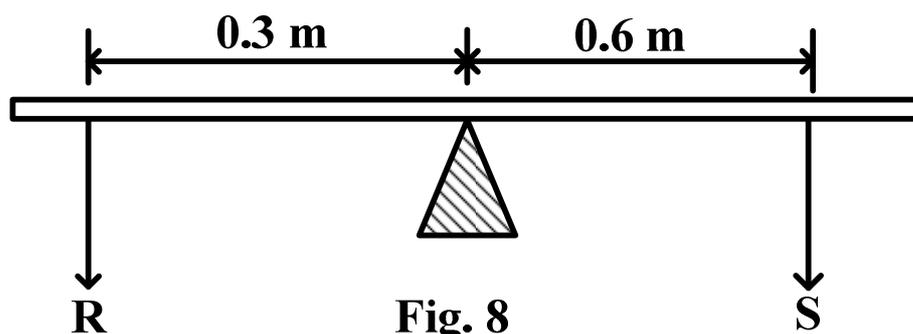
Fig. 8

The beam remains in equilibrium when force R and S act on it. If R is 5 N, find the:

(i). value of S. [2]

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    (ii).   reaction at the pivot.   [1]

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Question 37:
(a).   Define Moment of a force.   [1]

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(b).   A uniform metre-rule is balanced at the 30-cm mark when a load of 0.8 N is hang at the zero-mark. Find the weight of the metre-rule. [3]

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Question 38:
(a).   (i).   State the principle of moments.   [1]

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    (ii).   State the conditions for a body to be in equilibrium.   [2]

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(b).   What is meant by **centre of gravity**?   [1]

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Question 39:

(a). State one condition necessary for a body to be in equilibrium. [1]

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(b). What is meant by the centre of gravity of a body. [1]

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(c). A uniform metre rule, pivoted at the 10 cm mark , balances when a mass of 400 g is suspended at the 0 cm mark as shown in figure 7.
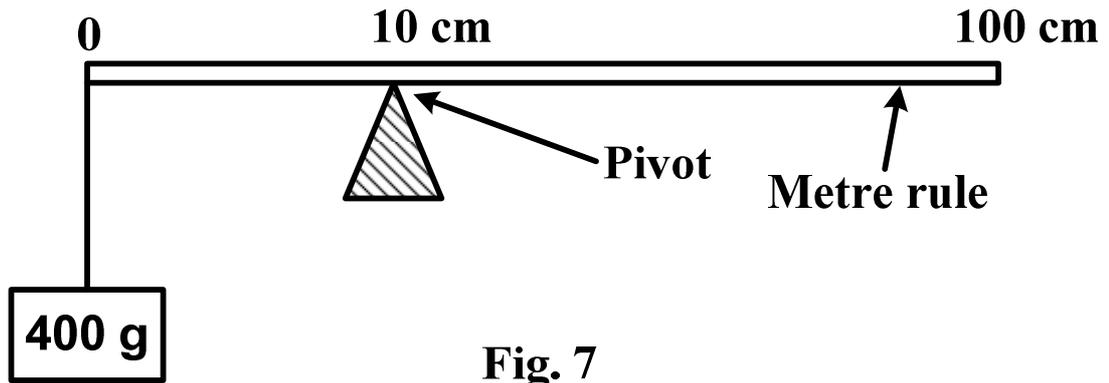
Fig. 7

Calculate the mass of the metre rule. [3]

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Question 40:

(a). Define **moment of a force**. [1]

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(b). A uniform metre rule is balanced at the 30 cm mark when a load of 0.80 N is hung at the 0 mark. Find the mass of the metre rule. [3]

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Question 41:

A non-uniform metal bar which is 4.0 cm long has its centre of gravity 1.0 m from the heavy end. The bar is balanced when it is pivoted from the middle and a weight of 750 N is suspended from the light end.

(a). Draw a diagram to show the forces acting on the bar. [2]

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(b). Find the weight of the bar. [3]

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Question 42:

A uniform metre rule with a 200 g mass suspended at the zero mark is balanced on a knife when pivoted at the 18.0 cm mark as shown below.

0   **18.0**   **100**
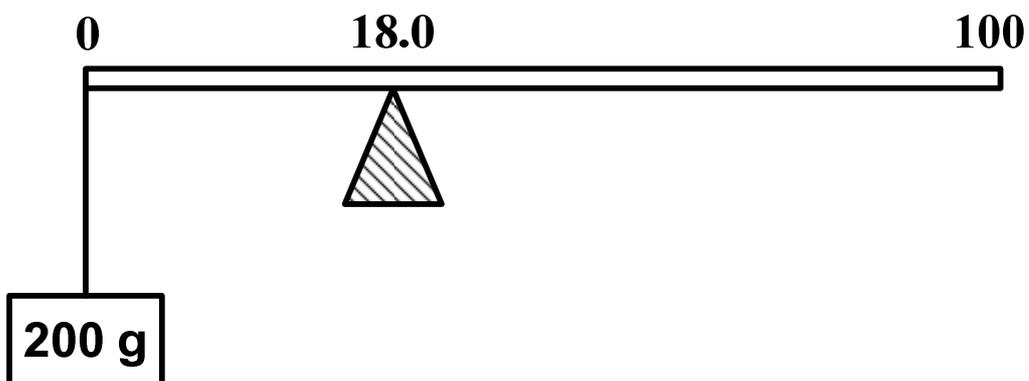
200 g

(a). Calculate the mass of the metre rule. [3]

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(b). If the 200 g mass was placed at the 5.0 cm mark, where would the knife edge be? [2]

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END