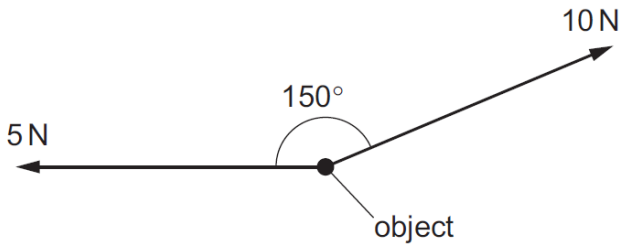
Forces – 2021 AS

1. June/2021/Paper_11/No.3

A force of 10 N and a force of 5 N act on an object.



The angle between the forces is 150°.

The resultant force on the object can be resolved into a pair of perpendicular components.

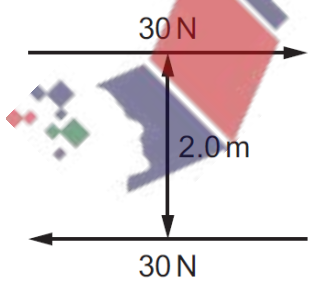
Which row shows numerical expressions for a possible pair of perpendicular components?

	force component / N	force component / N
A	10 cos 30° – 5	10 cos 30°
B	10 sin 30° – 5	10 cos 30°
C	10 – 5 cos 30°	5 sin 30°
D	10 – 5 sin 30°	5 cos 30°

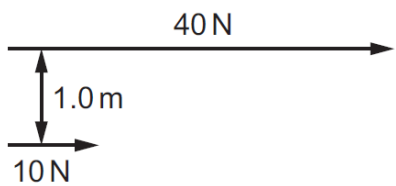
2. June/2021/Paper_11/No.12

Which pair of forces forms a couple with a torque of 30 N m?

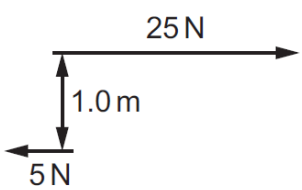
A



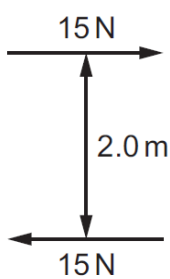
B



C



D



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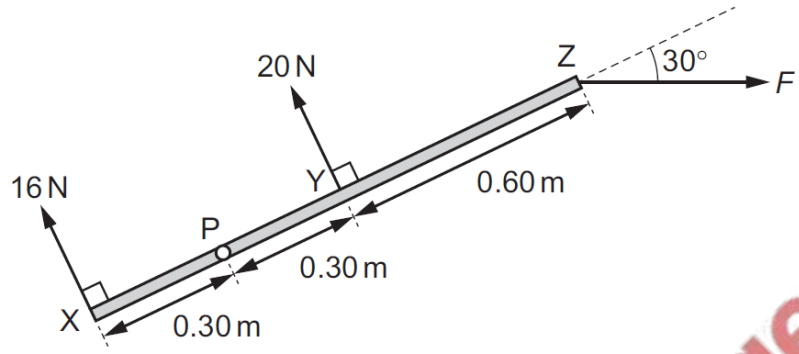
3. June/2021/Paper_11/No.13

A uniform rigid bar XZ with negligible mass is 1.20 m long. The bar is pivoted at point P. Three coplanar forces act on the bar as shown. Forces of 16 N and 20 N act perpendicularly to the bar at points X and Y respectively. Force *F* acts at point Z at an angle of 30° to the axis of the bar.

The distances along the bar of the pivot and of the forces are shown.



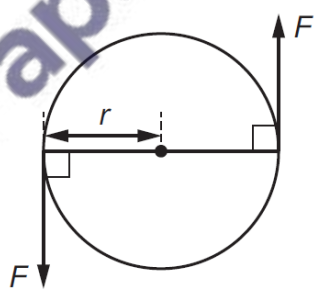
The bar experiences a resultant moment about P of 6.0 N m in a clockwise direction.

What is the magnitude of *F*?

A 9.2 N **B** 11 N **C** 16 N **D** 24 N

4. June/2021/Paper_12/No.12

A disc of radius *r* is acted upon by two opposite forces, each of magnitude *F*. The forces form a couple, as shown.



What is the torque of this couple?

A $\frac{1}{2}Fr$ **B** Fr **C** $2Fr$ **D** $4Fr$

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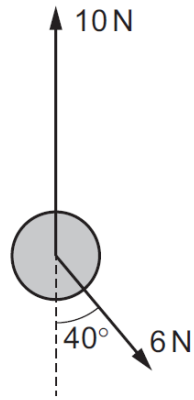
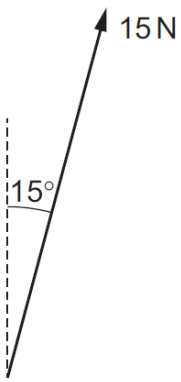
5. June/2021/Paper_12/No.3

An object is acted upon by two forces, 10 N in the vertical direction and 6 N at 40° to the vertical, as shown.

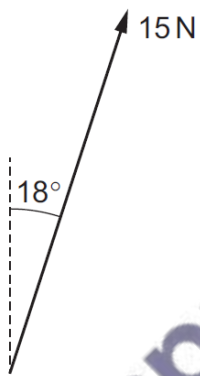


What is the resultant force acting on the object?

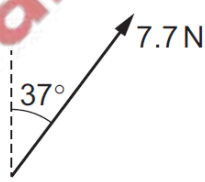
A



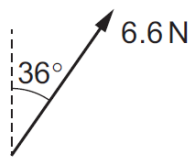
B



C



D



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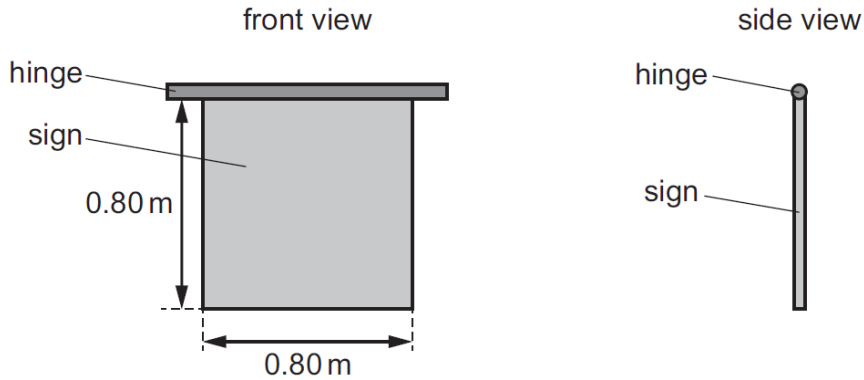
6. June/2021/Paper_12/No.13

A uniform square sign of weight 40 N is suspended vertically from its top edge by a horizontal hinge, as shown.



The hinge is not frictionless. When the sign is displaced from the vertical by an external force and then released, it does not return to the vertical position.

The maximum torque exerted by the hinge on the sign is 6.0 N m. The sign is displaced by 90° so that it is horizontal and then gradually released.

At which angle to the vertical does the sign hang after release?

A 11° **B** 22° **C** 68° **D** 79°

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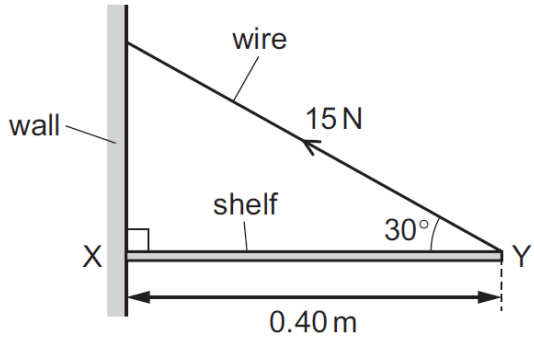
7. Nov/2021/Paper_11/No.12

A shelf XY is 0.40 m long and is attached to a wall at end X.

It is kept horizontal by a wire attached to Y and to the wall, as shown.



The tension force in the wire is 15 N at an angle of 30° to the horizontal.

What is the moment of this force about point X?

A 3.0 N m **B** 5.2 N m **C** 6.9 N m **D** 12 N m

8. Nov/2021/Paper_11/No.13

A statement about the principle of moments with some words omitted is shown.

> 'For an object in a state of rotational equilibrium, the sum of the clockwise moments about any point is equal to the sum of the anticlockwise moments about ..... .'

Which words correctly complete the statement?

A any point

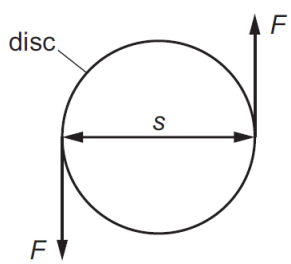
B the centre of gravity of the object

C the pivot

D the same point

9. Nov/2021/Paper_12/No.12

Two forces, each of magnitude *F*, act on a disc of diameter *s*, as shown.



What is the torque exerted on the disc?

A zero **B** $\frac{1}{2}Fs$ **C** Fs **D** $2Fs$

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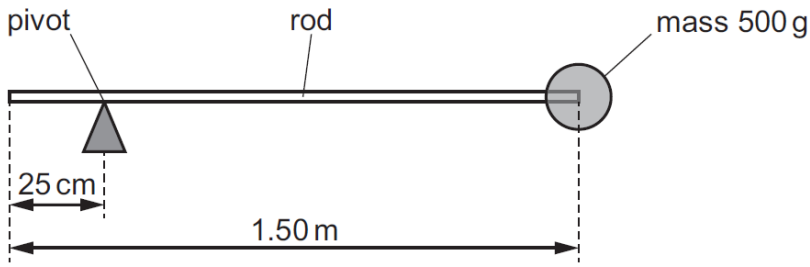
10. Nov/2021/Paper_12/No.13

A mass of 500 g is attached at one end of a rod of length 1.50 m. The rod is pivoted at a distance of 25 cm from the other end. The rod is horizontal.

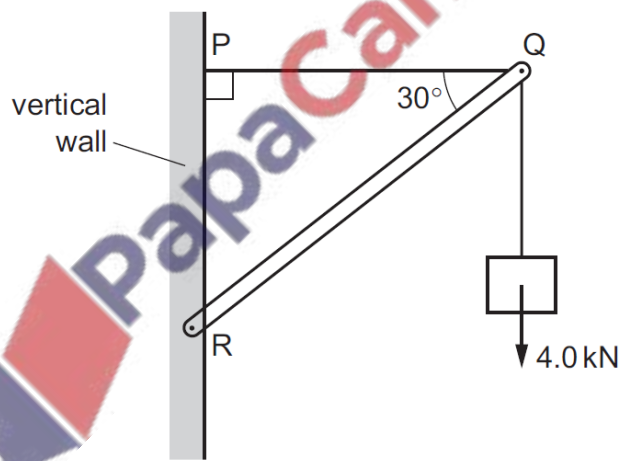


What is the moment about the pivot due to the mass?

A 0.63 N m **B** 1.2 N m **C** 6.1 N m **D** 7.4 N m

11. Nov/2021/Paper_12/No.14

A beam QR is held in position by a wire PQ. The structure is used to form a crane supporting a stationary load of 4.0 kN, as shown.



What is the force exerted by the beam QR on point Q?

A 4.0 kN **B** 4.6 kN **C** 6.9 kN **D** 8.0 kN

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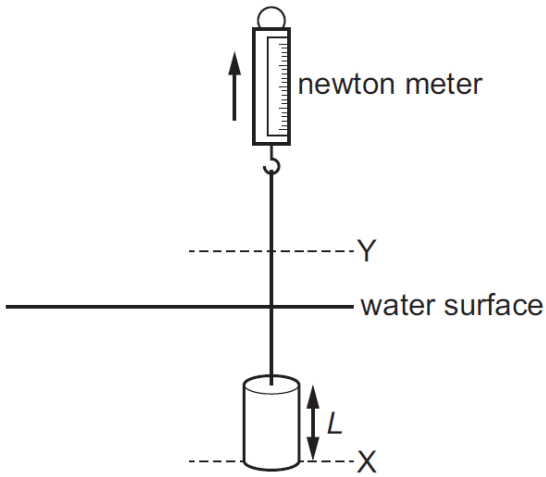
12. Nov/2021/Paper_12/No.15

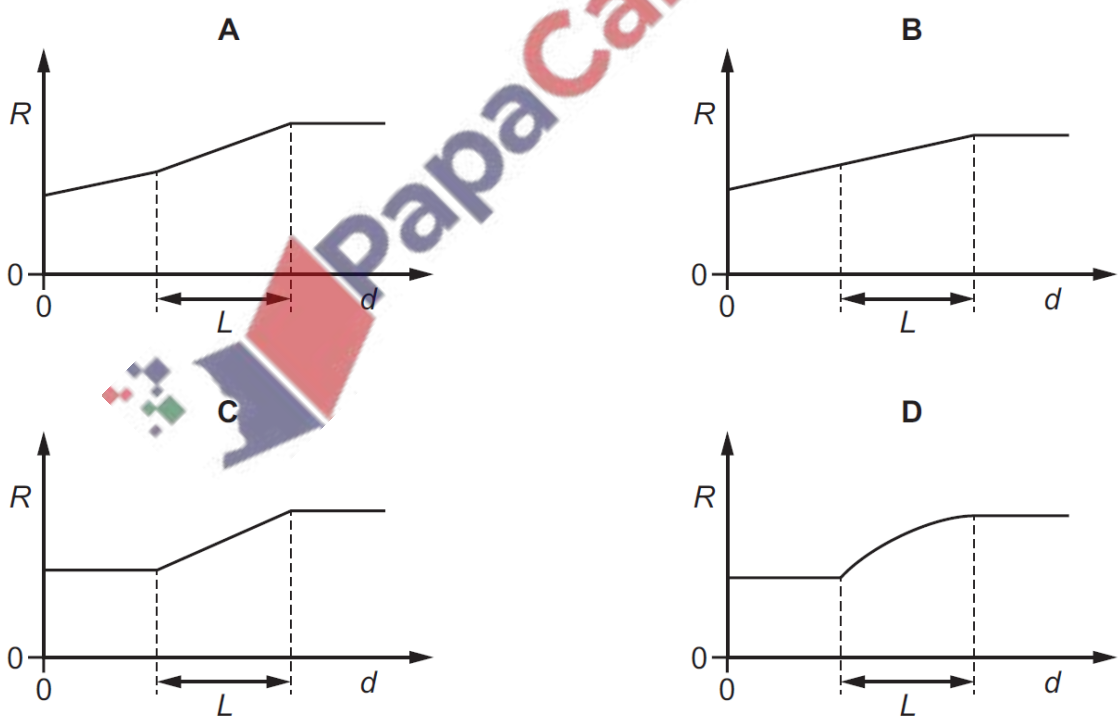
A metal cylinder, totally immersed in water, is hung from a newton meter.



The cylinder, of height *L*, is slowly raised vertically by lifting the newton meter.

As the base of the cylinder moves from line X in the water to line Y above the surface of the water, the reading *R* on the newton meter is recorded. The velocity of the cylinder is constant.

Which graph best shows the variation of *R* with the distance *d* of the base of the cylinder from line X?



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13. Nov/2021/Paper_13/No.12

Two forces act as a couple.

Which statement about the two forces must **not** be correct?

A They act along the same straight line.

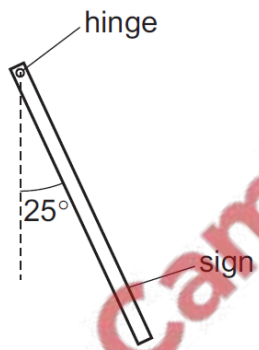
B They act in opposite directions.

C They are the same type of force.

D They have the same magnitude.

14. Nov/2021/Paper_13/No.13

A sign outside a shop is suspended from a rusty horizontal hinge at its top end. The sign hangs in equilibrium at an angle of 25° to the vertical, as shown.



The sign is a square of side length 52 cm and uniform thickness. It has a mass of 36 kg.

What is the moment of the weight of the sign about the hinge?

A 39 N m **B** 78 N m **C** 83 N m **D** 92 N m

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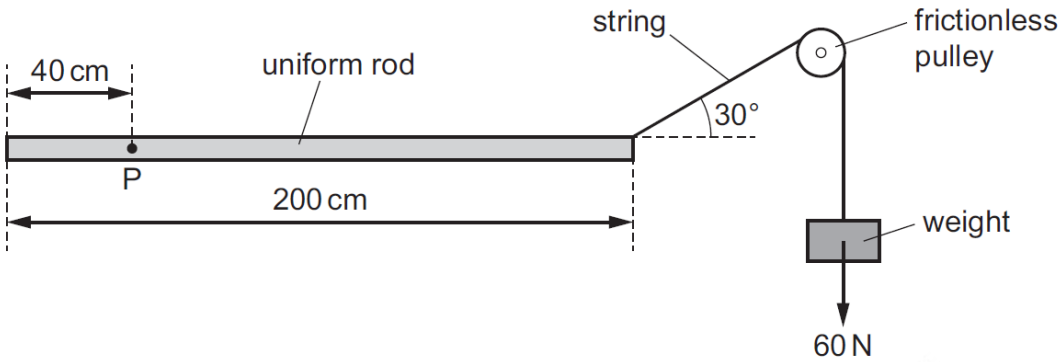
15. Nov/2021/Paper_13/No.14

A uniform rod of length 200 cm is freely pivoted at point P. The rod is held horizontally in equilibrium by a 60 N weight that is attached to the rod by a string passing over a frictionless pulley.



What is the weight of the rod?

A 30 N **B** 60 N **C** 80 N **D** 140 N

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