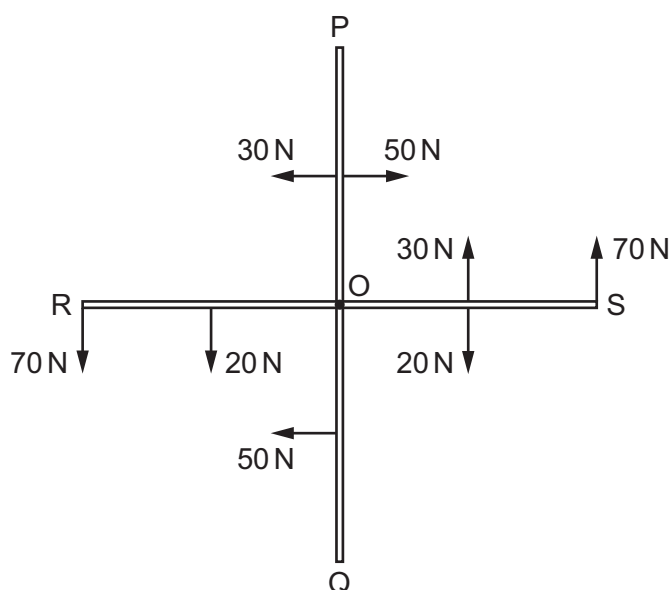


- 17 A rigid cross-shaped structure having four arms PO, SO, QO and RO, each 1.00 m long, is pivoted at O. Forces act on the ends of the arms and on the midpoints of the arms as shown.



What is the magnitude of the resultant moment on the structure about O?

- A 45 Nm      B 90 Nm      C 120 Nm      D 190 Nm
- 18 On the surface of a planet, 30 J of work is done against gravity to raise a mass of 1.0 kg through a height of 10 m.

How much work must be done to raise a mass of 4.0 kg through a height of 5.0 m on this planet?

- A 15 J      B 60 J      C 120 J      D 200 J
- 19 The speed of a car increases from  $10 \text{ m s}^{-1}$  to  $15 \text{ m s}^{-1}$  and its kinetic energy increases by  $E_1$ .

Later, the speed of the car increases from  $15 \text{ m s}^{-1}$  to  $25 \text{ m s}^{-1}$  and its kinetic energy increases by  $E_2$ .

What is the ratio  $\frac{E_2}{E_1}$ ?

- A 1.6      B 2.6      C 3.2      D 4.0
- 20 A car travels at a constant speed of  $25 \text{ m s}^{-1}$  up a slope. The wheels driven by the engine exert a forward force of 3000 N. There is a drag force due to air resistance and friction of 2100 N. The weight of the car has a component down the slope of 900 N.

What is the rate at which thermal energy is dissipated?

- A zero      B  $2.3 \times 10^4 \text{ W}$       C  $5.3 \times 10^4 \text{ W}$       D  $7.5 \times 10^4 \text{ W}$