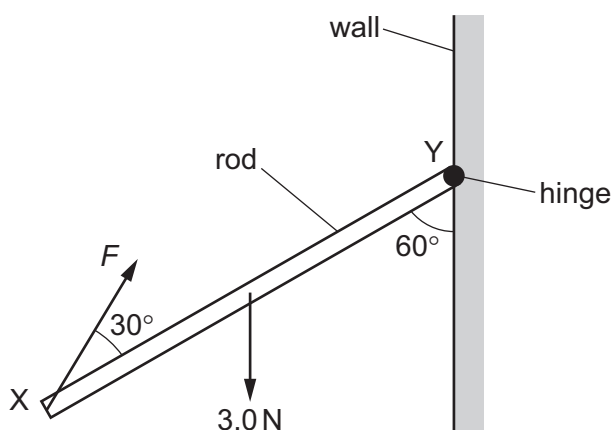


- 12 The diagram shows a uniform rod, XY, that is freely hinged to a vertical wall at end Y. The rod is at an angle of  $60^\circ$  to the wall.



not to scale

A force  $F$  acts at an angle of  $30^\circ$  to the rod at end X. The rod has a weight of  $3.0\text{ N}$  and is in equilibrium.

What is the magnitude of force  $F$ ?

- A**  $0.87\text{ N}$       **B**  $1.5\text{ N}$       **C**  $2.6\text{ N}$       **D**  $5.2\text{ N}$

- 13 Water has a density of  $1.0\text{ g cm}^{-3}$ .

Glycerine has a density of  $1.3\text{ g cm}^{-3}$ .

A student measures out a volume of  $40\text{ cm}^3$  of glycerine into a container.

The student adds water to the container to make a mixture of water and glycerine. Assume that the total volume of water and glycerine does not change when the two liquids are mixed.

Which volume of water needs to be added to make a mixture of density  $1.1\text{ g cm}^{-3}$ ?

- A**  $4.0\text{ cm}^3$       **B**  $8.0\text{ cm}^3$       **C**  $34\text{ cm}^3$       **D**  $80\text{ cm}^3$

- 14 The force resisting the motion of a car is proportional to the square of the car's speed. The magnitude of the force at a speed of  $20.0\text{ m s}^{-1}$  is  $800\text{ N}$ .

What useful output power is required from the car's engine to maintain a steady speed of  $40.0\text{ m s}^{-1}$ ?

- A**  $32\text{ kW}$       **B**  $64\text{ kW}$       **C**  $128\text{ kW}$       **D**  $512\text{ kW}$