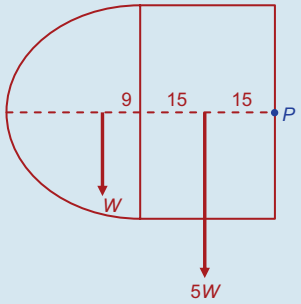
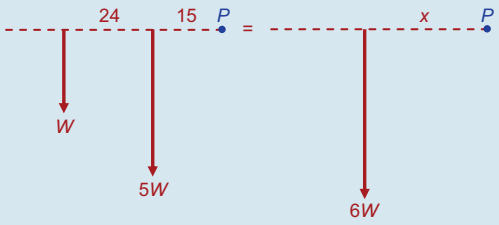
Q. 8.



$5W$ acts through a point
$\frac{1}{2}h = \frac{1}{2}(30) = 15$ mm from P.
W acts through a point $\frac{3}{8}(24) = 9$ mm from the base of the hemisphere, i.e. 39 mm from P.

Here, then, is the diagram of the forces. The total weight of the compound body is $6W$, which acts through a point which is x mm from P.



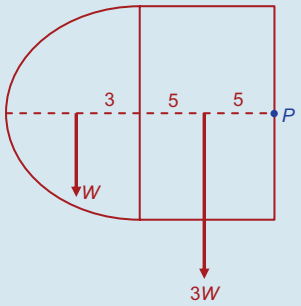
By the Principle of Moments:

$W(39) + 5W(15) = 6W(x)$ … divide by W

$\Rightarrow 114 = 6x$

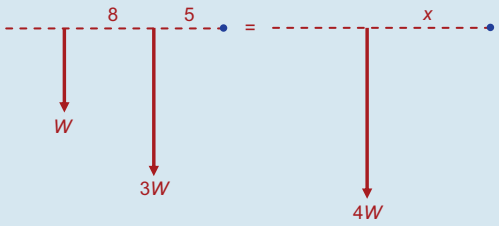
$\Rightarrow x = 19$ mm

Q. 9.



$3W$ acts through a point
$\frac{1}{2}h = \frac{1}{2}(10) = 5$ mm from P.
W acts through a point $\frac{1}{2}(6) = 3$ mm from the base of the hemisphere, i.e. 13 mm from P.

Here, then, is the diagram of the forces. The total weight of the compound body is $4W$, which acts through a point which is x mm from P.



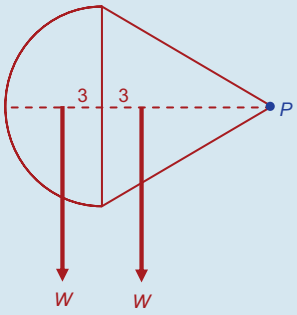
By the Principle of Moments,

$W(13) + 3W(5) = 4W(x)$ … divide by W

$\Rightarrow 28 = 4x$

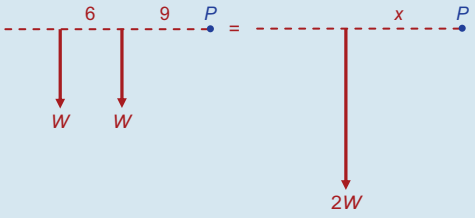
$\Rightarrow x = 7$ mm

Q. 10.



W acts through a point $\frac{1}{4}(12) = 3$ cm from the base of the hemisphere.
W acts through a point $\frac{3}{8}(8) = 3$ cm from the base of the cone, i.e. 15 cm from P.

Here, then, is the diagram of the forces. The total weight of the compound body is $2W$ which acts through a point which is x cm from P.



By the Principle of Moments,

$W(15) + W(9) = 2W(x)$ … divide by W

$\Rightarrow 24 = 2x$

$\Rightarrow x = 12$ cm

i.e. the centre of the compound body is 12 cm from P. This is at the plane where the bases of the two solids meet.

Q. 11. (i) $V_{\text{cylinder}} = \pi r^2 h$

$= \pi(12^2)(40)$

$= 5{,}760\pi \text{ cm}^3$