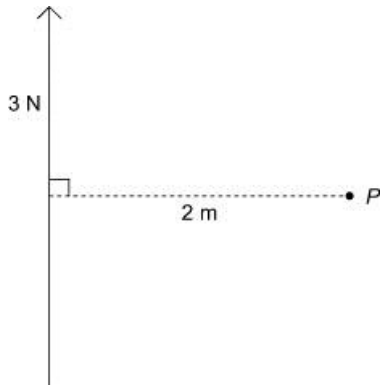
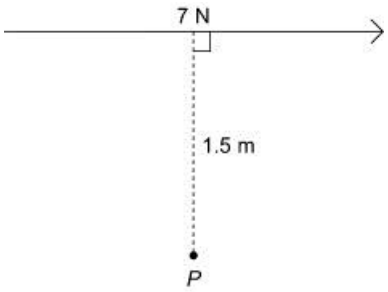
Moments 4A

1 a



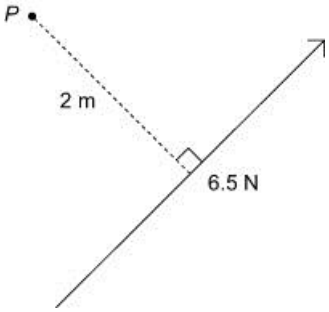
Moment $= 3 \times 2 = 6$ Nm clockwise

b



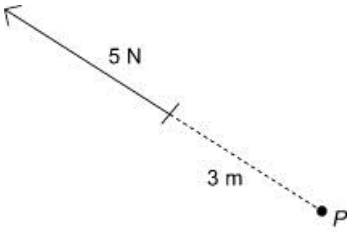
Moment $= 7 \times 1.5 = 10.5$ Nm clockwise

c



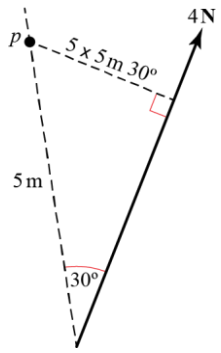
Moment $= 2 \times 6.5 = 13$ Nm anticlockwise

d



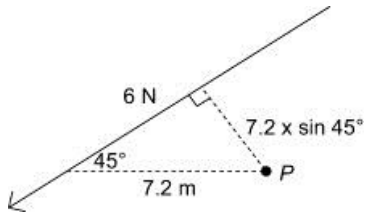
The line of action of the force acts through P, so moment $= 0$ Nm

2 a



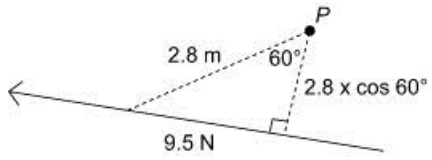
First, draw in the right-angled triangle.
Perpendicular distance $= 5 \times \sin 30°$
Moment $= 4 \times 5 \sin 30°$
$= 10$ Nm anticlockwise

b



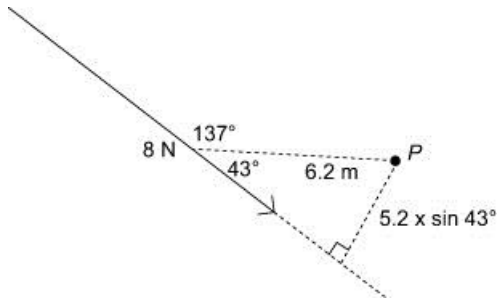
Distance $= 7.2 \times \sin 45°$
Moment $= 6 \times 7.2 \sin 45°$
$= 30.5$ Nm anticlockwise

c



Distance $= 2.8 \times \cos 60°$
Moment $= 9.5 \times 2.8 \cos 60°$
$= 13.3$ Nm clockwise

d



First, draw in the right-angled triangle.
Angle inside the triangle $= 180° - 137° = 43°$

2 d

$\text{Distance} = 6.2 \times \sin 43°$

$\text{Moment} = 8 \times 6.2 \sin 43°$

$= 33.8 \text{ Nm anticlockwise}$

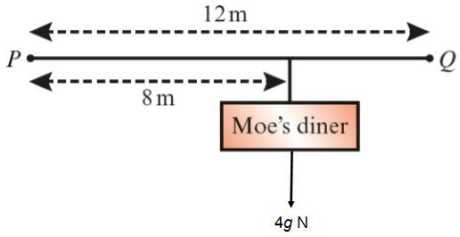
3 a i Moment = magnitude of force × perpendicular distance

Moment about $P = 4g \times 8$

$= 4 \times 9.8 \times 8$

$= 313.6$

The moment about P is 313.6 Nm clockwise.



ii Moment = magnitude of force × perpendicular distance

Moment about $Q = 4g \times (12 - 8)$

$= 4 \times 9.8 \times 4$

$= 156.8$

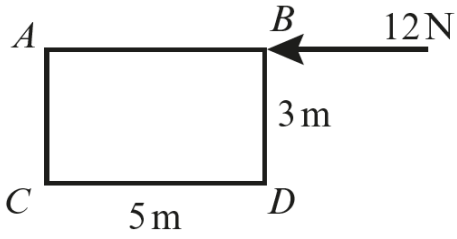
The moment about Q is 156.8 Nm anticlockwise.

b In these calculations, we have assumed that the sign is a particle – i.e. all the weight of the sign acts at its centre of mass.

4 a Moment = magnitude of force × perpendicular distance

Moment about $A = 12 \times 0$

$= 0 \text{ Nm}$



b Moment = magnitude of force × perpendicular distance

Moment about $B = 12 \times 0$

$= 0 \text{ Nm}$

c Moment = magnitude of force × perpendicular distance

Moment about $C = 12 \times 3$

$= 36 \text{ Nm anticlockwise}$

d Moment = magnitude of force × perpendicular distance

Moment about $D = 12 \times 3$

$= 36 \text{ Nm anticlockwise}$

5 Moment = magnitude of force × perpendicular distance

$15 = F \times 12 \sin 30^\circ$

$F = \dfrac{15}{12 \sin 30^\circ}$

$= 2.5 \text{ Nm}$