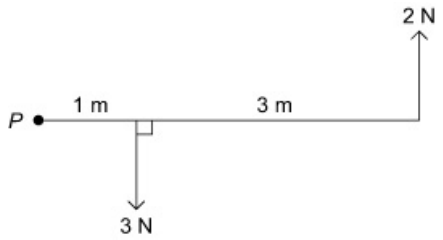
Exercise 8B

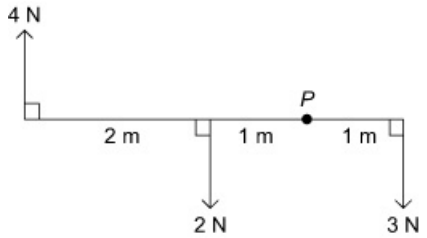
For each question in this exercise, clockwise is assumed to be the positive direction.

1 a



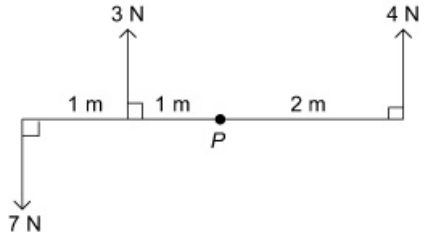
Moment of 3 N force
$= 3 \times 1 = 3$ Nm clockwise
Moment of 2 N force
$= (1+3) \times 2 = 8$ Nm anticlockwise
Resultant moment $= 8 - 3$
$= 5$ Nm anticlockwise

b



Moment of 4 N force
$= 4 \times (2+1) = 12$ Nm clockwise
Moment of 2 N force
$= 2 \times 1 = 2$ Nm anticlockwise
Moment of 3 N force
$= 3 \times 1 = 3$ Nm clockwise
Resultant moment $= 12 - 2 + 3 = 13$ Nm clockwise

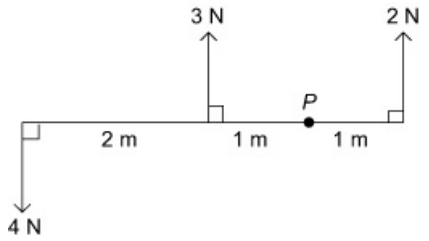
1 c



Moment of 7 N force
$= 7 \times (1+1) = 14$ Nm anticlockwise
Moment of 3 N force
$= 3 \times 1 = 3$ Nm clockwise
Moment of 4 N force
$= 4 \times 2 = 8$ Nm anticlockwise

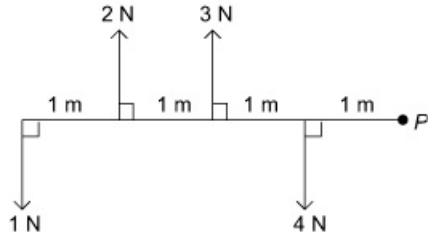
1 c Resultant moment $= -14 + 3 - 8 = -19$ Nm
The resultant moment is 19 Nm anticlockwise.

d



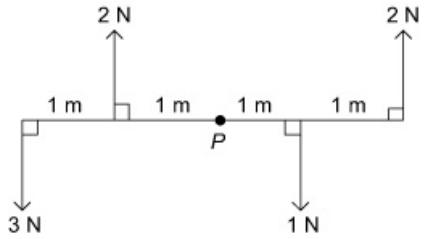
Moment of 4 N force
$= 4 \times (2 + 1) = 12$ Nm anticlockwise
Moment of 3 N force
$= 3 \times 1 = 3$ Nm clockwise
Moment of 2 N force
$= 2 \times 1 = 2$ Nm anticlockwise
Resultant moment $= -12 + 3 - 2 = -11$ Nm
The resultant moment is 11 Nm anticlockwise.

e



Moment of 1 N force
$= 1 \times (1 + 1 + 1 + 1) = 4$ Nm anticlockwise
Moment of 2 N force
$= 2 \times (1 + 1 + 1) = 6$ Nm clockwise
Moment of 3 N force
$= 3 \times (1 + 1) = 6$ Nm clockwise
Moment of 4 N force
$= 4 \times 1 = 4$ Nm anticlockwise
Resultant moment $= -4 + 6 + 6 - 4 = 4$ Nm clockwise

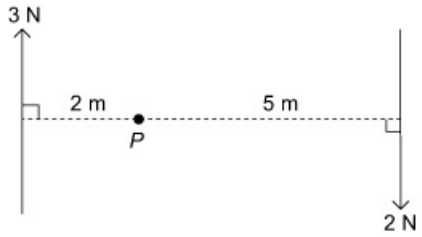
f



Moment of 3 N force
$= 3 \times (1 + 1) = 6$ Nm anticlockwise
Moment of 2 N force to the left of P
$= 2 \times 1 = 2$ Nm clockwise

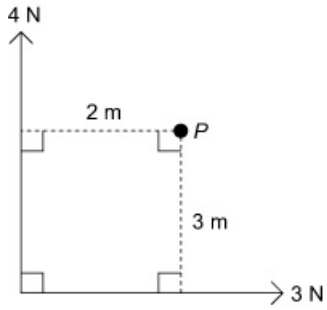
1 f Moment of 1 N force
$= 1 \times 1 = 1$ Nm clockwise
Moment of 2 N force to the right of P
$= 2 \times (1+1) = 4$ Nm anticlockwise
Resultant moment $= -6 + 2 + 1 - 4 = -7$ Nm
The resultant moment is 7 Nm anticlockwise.

2 a



Moment of 3 N force
$= 3 \times 2 = 6$ Nm clockwise
Moment of 2 N force
$= 2 \times 5 = 10$ Nm clockwise
Resultant moment $= 6 + 10 = 16$ Nm clockwise

b

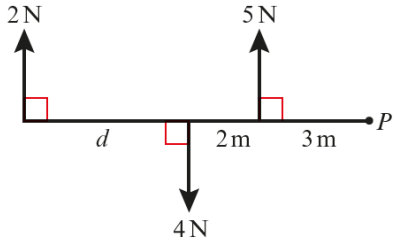


Moment of 4 N force
$= 4 \times 2 = 8$ Nm clockwise
Moment of 3 N force
$= 3 \times 3 = 9$ Nm anticlockwise
Resultant moment $= 8 - 9 = -1$ Nm
The resultant moment is 1 Nm anticlockwise.

3 Moment of 2 N force about P
$= 2 \times (5 + d)$ Nm clockwise
Moment of 5 N force about P
$= 5 \times 3 = 15$ Nm clockwise
Moment of 4 N force about P
$= 4 \times (2 + 3) = 20$ Nm anticlockwise
Resultant moment = 17 Nm clockwise so:

$$2(5+d) + 15 - 20 = 17$$
$$5 + 2d = 17$$
$$2d = 12$$
$$d = 6$$

The distance d is 6 m.



4 Moment of 6 N force about P
$= 6 \times (2 + 3 + 1)x = 36x$ Nm clockwise.
Moment of 12 N force about P
$= 12x$ Nm clockwise.
Moment of 10 N force about P
$= 10 \times (3 + 1)x = 40x$ Nm anticlockwise.
Resultant moment = 12.8 Nm clockwise so:

$$36x + 12x - 40x = 12.8$$

$$8x = 12.8$$

$$x = 1.6$$

The distance x is 1.6 m.