Chapter 8 Exercise 8A

Q. 1. (a) $R = 4\vec{j} + 5\vec{j} + \vec{j} = 10\vec{j}$ N

$4(0) + 5(50) + 1(100) = 10(x)$

$\Rightarrow x = 35$ cm

Answer: 35 cm from P

(b) $R = 2\vec{j} + \vec{j} + 2\vec{j} = 5\vec{j}$

$2(0) + 1(2) + 2(5) = 5x$

$\Rightarrow x = 2.4$ m

Answer: 2.4 m from P

(c) $R = \vec{j} - 7\vec{j} + \vec{j} = -5\vec{j}$

$1(0) - 7(1) + 1(2) = -5(x)$

$\Rightarrow x = 1$

Answer: 1 m from P

(d) $R = 3\vec{j} - 9\vec{j} + 3\vec{j} = -3\vec{j}$

$3(1) - 9(3) + 3(5) = -3x$

$\Rightarrow x = 3$

Answer: 3 m from P

(e) $R = \vec{j} - 2\vec{j} - 3\vec{j} + \vec{j} = -3\vec{j}$

$1(0) - 2(2) - 3(5) + 1(6) = -3(x)$

$\Rightarrow x = 4\frac{1}{3}$

Answer: $4\frac{1}{3}$ m from P

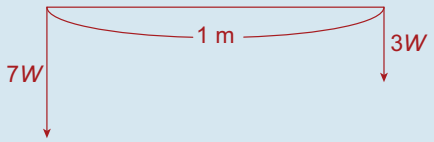
Q. 2. $R = 2W + W + 3W = 6W$

$2W(0) + W(3) + 3W(6) = 6W(x)$

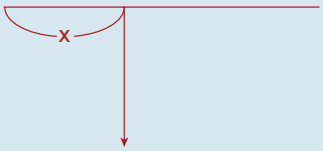
$\Rightarrow x = 3\frac{1}{2}$

Answer: $3\frac{1}{2}$ M and $2\frac{1}{2}$ M from the ends.

Q. 3. **Forces:**



Resultant:



$R = 7W + 3W = 10W$

$7W(0) + 3W(1) = 10W(x)$

$\Rightarrow x = \frac{3}{10}$ m

$= 30$ cm $=$ Answer

Q. 4. Let the length of the plank be 1.
Let d = the distance from the resultant's line of action from the left-hand end.

$R = W + x$

$\therefore W(0) + x(1) = (W + x)d$

$\Rightarrow d = \frac{x}{W + x}$

The remainder is $1 - \frac{x}{W + x} = \frac{W}{W + x}$

The ratio of these parts $= \frac{x}{W + x} : \frac{W}{W + x}$

$= x : W$

Q. 5. (i) $R = 4W + W + KW = (5 + K)W$

Taking moments about p.

$4W(0) + W(1) + KW(2) = (5 + K)W\left(\frac{7}{8}\right)$

$\Rightarrow 1 + 2K = \frac{7(5 + K)}{8}$

$\Rightarrow 8 + 16K = 35 + 7K$

$\Rightarrow K = 3$

(ii) $4W(0) + W(1) + KW(2) = (5 + K)W\left(\frac{11}{10}\right)$

$\Rightarrow 1 + 2K = \frac{11(5 + K)}{10}$

$\Rightarrow 10 + 20K = 55 + 11K$

$\Rightarrow K = 5$

Exercise 8B

Q. 1. $\left.\begin{array}{l} 3N \text{ at } (2, 1) \\ 2N \text{ at } (4, 3) \\ 1N \text{ at } (10, 9) \end{array}\right\} = 6N \text{ at } (x, y)$

$3(2) + 2(4) + 1(10) = 6(x)$

$\Rightarrow x = 4$

$3(1) + 2(3) + 1(9) = 6(y)$

$\Rightarrow y = 3$

Answer: (4, 3)

Q. 2. $\left.\begin{array}{l} 1N \text{ at } (1, 1) \\ 2N \text{ at } (1, 7) \\ 3N \text{ at } (3, 1) \\ 4N \text{ at } (2, 3) \end{array}\right\} = 10N \text{ at } (x, y)$