

Solutions

1a.

Moments about C	M1
$25\text{g} \times 2 = 40\text{g} \times x$	M1
$x = 1.25\text{m}$	M1

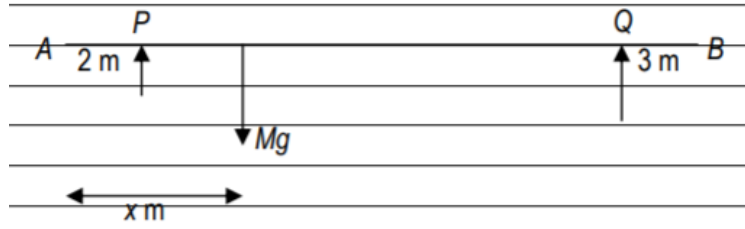
1b.

Weight/mass acts at mid-point; or weight/mass evenly distributed	M1
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Solutions

1a.



M1

Taking moments abouts P

M1

$$50g \times 2 = mg \times (x - 2)$$

M1

Taking moments about Q

M1

$$50g \times 3 = mg \times (12 - x)$$

M1

Solving by elimination

M1

$$m = 25 \text{ kg}$$

M1

$$x = 6$$

M1

Solutions

1a.

	M1
Taking moments about D	M1
$mg \times GD = \frac{5}{2}mg \times d$	M1
$GD = \frac{5}{2}d$	M1

1b.

	M1
Taking moments about C	M1
$mg \times \frac{d}{2} + \frac{5}{2}mg \times \frac{3}{2}d = Y \times 3d$	M1
$Y = \frac{17}{12}mg$	M1

Solutions

1a.

Taking moments about A	M1
$4g \times 0.7 \times \cos 20 = 1.4T$	M1
$T = 18.4\text{N}$	M1

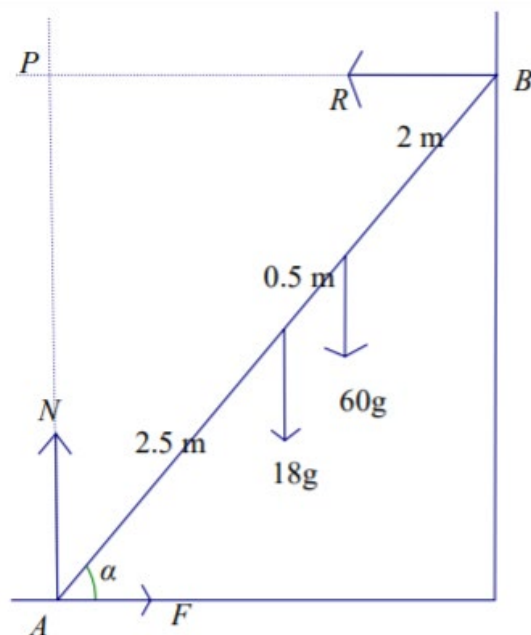
1b.

Resolving vertically	M1
$R + T \cos 20 = 4g$ $R = 4g - T \cos 20$	M1
Resolving horizontally	M1
$F = T \sin 20$	M1
$F = \mu R$ $F = T \sin 20$	M1
$T \sin 20 = \mu(4g - T \cos 20)$	M1
$\mu = \frac{T \sin 20}{4g - T \cos 20} = 0.29$	M1



Solutions

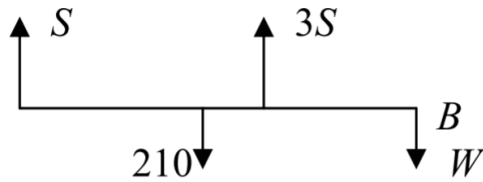
1.



$F = \mu N$	M1
Resolving vertically $18g + 60g = N$ $N = 78g$	M1
Resolving horizontally $R = F = \mu N$	M1
$2.5 \times 18g \cos \alpha + 3 \times 60g \cos \alpha = 5F \sin \alpha$ $18g \times 2.5 \cos \alpha + 60g \times 3 \cos \alpha = R \times 5 \sin \alpha$ $\frac{1}{2} \cos \alpha \times 18g + 3 \sin \alpha F + 2 \sin \alpha R = 3 \cos \alpha N$	M1
$5 \cos \alpha N = 5 \sin \alpha F + 2.5 \cos \alpha \times 18g + 2 \cos \alpha \times 60g$ $60g \times \frac{1}{2} \cos \alpha + 2.5N \cos \alpha = 2.5R \sin \alpha + 2.5F \sin \alpha$	M1
$45 \times \frac{3}{5}g + 180 \times \frac{3}{5}g = 4R$ $R = \frac{135}{4}g$	M1
$78g\mu = \frac{135}{4}g$	M1
$\mu = \frac{135}{4 \times 78} = \frac{135}{312}$ $= 0.43$	M1

Solutions

1a.



Resolving vertically	M1
$4S = 210 + W$	M1
Taking moment about B (o.e)	M1
$S \times 120 + 3S \times 30 = 210 \times 60$	M1
Solving simultaneously	M1
$(S = 60)$ $W = 30$	M1