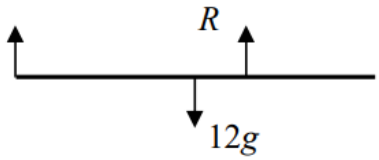
Moments In 1 Dimension (From Edexcel 6677)

Q1, (Jun 2005, Q6)

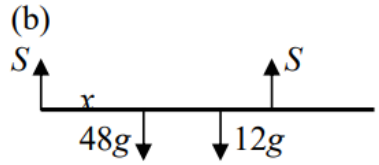


(a) M(A): $12g$ x 1.5 = R x 2 — M1 A1

R = 9g or 88.2 N — A1

(3)

(b)



R(↑) $2S = 48g + 12g$ — M1 A1

$S = 30g$

M(A): S x 2 = $12g$ x 1.5 + $48g$ x x — M1 A2,1,0

Sub for S and solve for x: x = 7/8 or 0.875 or 0.88 m — M1 A1

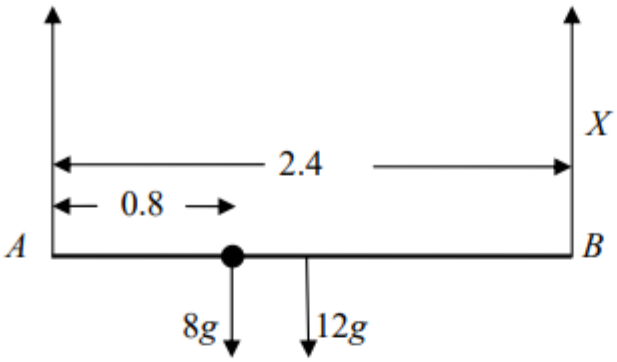
(7)

Q2, (Jan 2007, Q2)

(a)	M(C) $80 \times x = 120 \times 0.5$			M1 A1
	$x = 0.75$ ✱		cso	A1 3
(b)	Using reaction at $C = 0$			B1
	M(D) $120 \times 0.25 = W \times 1.25$		ft their x	M1 A1
	$W = 24$ (N)			A1 4
(c)	i $X = 24 + 120 = 144$ (N)		ft their W	M1 A1ft 2
(d)	The weight of the rock acts precisely at B.			B1 1 **10**

Q3, (Jun 2008, Q6)

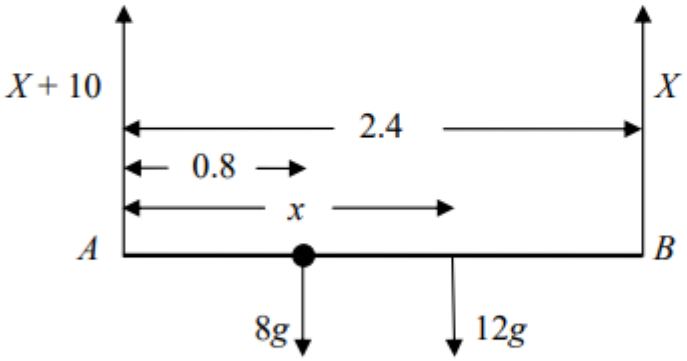
(a)



$M(A)$ $\quad 8g \times 0.8 + 12g \times 1.2 = X \times 2.4$ M1 A1

$X \approx 85 \ (\text{N})$ accept 84.9, $\frac{26g}{3}$ DM1 A1 **(4)**

(b)



$R(\uparrow)$ $\quad \underline{(X+10)} + \underline{X} = 8g + 12g$ M1 B1 A1

$(X = 93)$

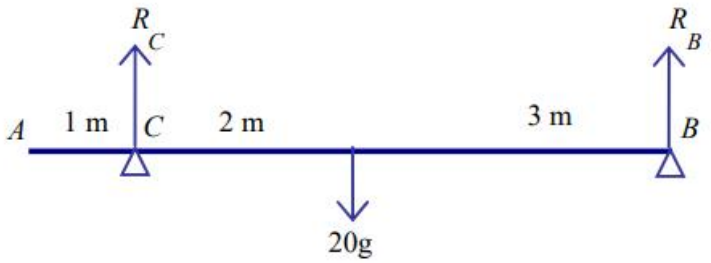
$M(A)$ $\quad 8g \times 0.8 + 12g \times x = X \times 2.4$ M1 A1

$x = 1.4 \ (\text{m})$ accept 1.36 A1 **(6)**

[10]

Q4, (Jan 2011, Q3)

(a)



Taking moments about B: $5 \times R_C = 20g \times 3$ — M1A1

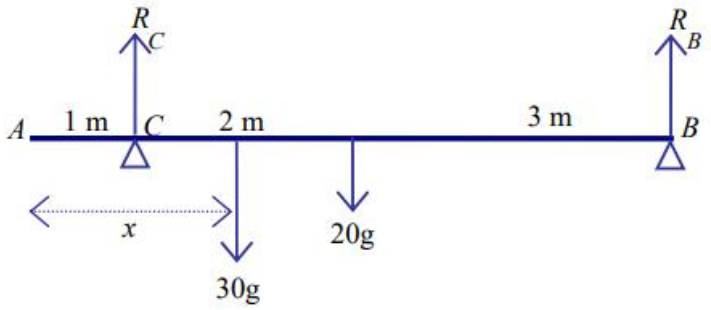
$R_C = 12g$ or $60g/5$ or 118 or 120 — A1

Resolving vertically: $R_C + R_B = 20g$ — M1

$R_B = 8g$ or 78.4 or 78 — A1

(5)

(b)



Resolving vertically: $50g = R + R$ — B1

Taking moments about B:

$$5 \times 25g = 3 \times 20g + (6 - x) \times 30g$$ — M1 A1 A1

$30x = 115$

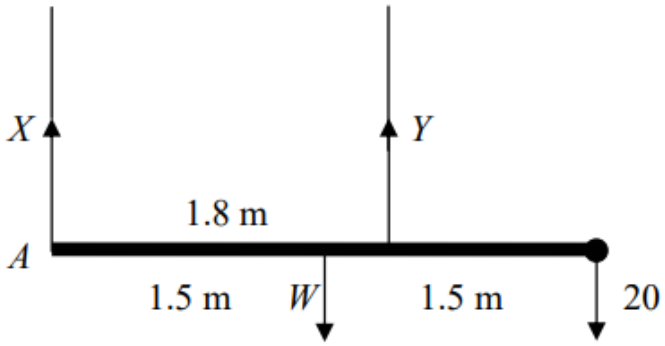
$x = 3.8$ or better or 23/6 oe — A1

(5)

[10]

Q5, (Jan 2010, Q4)

(a)

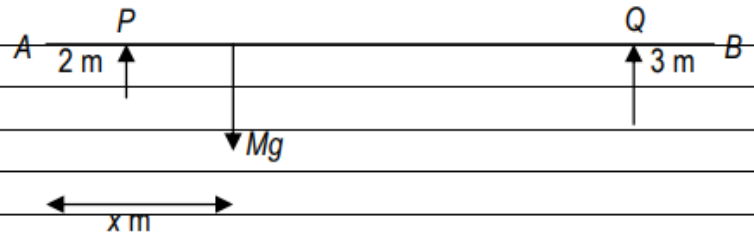
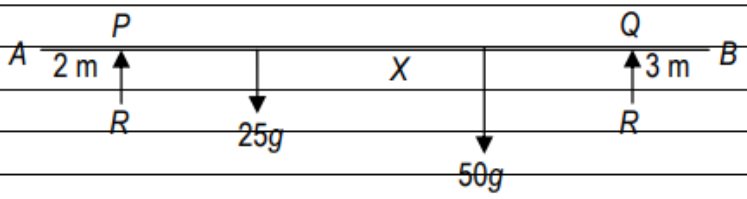


M (A)	$W \times 1.5 + 20 \times 3 = Y \times 1.8$		M1 A2 (1, 0)
	$Y = \frac{5}{6}W + \frac{100}{3}$ *	cso	A1 (4)
(b) ↑	$X + Y = W + 20$	or equivalent	M1 A1
	$X = \frac{1}{6}W - \frac{40}{3}$		A1 (3)
(c)	$\frac{5}{6}W + \frac{100}{3} = 8\left(\frac{1}{6}W - \frac{40}{3}\right)$		M1 A1 ft
	$W = 280$		A1 (3)
			[10]

Alternative to (b)

M(C)	$X \times 1.8 + 20 \times 1.2 = W \times 0.3$	M1 A1
	$X = \frac{1}{6}W - \frac{40}{3}$	A1

Q6, (Jun 2013, Q6)

(a)		
	$M(P),\quad 50g\times 2 = Mg\times(x-2)$	M1 A1
	$M(Q),\quad 50g\times 3 = Mg\times(12-x)$	M1 A1
(i)	$M = 25$ (kg)	**DM**1 A1
(ii)	$x = 6$ (m)	**DM**1 A1
		(8)
(b)		
	$(\uparrow) R + R = 25g + 50g$	M1 A1 **ft**
	$M(A),\quad 2R + 12R = 25g\times 6 + 50g\times AX$	M1 A1 **ft**
	$AX = 7.5$ (m)	**DM**1 A1
		(6)
		[14]

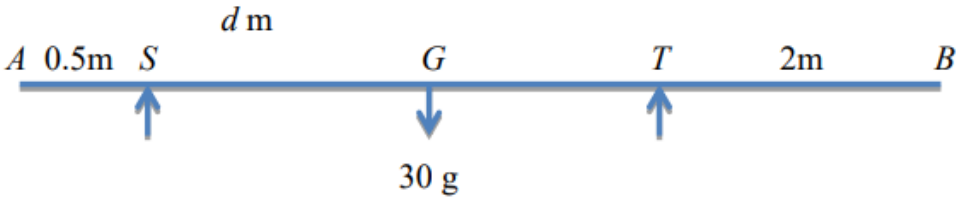
Q7, (Jan 2013, Q2)

.(a)	$M(D),\quad 8R = (80g \text{ x } 6) + (200g \text{ x } 4)$ $R = 160g,\ 1600,\ 1570$	M1 A1 A1 (3)
(b)	$(\uparrow),\quad 2S = 80g + 200g$ $S = 140g,\ 1400,\ 1370$	M1 A1 (2)
(c)	$M(B),\quad Sx + (S \text{ x } 10) = (80g \text{ x } 8) + (200g \text{ x } 6)$ $140x + 1400 = 640 + 1200$ $140x = 440$ $x = \frac{22}{7}$	M1 A2 A1 (4) **9**

Q8, (Jun 2014, Q4)

a	Resolving vertically: $T+2T\left(=3T\right)=W$	M1A1
	Moments about A: $2W=2T\times d$	M1A1
	Substitute and solve: $2W=2\dfrac{W}{3}d$	**DM1**
	$d=3$	A1 (6)
b	Resolving vertically: $T+4T=W+kW \quad \left(5T=W\left(1+k\right)\right)$	M1A1 **ft**
	Moments about A: $2W+4kW=3\times 4T$	M1A1 **ft**
	Substitute and solve: $2W+4kW=\dfrac{12}{5}W\left(1+k\right)$	**DM1**
	$2+4k=\dfrac{12}{5}+\dfrac{12}{5}k$	
	$\dfrac{8}{5}k=\dfrac{2}{5}, \qquad k=\dfrac{1}{4}$	A1 (6)
		[12]

Q9, (Jun 2016, Q6)



$M(S)$: $Mg \times 0.5 = 30g(d - 0.5)$	M1 A1
$M(T)$: $Mg \times 2 = 30g(4 - d)$	M1 A1
dividing: $4 = \dfrac{(4 - d)}{(d - 0.5)}$ => (i) $d = 1.2$	**DM1** A1
=> (ii) $M = 42$	A1

Q10, (Jun 2015, Q5)

(a)	$T_A + T_C = 85g$	M1 A1
	OR $M(A)$, $25g \times 2.5 + 60g \times 5 = 4.5 \times T_C$	
	OR $M(C)$, $T_A \times 4.5 + 60g \times 0.5 = 25g \times 2$	
	OR $M(B)$, $T_A \times 5 + T_C \times 0.5 = 25g \times 2.5$	M1 A1
	OR $M(G)$, $T_A \times 2.5 + 60g \times 2.5 = 2 \times T_C$	
	$T_A = \dfrac{40g}{9} = 44\text{N or } 43.6\text{N}; \; T_C = \dfrac{725g}{9} = 790\text{N or } 789\text{ N}$	A1; A1 (6)
(b)	$M(C)$, $25g \times 2 = Mg \times 0.5$	M1 A1
(i)	$M = 100$	A1
(ii)	$T_c = 25g + 100g$	M1 A1
	$T_c = 125g \ (1200 \text{ or } 1230)\text{N}$	B1 (6) **12**