$\overrightarrow{ca} = 4\cos 60°\vec{i} + 4\sin 60\vec{j}$

$= 2\vec{i} + 2\sqrt{3}\vec{j}$

$\Rightarrow \vec{R} = 6\vec{i} + 6\sqrt{3}\vec{j}$

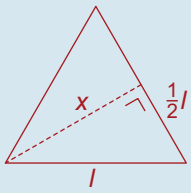
$\therefore |\vec{R}| = \sqrt{6^2 + (6\sqrt{3})^2}$

$= \sqrt{36 + 108}$

$= \sqrt{144}$

$= 12$ N

(ii)



$x^2 + \left(\frac{1}{2}l\right) = l^2$

$\Rightarrow x = \frac{\sqrt{3}}{2}l$

Taking moments about *a*:

Moment of the sum = the sum of the moments

$12(x) = 8(0) + 8\left(\frac{\sqrt{3}}{2}l\right) + 4(0)$

$\Rightarrow 12x = 4\sqrt{3}l$

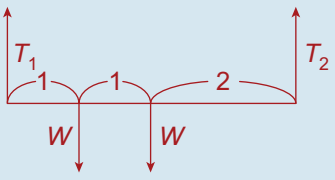
$\Rightarrow x = \frac{\sqrt{3}}{3}l$

$= \frac{1}{\sqrt{3}}l$ m

The moment of the forces about *a* was $4\sqrt{3}l$ N m, so the moment $M = 4\sqrt{3}l$ N m.

Exercise 8F

Q. 1.



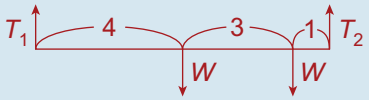
① $T_1 + T_2 = 2W$

② $W(1) + W(2) = T_2(4)$

$\Rightarrow T_2 = \frac{3}{4}W$

$\Rightarrow T_1 = 1\frac{1}{4}W$

Q. 2.



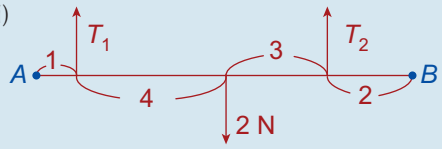
① $T_1 + T_2 = 2W$

② $W(4) + W(7) = T_2(8)$

$\Rightarrow T_2 = \frac{11}{8}W$

$\Rightarrow T_1 = \frac{5}{8}W$

Q. 3. (i)



① $T_1 + T_2 = 2$

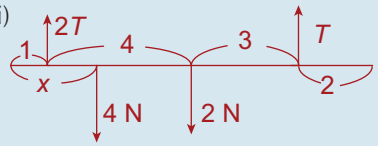
② $2(5) = T_1(1) + T_2(8)$

$\Rightarrow T_1 + T_2 = 10$

Solving these gives $T_1 = \frac{8}{7}$ N,

$T_2 = \frac{6}{7}$ N

(ii)



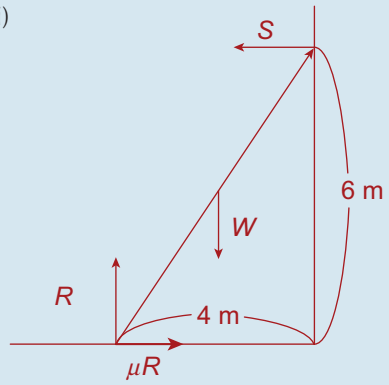
① $T + 2T = 6$

$\Rightarrow T = 2$ N

② $4(x) + 2(5) = 4(1) + 2(8)$

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

Q. 4. (i)



① $R = W$

② $\mu R = S$