③ Taking moments about p:

$W(6) = \frac{5}{13}T(12)$

$\Rightarrow T = \frac{13}{10}W$

$\therefore X = \frac{12}{13}\left(\frac{13}{10}W\right)$

$= \frac{6}{5}W$

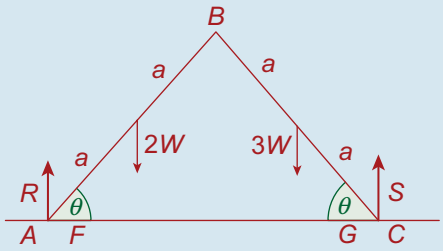
$Y + \frac{5}{13}\left(\frac{13}{10}T\right) = W$

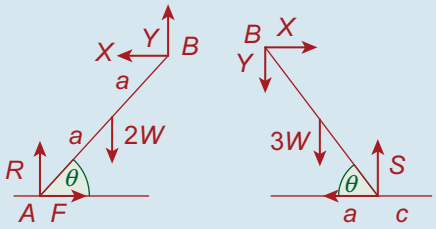
$\Rightarrow Y = \frac{1}{2}W$

Answer: (i) $\frac{6}{5}W, \frac{1}{2}W$

(ii) $\frac{13}{10}W$

Q. 5. (i)





(ii) **From system *ABC***

① $R + S = 2W + 3W$

$\Rightarrow R + S = 5W$

② $F = G$

③ Taking moments about a.

$2W(a\cos\theta) + 3W(3a\cos\theta) = S(4a\cos\theta)$

$\Rightarrow 4S = 11W$

$\Rightarrow S = 2\frac{3}{4}W$

$\therefore R = 2\frac{1}{4}W$, from **Equation 1**.

(iii) Since $R < S$, $\mu R < \mu S$

$\therefore$ slipping will occur at A first.

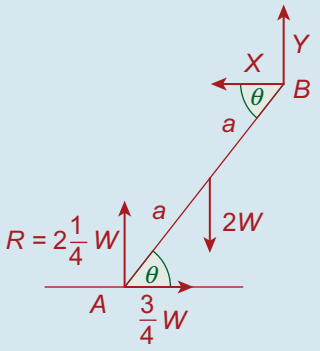
(iv) Let the rod AB be on the point of slipping.

$\therefore F = \mu R$

$= \frac{1}{3}R$

$= \frac{1}{3}\left(2\frac{1}{4}W\right)$

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



① $R + Y = 2W$

② $\frac{3}{4}W = X$

③ Taking moments about B:

$2W(a\cos\theta) + \frac{3}{4}W(2a\sin\theta) = 2\frac{1}{4}(2a\cos\theta)$

$\Rightarrow 2\cos\theta + \frac{3}{2}\sin\theta = \frac{3}{2}\cos\theta$

$\Rightarrow 3\sin\theta = 5\cos\theta$

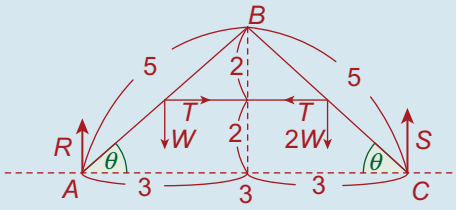
$\Rightarrow 3\tan\theta = 5$

$\Rightarrow \tan\theta = \frac{5}{3}$

$\Rightarrow \theta = \tan^{-1}\frac{5}{3}$

$= 59°2'$

Q. 6.



Since $\cos\theta = \frac{3}{5}$, $\sin\theta = \frac{4}{5}$ and $\tan\theta = \frac{4}{3}$

The system *ABC*

① $R + S = W + 2W$

$\Rightarrow R + S = 3W$