② $T = T$

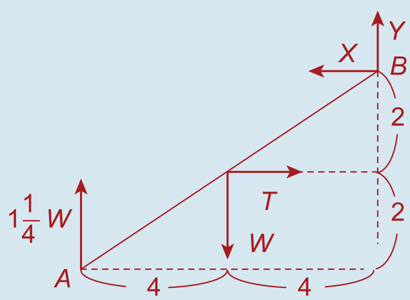
③ Taking moments about A:

$$W\left(1\frac{1}{2}\right) + T(2) + 2W\left(4\frac{1}{2}\right)$$

$$= T(2) + S(6)$$

$$\Rightarrow S = 1\frac{3}{4}W$$

$$\therefore R = 1\frac{1}{4}W, \text{ from } \textbf{Equation 1}$$



The rod *AB*

① $1\frac{1}{4}W + Y = W$

$$\Rightarrow Y = -\frac{1}{4}W$$

② $T = X$

③ Taking moments about B:

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

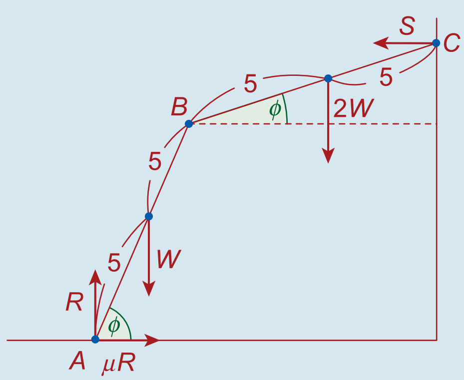
$$\Rightarrow T = 1\frac{1}{8}W$$

Answer: $T = 1\frac{1}{8}W$,

$R = 1\frac{1}{4}W$,

$S = 1\frac{3}{4}W$

Q. 7.



Since $\tan\phi = \frac{4}{3}$,

$\sin\phi = \frac{4}{5}$,

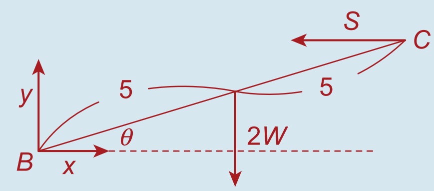
$\cos\phi = \frac{3}{5}$

① $R = W + 2W = 3W$

② $\mu R = S$

③ Taking moments about A:

$$W(5\cos\phi) + 2W(10\cos\phi + 5\cos\theta)$$
$$= S(10\sin\phi + 10\sin\theta)$$
$$\Rightarrow 3W + 12W + 10W\cos\theta$$
$$= 8S + 10S\sin\theta$$
$$\Rightarrow 15W + 10W\cos\theta = 8S + 10S\sin\theta$$



④ $Y = 2W$

⑤ $X = S$

⑥ Taking moments about B:

$$2W(5\cos\theta) = S(10\sin\theta)$$
$$\Rightarrow 10W\cos\theta = 10S\sin\theta$$

This means that Equation ③ reads:

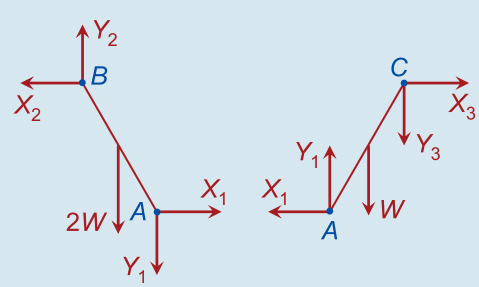
$$15W + 10S\sin\theta = 8S + 10S\sin\theta$$

$$\Rightarrow S = \frac{15}{8}W$$

Equation ② now reads:

$$\mu R = S$$
$$\Rightarrow \mu(3W) = \frac{15}{8}W$$
$$\Rightarrow \mu = \frac{5}{8}$$

Q. 8. (i) Let the length of each rod be $2l$.
Here are the forces acting on the rods AB and AC:



Rod *AB*:

Taking moments around B we get:

$2W(l\cos\beta) + Y_1(2l\cos\beta)$

$= X_1(2l\sin\beta)$ ... divide by $2l\cos\beta$

$\Rightarrow W + Y_1 = X_1\tan\beta$ ... **Equation 1**