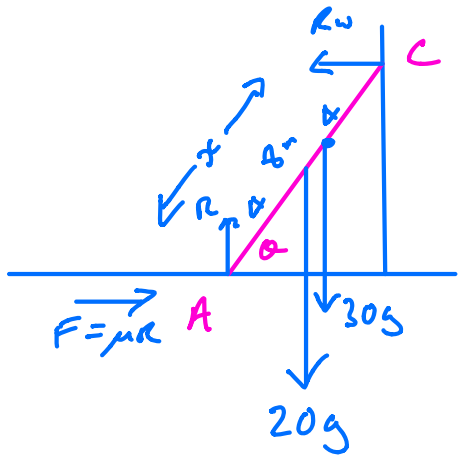
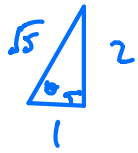
Exercise 7J Q4




$\tan\theta = 2$

$\sin\theta = \frac{2}{\sqrt{5}}$

$\cos\theta = \frac{1}{\sqrt{5}}$




$\mu = 0.3$

Resolve ↕

$R = 20g + 30g$

$R = 50g$

Resolve ↔

$F = R_w$

At point of slipping

$\mu R = R_w$

$0.3 \times 50g = R_w$

$R_w = 15g$

Moments about A

$$20g \times 4\cos\theta + 30g \times x\cos\theta = R_w \times 8\sin\theta$$

$$80g \times \frac{1}{\sqrt{5}} + 30g \times \frac{x}{\sqrt{5}} = 15g \times \frac{16}{\sqrt{5}}$$

$$80 + 30x = 240$$

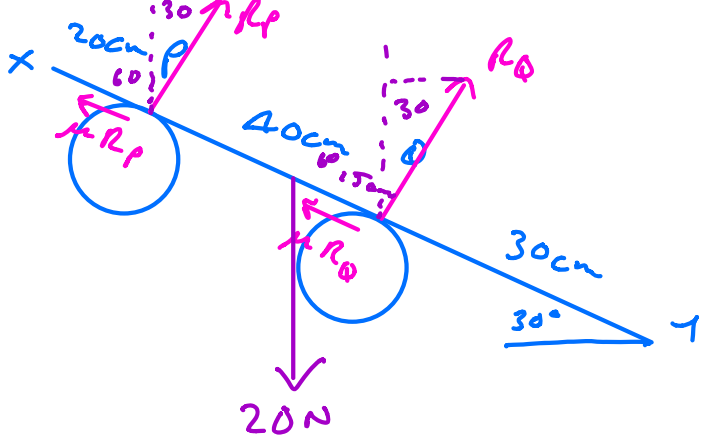
$$30x = 240 - 80$$

$$30x = 160$$

$$x = \frac{160}{30}$$

$$x = 5\tfrac{1}{3}\text{ m}$$

Q10




$\mu$ same at P and Q

$\perp$ to rod

$$R_P + R_Q = 20 \sin 60^\circ$$

$$R_P + R_Q = 10\sqrt{3} \quad (1)$$

Moments about Y

$$0.7 R_P + 0.3 R_Q = 20 \times 0.45 \cos 30$$

$$0.7 R_P + 0.3 R_Q = 4.5\sqrt{3} \quad (2)$$

$R_P = 6.495$ N $\qquad R_Q = 10.825$

$R_P = 6.5$ N $\qquad R_Q = 10.8$ N

Resolve Parallel to Rod

$$\mu R_P + \mu R_Q = 20 \cos 60$$

$$\mu(R_P + R_Q) = 10$$

$$\mu = \frac{10}{6.495 + 10.825} = 0.577$$

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Classwork / Hwk Ex 7D Q3, Q9, Q11