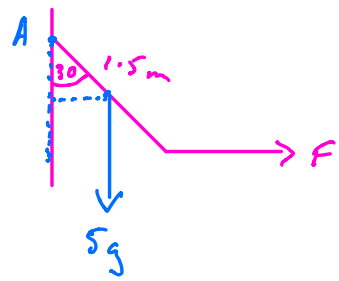
Moments

Exercise 4c Q10



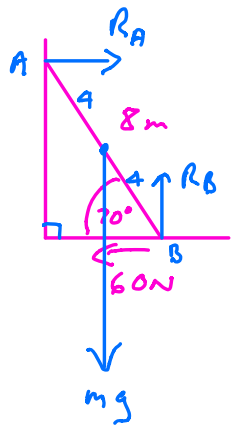
Moments about A

$$5g \times 0.75 \sin 30 = F \times 1.5 \cos 30$$

$$\frac{(5g \times 0.75 \sin 30)}{(1.5 \cos 30)} = F$$

$$F = 14.1 \text{ N}$$

Q11



a) $\leftrightarrow$ equilibrium

$R_A = 60$ N

b) moments about B

$$mg \times 4\cos 70 = R_A \times 8 \sin 70$$

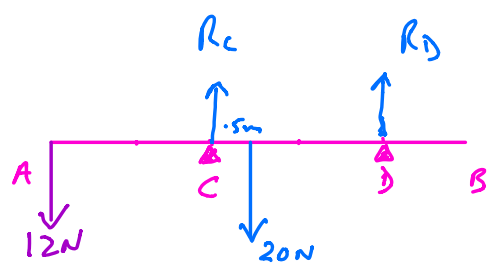
$$m = \frac{(60 \times 8 \sin 70)}{(g \times 4 \cos 70)}$$

$$m = 33.6 \text{ kg}$$

Tilting

Exercise 4E

Q4



a) Find R_C and R_D

Moments about C $\quad 20 \times 0.5 = R_D \times 2$

$\frac{10}{2} = R_D$

$R_D = 5\ N$

$\updownarrow$ equilibrium $\quad R_C = 15\ N$

b) Moments about C

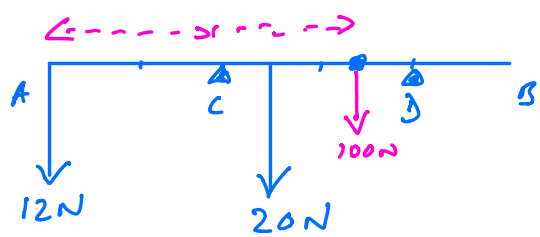
$R_D \times 2 + 12 \times 2 = 20 \times 0.5$

$2R_D = 10 - 24$

$2R_D = -14$

$R_D = -7\ N$ $\quad$ R_D cannot be < 0

$\therefore$ tilts about C



Minimum x is when the 100N weight opposes the anti-clockwise resultant moment

Moments about C $\quad 12 \times 2 = 20 \times 0.5 + 100 \times (x - 2)$

$24 = 10 + 100x - 200$

$24 - 10 + 200 = 100x$

$214 = 100x$

$x = 2.14\ m$

Maximum x is when reaction at $C = 0$

Moments about D

$$100(x-4) = 20 \times 1.5 + 12 \times 4$$

$$100x - 400 = 30 + 48$$

$$100x = 78 + 400$$

$$x = \frac{478}{100}$$

$$\underline{x = 4.78\,m}$$

$$\therefore\ 2.14\,m \leq x \leq 4.78\,m$$