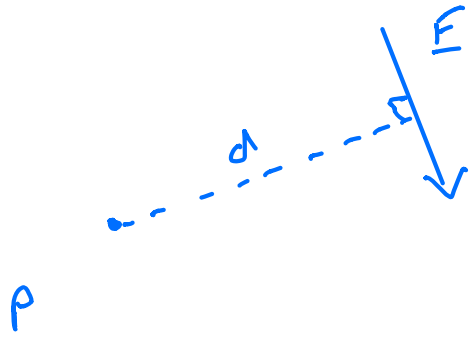
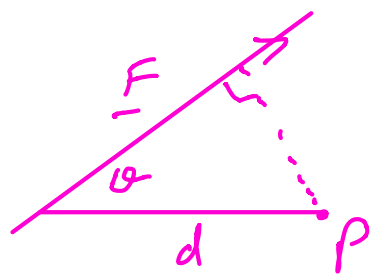
Moments



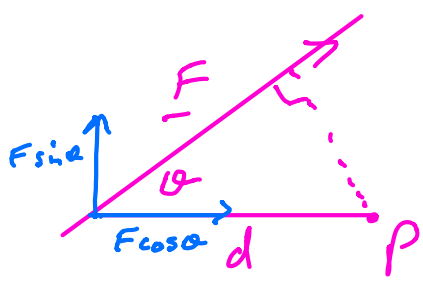
The moment of a force $\underline{F}$ about a point P is the magnitude of the force multiplied by the perpendicular distance of its line of action from P. The moment is either clockwise or anti-clockwise.

Shown above the clockwise moment

$$= |\underline{F}| \times d$$



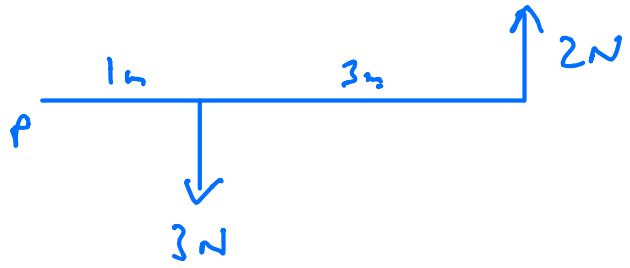
Moment $= |\underline{F}|\, d \sin\theta$



Splitting $\underline{F}$ into its components

Exercise 4B

1 a)



Resultant moment $= 2 \times 4 - 3 \times 1$

$= 8 - 3$

$= 5$ Nm anti-clockwise

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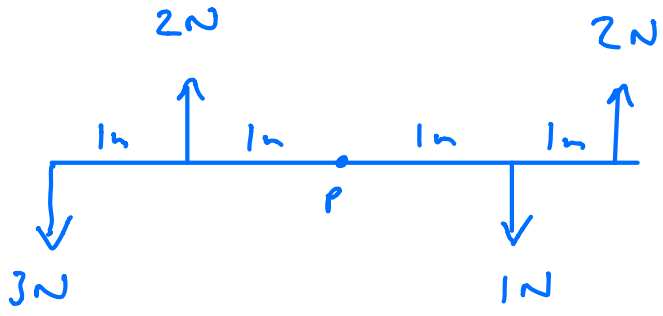
1 f)



Clockwise

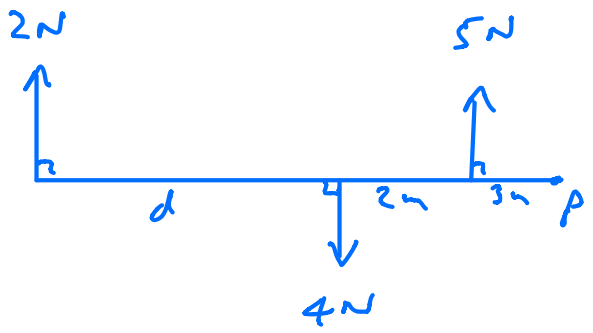
$1 \times 1 + 2 \times 1 = 3$ Nm

Anti-clockwise

$3 \times 2 + 2 \times 2 = 10$ Nm

Resultant moment $= 7$ Nm anti-clockwise

3)



clockwise moment about P

$= 2(d+5) + 5\times3 - 4\times5 = 17$ Nm

$2d + 10 + 15 - 20 = 17$

$2d = 12$

$d = 6$ m

Classwork and Homework

Exercise 4B

1b, 1e, 2a, 2b, 2e, 2f, 4, 5.

5.

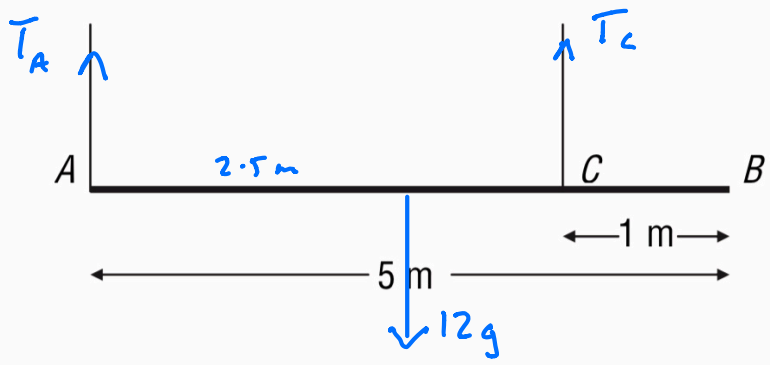


Figure 2

A beam AB has mass 12 kg and length 5 m. It is held in equilibrium in a horizontal position by two vertical ropes attached to the beam. One rope is attached to A, the other to the point C on the beam, where $BC = 1$ m, as shown in Figure 2. The beam is modelled as a uniform rod, and the ropes as light strings.

(a) Find

(i) the tension in the rope at C,

(ii) the tension in the rope at A.

(5)

i) Mom about A

$T_C \times 4 = 12g \times 2.5$

$T_C = \frac{30g}{4} = 73.5\text{ N}$

ii) Resolve ↕

$T_A + T_C = 12g$

$T_A = 12g - T_C$

$T_A = 12 \times 9.8 - 73.5 = 44.1\text{ N}$

$T_A = 44.1\text{ N}$