

Question 1

Triangle ~~ABC~~ BCD

$$\text{Find angle } C = \frac{\sin A}{13} = \frac{\sin 47}{10.5} = \frac{\sin C}{13}$$

$$= 0.069 = \frac{\sin C}{13}$$

$$= 13(0.069) = \sin C$$

$$= 0.91 = \sin C$$

$$= \sin^{-1}(0.91) = C$$

$$\text{Angle } C = ~~66~~ 65.5^\circ$$

Find angle D = Angle B + Angle C taken from 180°

$$= 180^\circ - (47^\circ + 65.5^\circ)$$

$$\text{Angle } D = 67.5^\circ$$

$$\text{Find Side } d = \frac{13}{\sin 65.5} = \frac{d}{\sin 67.5}$$

$$= 14.3 = \frac{d}{\sin 67.5}$$

$$= 14.3(\sin 67.5) = d$$

$$= 13.2 \text{ m}$$

Triangle ABC

$$\text{Find angle } C = \frac{\sin C}{6.4} = \frac{\sin 69}{13.2}$$

$$= \frac{\sin C}{6.4} = 0.07$$

$$= \sin C = 6.4(0.07)$$

$$= \sin C = 0.45$$

$$= C = \sin^{-1}(0.45)$$

$$\text{Angle } C = 27^\circ$$

$$\text{Find Angle } B = 180^\circ - 69 + 27$$

$$= 180 - 96$$

$$\text{Angle } B = 84^\circ$$

$$\text{Find Side } B = \frac{b}{\sin 84} = \frac{6.4}{\sin 27}$$

$$= \frac{b}{\sin 84} = 14.1$$

$$= b = 14.1(0.99)$$

$$\text{Side } b = 14 \text{ m}$$

$$\text{Area of Triangle ABC} = \frac{1}{2} \times 6.4 \times 14 \times \sin 27$$

$$= 20.34 \text{ m}$$

Question 2

a. Pin support -

Roller support -

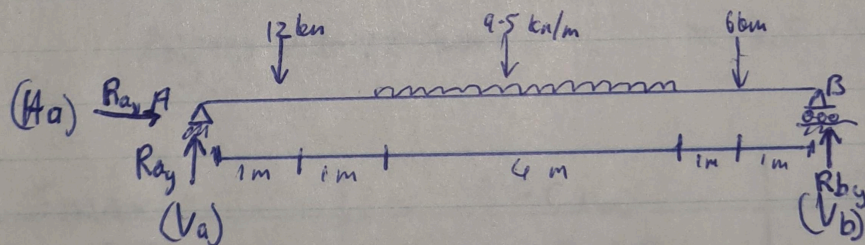
Fixed support -

b. Pin support - 2 reaction forces

Roller support - 1 reaction force

Fixed support - 3 reaction forces

c.



$$\sum H = 0$$

$$R_{ax} = 0$$

$$\sum V = 0$$

$$R_{ay} - 12 - 38 - 6 + R_{by} = 0$$

$$R_{ay} + R_{by} - \overset{56}{\cancel{32}} = 0$$

$$R_{ay} + R_{by} = \overset{56}{\cancel{32}} \text{ kN}$$

$$\sum m_b = 0$$

$$(R_{ay} \times 8) + (12 \times \frac{7}{2}) - (38 \times \frac{4}{2}) - (6 \times 1) = 0$$

$$8R_{ay} - 84 - 152 - 6 = 0$$

$$8R_{ay} - \frac{242}{74} = 0$$

$$R_{ay} = \frac{242}{8}$$

$$R_{ay} = \cancel{4.25 \text{ kn}} \quad 30.25$$

$$\cancel{4.25 + R_{by} = 32 \text{ kn}} \quad 30.25 + R_{by} = 56$$

$$\cancel{R_{by} = 32 - 4.25} \quad R_{by} = 56 - 30.25$$

$$\cancel{R_{by} = 22.75 \text{ kn}} \quad R_{by} = 25.75 \text{ kn}$$

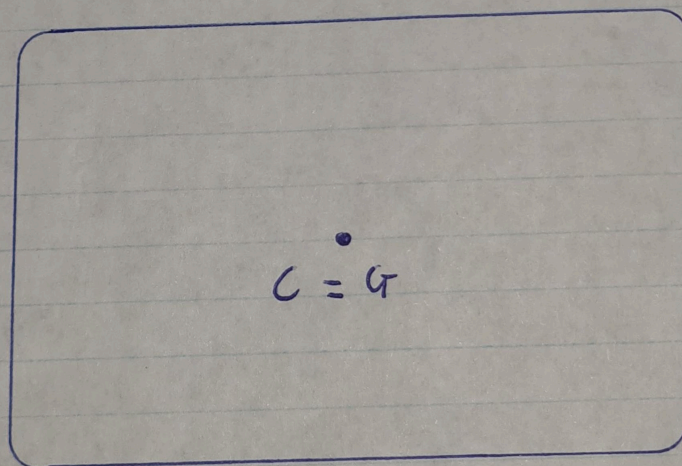
Section	SF (kn)	Bm (kn/m)
① Support A	0 or $\frac{30.25}{4.25}$	0
② 1m from Support A		
③ 2m from Support A		
④ 6m from Support A		
⑤ 7m from Support A		
⑥ 8m from Support A	0 or 25.75	0

Question 3

- a. The difference between the centroid and centre of gravity is that centroid may be referred to as the geometrical centre of a body and it is the centre of gravity of uniform density objects. Denoted by C .

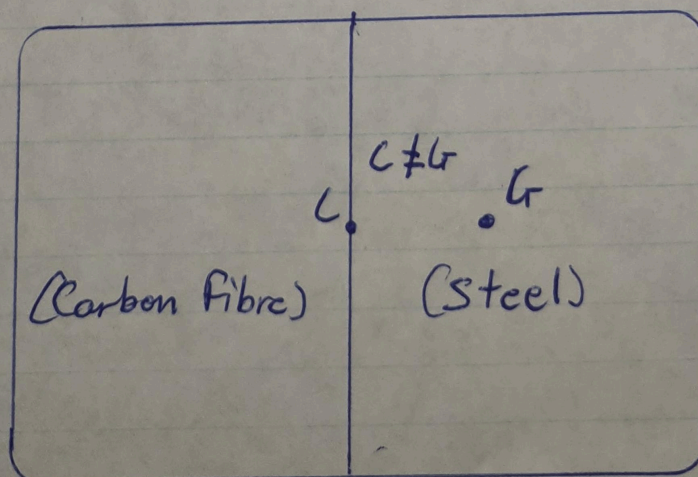
Whereas, centre of gravity is the point at which the total weight of the body focuses upon. This is where gravitational force acts on the body. Denoted by G .

b.



Body composed of uniform material $C = G$

c.



Body composed of two materials $C \neq G$