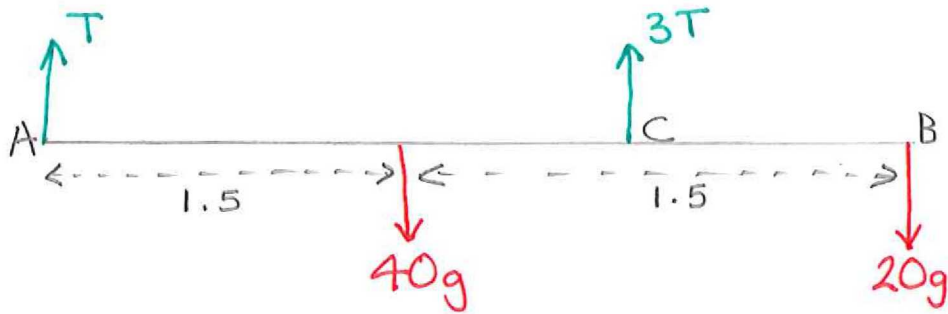


①

M1 MOMENTS

a) $(\uparrow) \quad T + 3T = 40g + 20g$

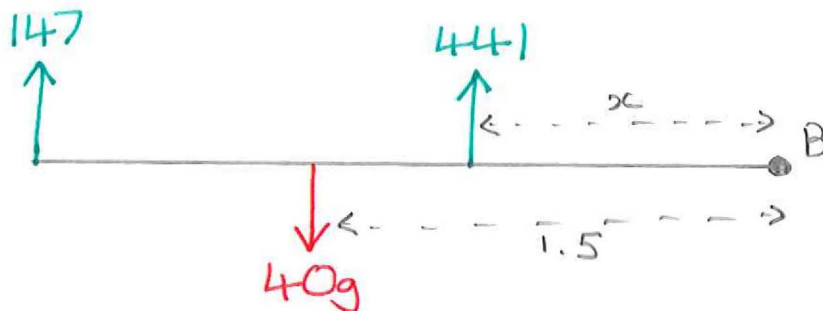
$$4T = 60g$$

$$T = 15g$$

$$T = 147 \text{ N}$$

$$\therefore \text{Tension in C} = \underline{\underline{441}}$$

b)



M(B) $(147 \times 3) + (441x) = 40g \times 1.5$

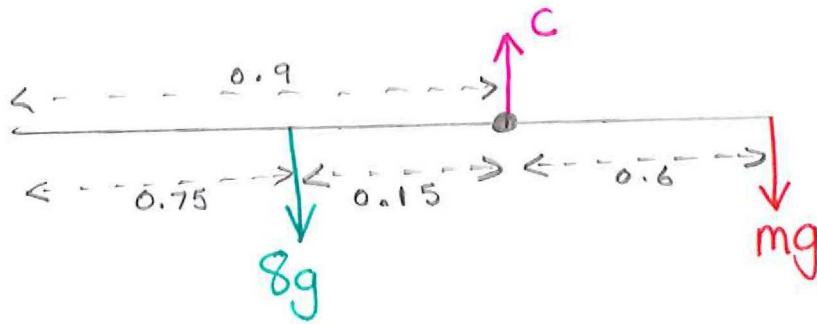
$$441 + 441x = 60g$$

$$x = \frac{60g - 441}{441}$$

$$x = \underline{\underline{\frac{1}{3}}}$$

(2)

a)



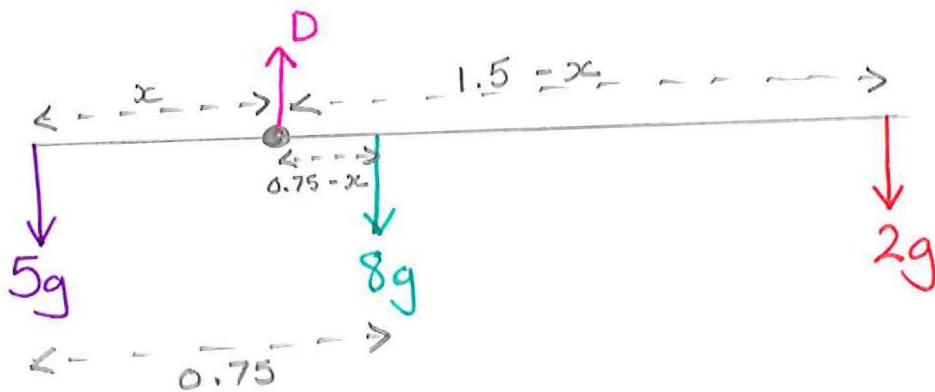
$$m(c) \quad 8g \times 0.15 = 0.6 \times mg$$

$$\frac{6g}{5} = 0.6mg$$

$$\frac{6}{5} = 0.6m$$

$$m = 2$$

b)



$$m(d) \quad 5gx = (0.75 - x)8g + (1.5 - x)2g$$

$$5gx = 6g - 8xg + 3g - 2xg$$

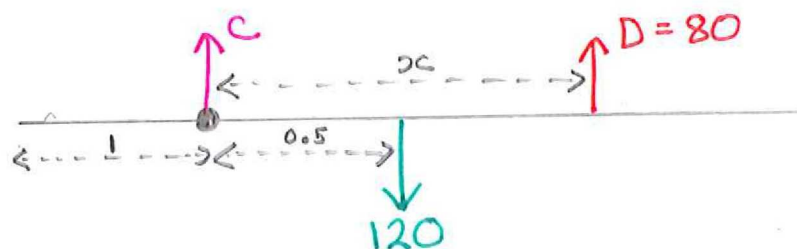
$$13gx = 9g - 2xg$$

$$15gx = 9g$$

$$x = 9/15 = \underline{\underline{0.6}}$$

3)

a)

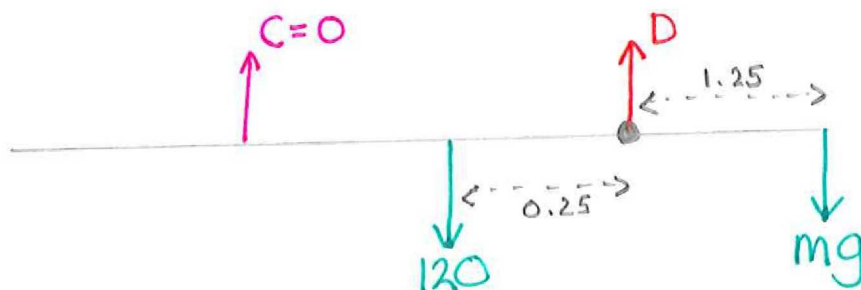


$$m(c) \quad 120 \times 0.5 = 80x$$

$$60 = 80x$$

$$x = \underline{\underline{\frac{3}{4}}}$$

b)

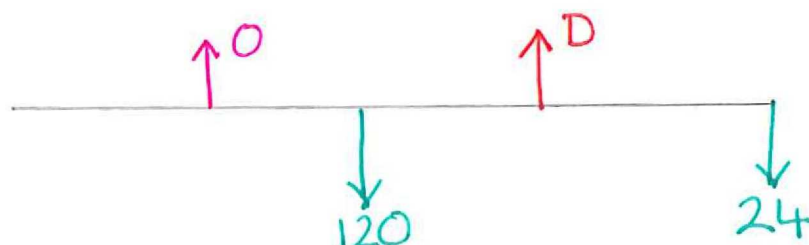


$$m(d) \quad 120 \times 0.25 = 1.25 \times mg$$

$$30 = 1.25W$$

$$W = \underline{\underline{24}}$$

c)

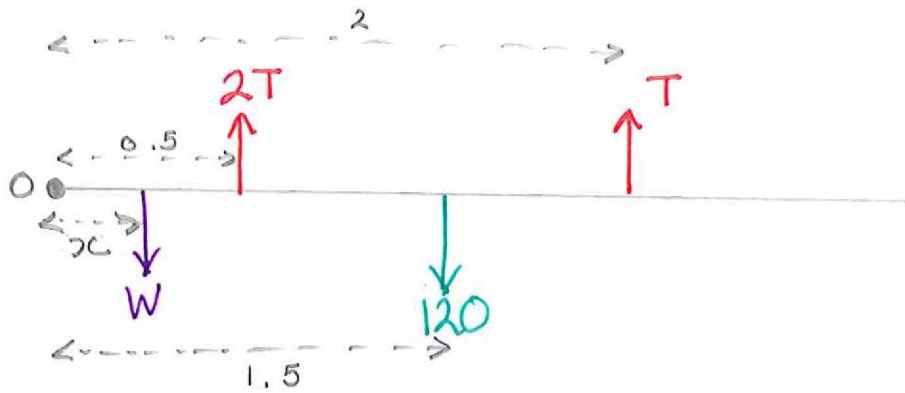


$$O + D = 120 + 24$$

$$D = \underline{\underline{144}}$$

d) the rock acts at a single point.

4)
a)



(↑)

$$3T = 120 + W$$

$$T = 40 + \frac{W}{3}$$

m(o)

$$Wx + (1.5 \times 120) = (2T \times 0.5) + (2 \times T)$$

$$Wx + 180 = T + 2T$$

$$Wx + 180 = 3T$$

$$\text{sub in } T = 40 + \frac{W}{3}$$

$$Wx + 180 = 3 \left(40 + \frac{W}{3} \right)$$

$$Wx + 180 = 120 + W$$

$$Wx - W = -60$$

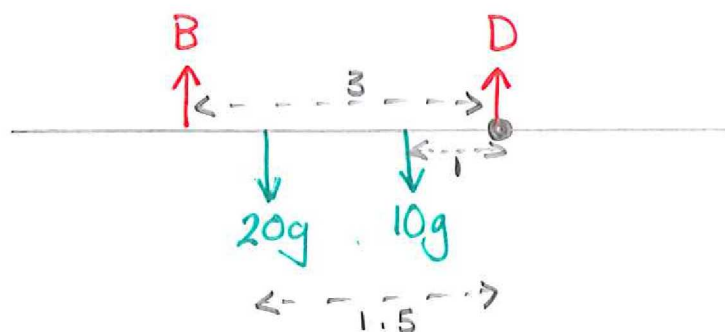
$$W(x - 1) = -60$$

$$W = \frac{-60}{x-1} = \frac{60}{1-x}$$

b) $x < 1$

5

a)
and
b)



$$(\uparrow) \quad B + D = 30g$$

$$m(D) \quad 3B = (20g \times 1.5) + (10g \times 1)$$

$$3B = 30g + 10g$$

$$3B = 40g$$

$$B = \frac{40g}{3} = \underline{\underline{13\frac{1}{3}}}$$

(\uparrow) sub in B

$$\frac{40g}{3} + D = 30g$$

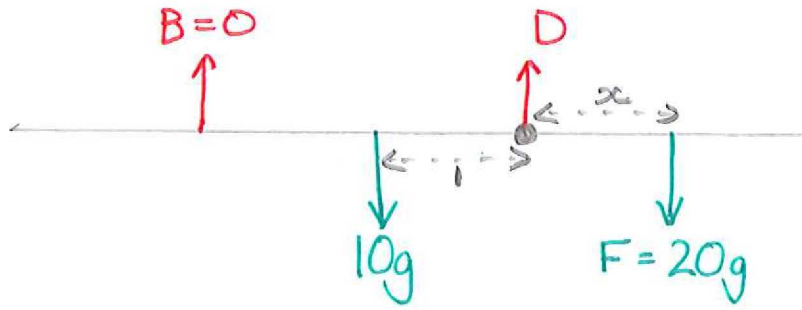
(\times 3)

$$40g + 3D = 90g$$

$$3D = 50g$$

$$D = \frac{50g}{3} = \underline{\underline{16\frac{2}{3}}}$$

5
c)



$$m(D) \quad 10g \times 1 = 20g \times x$$

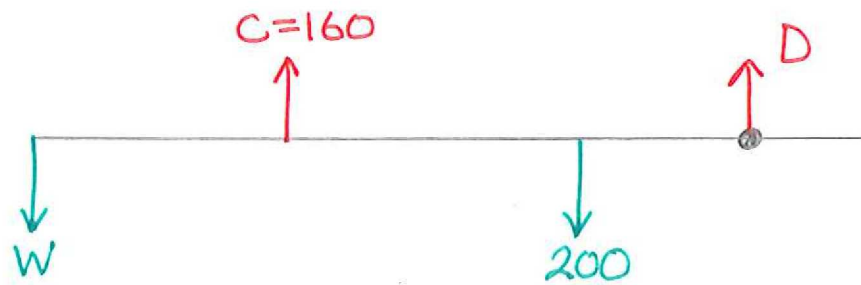
$$10g = 20xg$$

$$10 = 20x$$

$$x = \underline{\underline{\frac{1}{2}}}$$

(6)

a)



$$m(D) \quad 160 \times 2.5 = 4W + (4-x)200$$

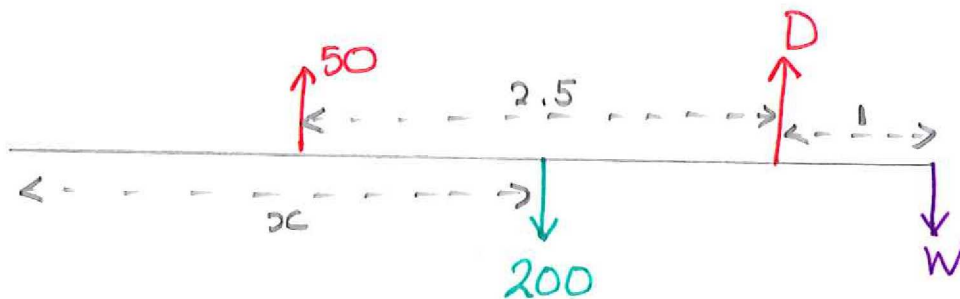
$$400 = 4W + 800 - 200x$$

$$100 = W + 200 - 50x$$

$$50x = W + 100$$

$$50x - W = 100$$

b)



$$(50 \times 2.5) + 1W = 200(4-x)$$

$$125 + W = 800 - 200x$$

$$W + 200x = 675$$

⑥

c) from part b) $W + 200x = 675$

$$\therefore W = 675 - 200x$$

from part a) $50x - W = 100$

sub in $W = 675 - 200x$

$$50x - (675 - 200x) = 100$$

$$50x - 675 + 200x = 100$$

$$250x = 775$$

$$x = \underline{\underline{3.1}}$$

$$W = 675 - 200x$$

$$W = 675 - 200(3.1)$$

$$W = \underline{\underline{55}}$$