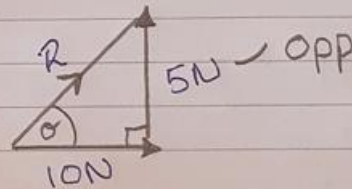
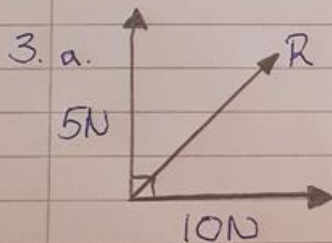


Jamie Richards
0852036
ACHA 3000
14/01/2022
Page 1

1. a. Area = M^2 (A)
b. Volume = M^3 (V)
c. Mass = Kg (m)
d. Force = N (F or R) kgm/s^2
e. Weight = N (W)

2. Density = $\frac{\text{Mass}}{\text{Volume}} = \frac{Kg}{M^3}$ or kg/M^3



By Pythagoras

$$\sum R^2 = 5^2 + 10^2$$

$$\sum R^2 = 25 + 100$$

$$R = \sqrt{125}$$

$$R = \sqrt{125}$$

$$R = 11.18N$$

$$\tan \theta = \frac{\text{Opp}}{\text{Adj}}$$

$$\tan \theta = \frac{5}{10}$$

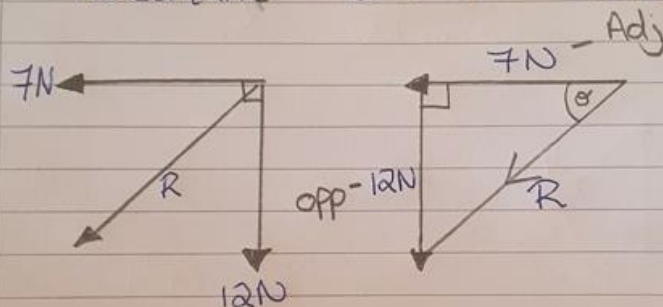
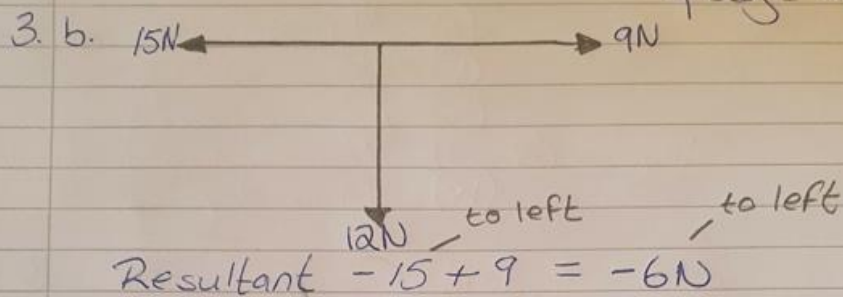
$$\theta = \tan^{-1}\left(\frac{5}{10}\right)$$

$$\theta = 26.57^\circ$$

$\therefore$ Resultant is 11.18N to the right
26.57° above the horizontal.

$\swarrow$ 90° Bearing = $90^\circ - 26.57^\circ$
= 63.43°

Jamie Richards
0852036
ACHA 3000
14/01/2022
Page 2



By Pythagoras

$$\sum R^2 = 12^2 + 7^2$$

$$\sum R^2 = 144 + 49$$

$$R = 193$$

$$R = \sqrt{193}$$

$$R = 13.89\text{N}$$

$$\tan \theta = \frac{\text{opp}}{\text{Adj}}$$

$$\tan \theta = \frac{12}{7}$$

$$\theta = \tan^{-1}\left(\frac{12}{7}\right)$$

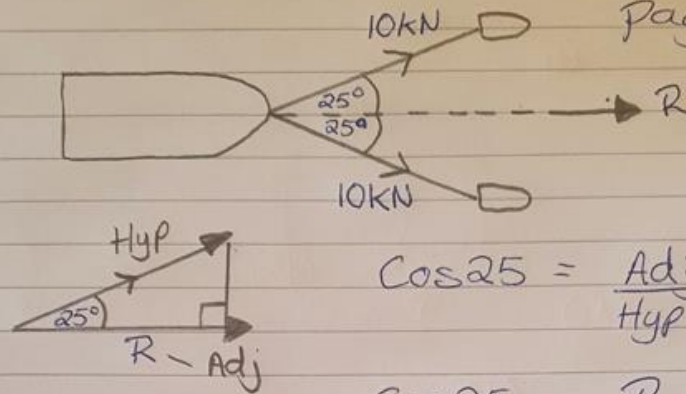
$$\theta = 59.74^\circ$$

$\therefore$ Resultant is 13.89N to the left
 59.74° below the horizontal.

Bearing = $270^\circ - 59.74^\circ$
 $= 210.26^\circ$

Jamie Richards
0852036
ACHA3000
14/01/2022
Page 3

4. a.



$$\cos 25 = \frac{\text{Adj}}{\text{Hyp}}$$

$$\cos 25 = \frac{R}{10000}$$

$$10000 \times \cos 25 = \frac{R}{10000} \times 10000$$

$$10000 \times \cos 25 = 9063.08$$

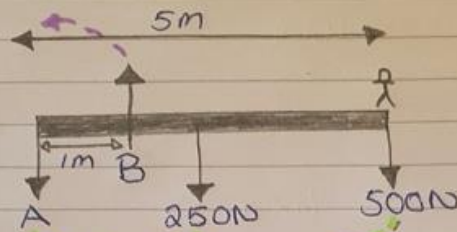
$$R = 9063.08 \text{ N}$$

$$\therefore \text{for 2 tug boats} = 2 \times 9063.08 \\ = 18126.16 \text{ N}$$

b. Due to boat moving at constant Velocity
 $\therefore$ Resultant of 2 boats = 18126.16 N

Jamie Richards
0852036
ACHA3000
14/01/2022
Page 4

5. a.



To moments about B

$$\begin{aligned} \text{CWM} &= \text{ACWM} \\ (250 \times 1\text{m}) &= (500 \times 4) = (A \times 1) \\ 2250\text{N} &= A \end{aligned}$$

b. Take moments about A

$$\begin{aligned} \text{CWM} &= \text{ACWM} \\ (250 \times 2) + (500 \times 5) &= (B \times 1) \\ 3000\text{N} &= B \end{aligned}$$

forces up = forces down.

$$\begin{aligned} 3000 &= 2250 + 250 + 500 \\ &= 3000 \end{aligned}$$

Janie Richards
0852036
ACTIA3000
14/01/2022
Page 5

6. a. A positive to negative

b. $R_{total} = R_1 + R_2 + R_3 + R_4$

$$0.5 + 2 + 6 + 3 = 11.5 \text{ Ohms}$$

c. $V = IR \therefore I = \frac{V}{R} = \frac{12}{11.50} = 1.04 \text{ A}$

d. $V = IR = 1.04 \times 3 = 3.12 \text{ V}$

e. $V = IR \therefore I = \frac{V}{R_2} = \frac{12}{2} = 6 \text{ A}$

f. $V = IR \therefore I = \frac{V}{R_3} = \frac{12}{6} = 2 \text{ A}$

g. R4