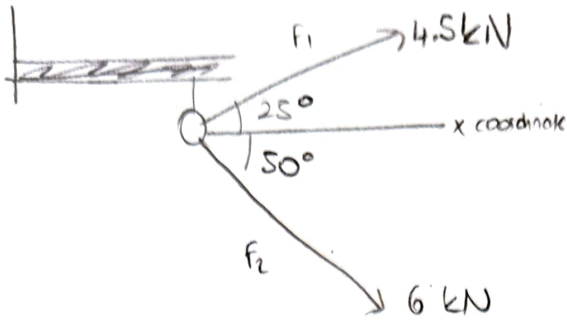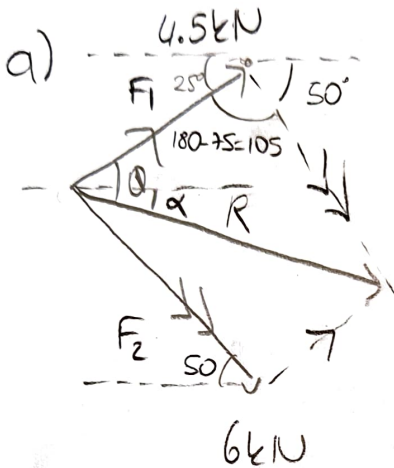Q.1)

what is the R
Resultant vector of
two forces.
a) with parallelogram
b) with triangle Rule

(I named vectors as F₁ and F₂)

a)

$R = \sqrt{(4.5)^2 + (6)^2 - 2.4.5.6 \cos(105)}$

$R = 8.38 \text{ kN}$ = magnitude

$\dfrac{6}{\sin Q} = \dfrac{8.38}{\sin 105}$ by sin law

$\sin Q = \dfrac{6 \cdot \sin 105}{8.38} \rightarrow Q = \arcsin\left(\dfrac{6 \cdot \sin 105}{8.38}\right)$

$Q = 43.76°$

$\alpha = Q - 25 = 43.76° - 25°$

$\alpha = 18.76°$

b)
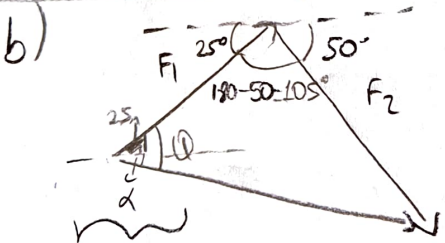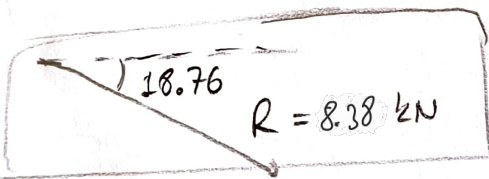
$\alpha + 25 = Q$
$\alpha = Q - 25$

$R = \sqrt{(4.5)^2 + (6)^2 - 2.4.5.6 \cos 105}$

$R = 8.38 \text{ kN}$ magnitude

$\dfrac{6}{\sin Q} = \dfrac{8.38}{\sin 105}$ by sin law
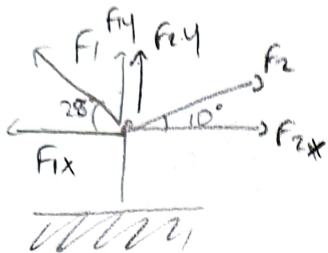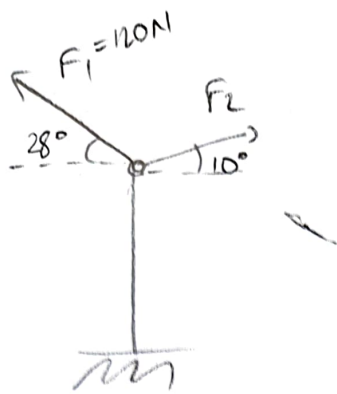
$\sin Q = \dfrac{6 \cdot \sin 105}{8.35} \rightarrow Q = \arcsin\left(\dfrac{6 \cdot \sin 105}{8.38}\right)$

$Q = 43.76°$
$\alpha = 43.76° - 25 = 18.76°$

Q₂)

$F_1 = 120N$

$F_1 = 120N$

R is vertical

a) $F_2 = ?$

b) $R = ?$

$F_{1X} = F_2$

$F_{1X} = F_1 . \cos 28$

$F_{2X} = F_2 . \cos 10$

$120 . \cos 28 = F_2 . \cos 10$

$F_2 = \dfrac{\cos 28 \times 120}{\cos 10}$

a) $\boxed{F_2 \cong 107.59 \, kN}$

$R = F_{1y} + F_{2y}$

$F_{1y} = F_1 . \sin 28 = 120 . \sin 28 = 56.34 \, kN$

$F_2 y = F_2 . \sin 10 = 107.59 . \sin 10 = 18.68 \, kN$
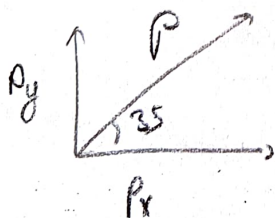
$R = 56.34 + 18.68 = \boxed{75.02 \, kN}$

Q₃)
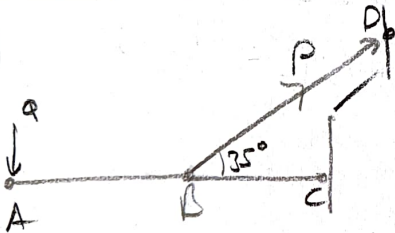
P applied along BD must have
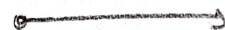
960 N vertical component

a) magnitude of P.
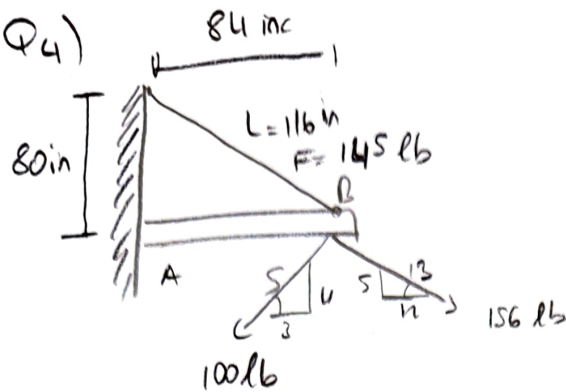
b) its horizontal component

$P_y = P . \sin 35 = 960 N$

a) $P = \dfrac{960}{\sin 35} = \boxed{1673.71 \, N}$

b) $1673.71 . \cos 35 = \boxed{1371.02 \, N}$

$P_x = 1371.02$ Newton

Q4)

84 inc

$L = 116^h$
$F = 145\,lb$

80in

B

A

$\dfrac{4}{3}\dfrac{5}{}$ $\dfrac{13}{12}$ → 156 lb

3

100lb

R of three forces = ?
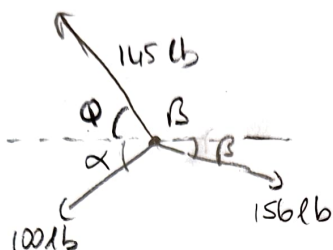
$\cos\theta = \dfrac{84}{116} = \dfrac{21}{29}$

$\sin\theta = \dfrac{80}{116} = \dfrac{20}{29}$

145 lb

θ β

α β

156 lb

100lb

$\cos\alpha = 3/5$

$\sin\alpha = 4/5$

$\cos\beta = 12/13$
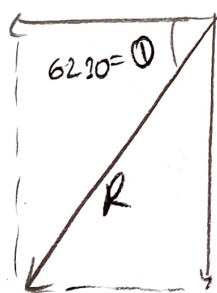
$\sin\beta = 5/13$

$R = \Sigma F_{ix} + \Sigma F_{iy} = R_x + R_y$

$R_x = -145.\dfrac{21}{29} - 100.\dfrac{3}{5} + 156.\dfrac{12}{13} = -105 - 60 + 144 = \boxed{-21}\ \text{Newton}$

R_x

$R_y = 145.\dfrac{20}{29} - 100.\dfrac{4}{5} + 156.\dfrac{5}{13} = 100 - 80 - 60 = \boxed{-40}\ \text{Newton}$

R_y

$R_x = -21\ \text{Newton}$

$62.30 = \theta$

R

$-40\ \text{Newton}$

R_y

$\tan\theta = \dfrac{40}{21} \rightarrow \theta = \arctan\left(\dfrac{40}{21}\right)$

$\theta = 62.30$

$R^2 = 21^2 + 40^2$

$R = 45.18$

$62.30°$

R

$45.18\,N$