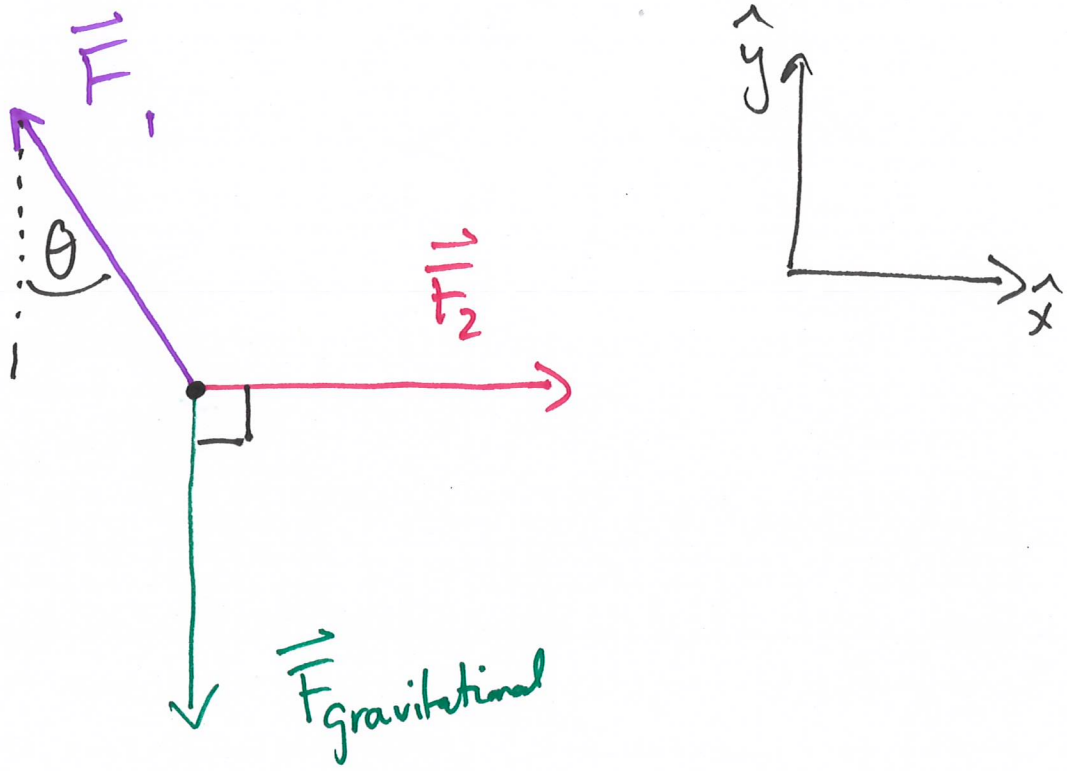
FBD

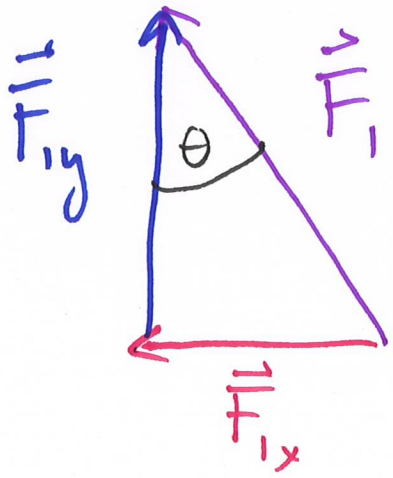


$\theta = 55°$

$|\vec{F}_1| = 192\ N$

a) <u>components</u> of $\vec{F}_1$?

↳ what are the parts of $\vec{F}_1$ that lay along $\hat{x}$ and $\hat{y}$?



$$\vec{F}_1 = \vec{F}_{1x} + \vec{F}_{1y}$$

$F_{1x} = ?$

$F_{1y} = ?$

a) solve for F_{1x}:

$$\sin(\theta) = \frac{F_{1x}}{F_1}$$

$$F_{1x} = F_1 \sin(\theta)$$

$$= (192\,N)\sin(55°)$$

$$= \ominus 157\,N$$

F_{1x} points to the left ($-\hat{x}$)

Q: Did we get the sign right?

$$F_{1y} = F_1 \cos(\theta)$$

$$= (192\,N)\cos(55°)$$

$$= \oplus 110\,N$$

b) What is m?

Newton's 2nd Law:

$$m\vec{a} = \vec{F}_{NET} = \vec{F}_1 + \vec{F}_2 + \vec{F}_{gravity}$$

Where does m occur in our equations?

① $m\vec{a} = \vec{F}_{NET}$

② $\vec{F}_{gravity} = mg(-\hat{y})$

→ Break Newton's 2nd into $\hat{x}$ & $\hat{y}$ components.

Equilibrium

$\hat{y}$: $m a_y = F_{1y} + F_{2y} + F_{gravity,y}$

Are any of these terms 0?

$$0 = F_{1y} + F_{gravity,y}$$

$$0 = F_{1y} + (-mg)$$

$$m = \frac{F_{1y}}{g} = \frac{110\ N}{9.8\ m/s^2} = 11.2\ kg$$

c) What is the magnitude of $\vec{F}_2$?

Look at x-component of Newton's 2nd.

$\hat{x}$: $ma_x = F_{1x} + F_{2x} + F_{gravity,x}$ (0 Equilibrium; 0)

$$0 = F_{1x} + F_{2x}$$

$$F_{2x} = -F_{1x}$$

$$= -(-157\ N)$$

$$\boxed{F_{2x} = +157\ N}$$

$$\vec{F}_2 = F_{2x}(\hat{x})$$

$$|\vec{F}_2| = |F_{2x}| = 157\ N$$