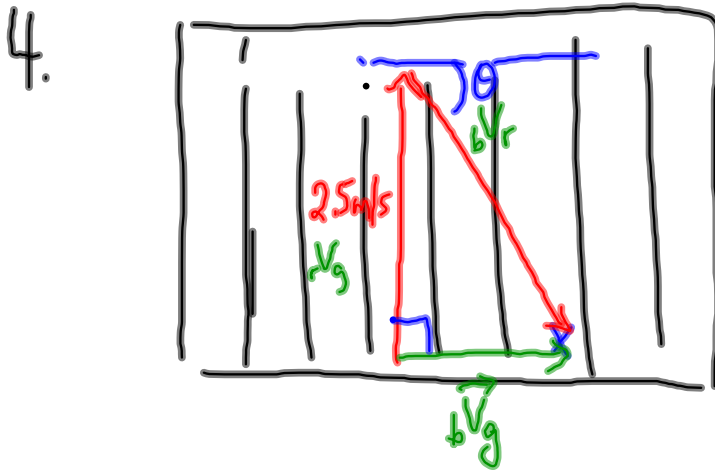


Law of Cosines:

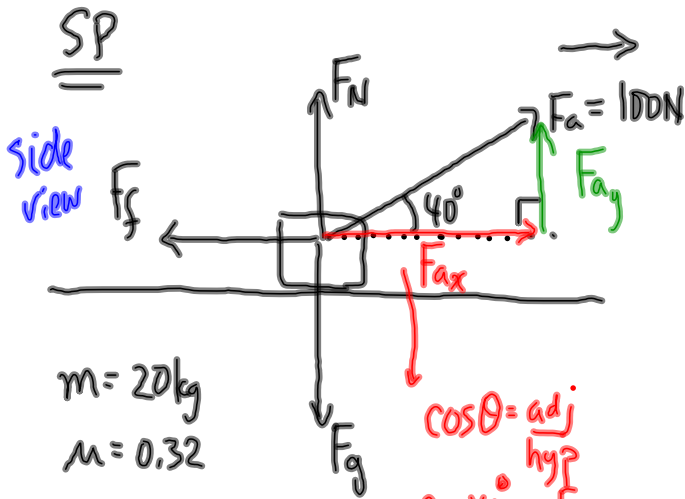
$$c^2 = a^2 + b^2 - 2ab \cos C$$

$$\Delta \vec{d} = \vec{V} \Delta t$$



Forces at Angles

* FBDs are VERY IMPORTANT!



Vertically (no acc)

$$F_N + F_{ay} = F_g$$

$$F_N = F_g - F_{ay}$$

$$F_g = mg$$

$$F_g = (20kg)(9.8)$$

$$F_g = 196.2N$$

$$F_{ay} = (100N)\sin 40^\circ$$

$$F_{ay} = 64.3N$$

$$\cos \theta = \frac{\text{adj}}{\text{hyp}}$$

$$\cos 40^\circ = \frac{F_{ax}}{100N}$$

$$F_{ax} = 100 \cos 40^\circ$$

$$F_{ax} = 76.6N$$

$$F_N = 196.2N - 64.3N$$

$$F_N = 131.9N$$

Horizontally (there is an acceleration)

$$\vec{F}_{net} = m\vec{a}$$

$$F_{ax} - \bar{F}_f = ma$$

$$\bar{F}_{ax} - \mu F_N = ma$$

$$76.6N - 0.32(131.9N) = (20kg)a$$

$$76.6N - 42.2N = (20kg)a$$

$$34.4N = (20kg)a$$

$$a = 1.7 \text{ m/s}^2$$

Example

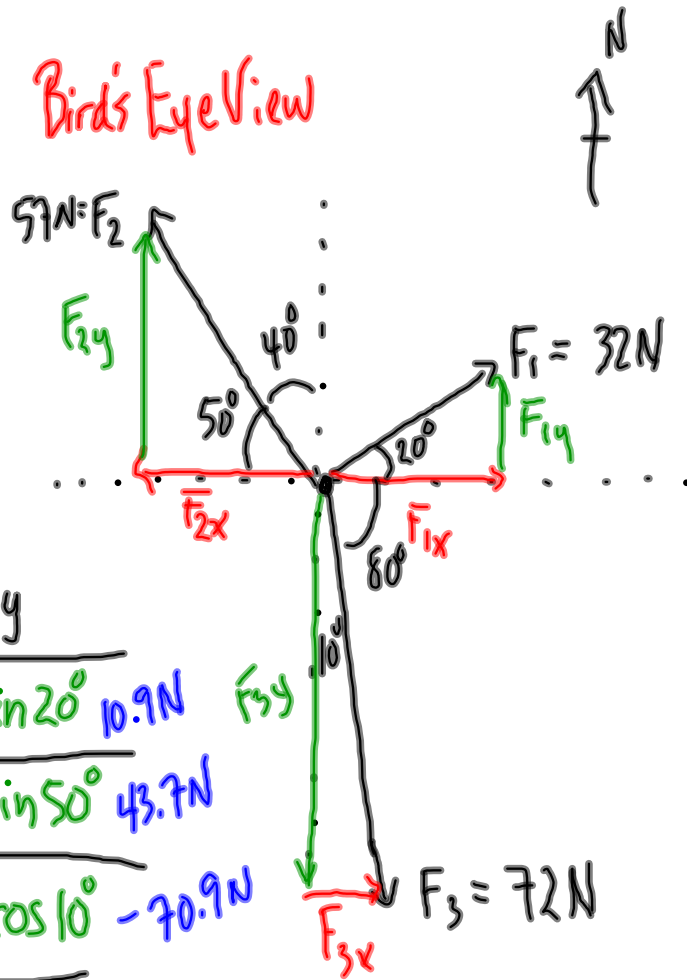
$F_1 = 32\text{ N [E } 20^\circ\text{ N]}$

$F_2 = 57\text{ N [N } 40^\circ\text{ W]}$

$F_3 = 72\text{ N [E } 80^\circ\text{ S]}$

$F_{\text{net}} = ?$

Bird's Eye View



	x	y
F_1	$+32 \cos 20^\circ$ 30.1N	$+32 \sin 20^\circ$ 10.9N
F_2	$-57 \cos 50^\circ$ -36.6N	$+57 \sin 50^\circ$ 43.7N
F_3	$+72 \sin 10^\circ$ +12.5N	$-72 \cos 10^\circ$ -70.9N
F_{net}	6.0N	-16.3N

Forces@Angles

PP on Sheet

