

## Application of Vectors

### Force Application Problems

Force required to keep an object from down the hill formula:

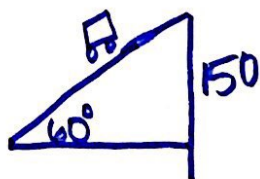
$$\sin \theta = \frac{\|F\|}{W}$$

Force perpendicular to the hill formula:

$$\cos \theta = \frac{\|F\|}{W}$$

Examples:

1. A 150-pound cart sits on a ramp with an incline of  $60^\circ$ . What force is required to keep the cart from rolling down the ramp? Find the force perpendicular to the hill.

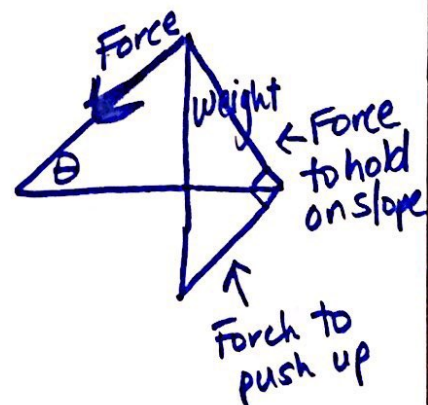


$$a) \sin 60 = \frac{\|F\|}{150}$$

$$\boxed{129.9 \text{ lbs} = \|F\|}$$

$$b) \cos 60 = \frac{\|F\|}{150}$$

$$\boxed{75 \text{ lbs} = \|F\|}$$



2. Carly is pulling her brother on a sled up a hill with a  $12^\circ$  incline. If the combined weight of the sled and her brother is 45 pounds, what force is required to keep the sled from sliding down the hill?

$$\sin 12 = \frac{\|F\|}{45}$$

$$\boxed{9.4 \text{ lbs} = \|F\|}$$

### Work Applications

Formula:  $W = \|F\| \cdot \|\vec{AB}\| \cos \theta$

Examples:

3. Rick is pushing a snow blower with a force of 90 pounds. The handle of the snow blower makes a  $60^\circ$  angle with the ground. How much work does it do if he pushes the snow blower 15 feet?

$$W = 90(15) \cos 60$$

$$\boxed{W = 675 \text{ ft-lbs}}$$