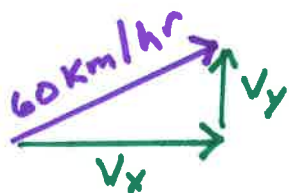


Perpendicular Components of Vector Quantities

Show all of your work, make a drawing, show formulas, show calculations, and remember the form for vectors: size @ angle & direction north or south of east or west

1. A 60 km/hr wind is blowing 30° N of E. What is the velocity's:



a. northward component

$$V_y = V \sin \theta$$

$$V_y = 60 \sin(30)$$

$$V_y = 30 \text{ km/hr N}$$

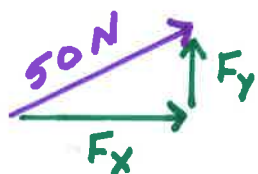
b. eastward component

$$V_x = V \cos \theta$$

$$V_x = 60 \cos(30)$$

$$V_x = 52 \text{ km/hr E}$$

2. A child pulls a sled with a rope by making an angle of 20° with the ground. If the child's force on the rope is 50 N, what is the force:



a. parallel to the ground

$$F_x = F \cos \theta$$

$$F_x = 50 \cos(20)$$

$$F_x = 47 \text{ N} \rightarrow$$

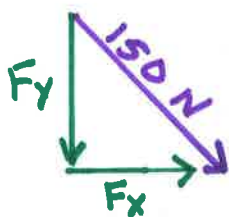
b. perpendicular to the ground

$$F_y = F \sin \theta$$

$$F_y = 50 \sin(20)$$

$$F_y = 17 \text{ N} \uparrow$$

3. A gardener pushes a lawn mower by applying a force of 150 N to the handle. If the lawn mower handle makes a 38° angle with the ground, what is the:



a. parallel to the ground

$$F_x = F \cos \theta$$

$$F_x = 150 \cos(38)$$

$$F_x = 118 \text{ N} \rightarrow$$

b. perpendicular to the ground

$$F_y = F \sin \theta$$

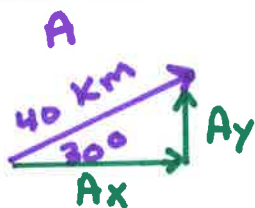
$$F_y = 150 \sin(38)$$

$$F_y = 92 \text{ N} \downarrow$$

4. **Challenge Problem:** A car travels 40 km at 30° N of E, then 20 km at 50° N of W, then 30 Km North. How far north/south and east/west did the car travel? (Hint: find each X and Y components, and add or subtract).

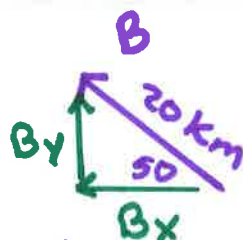
a. North/South component: $20 + 15.3 + 30 = 65.3 \text{ North}$

b. East/West component: $34.6 - 12.9 = 21.7 \text{ EAST}$



$$A_x = 40 \cos 30 = 34.6$$

$$A_y = 40 \sin 30 = 20$$



$$B_x = 20 \cos 50 = 12.9$$

$$B_y = 20 \sin 50 = 15.3$$

C ↑ 30

$$C_x = 0$$

$$C_y = 30$$