

Unit #8: Extended Trigonometry

Lesson 8: Velocity and Force Vectors

EQ:

Speed --- _____ quantity that refers to how _____ an object is moving; the _____ at which an object covers a distance; does not keep track of _____

Velocity -- the _____ at which an object changes its _____; _____ quantity therefore _____ aware;



SPEED vs VELOCITY

Force Vector --- represents _____ and amount of _____ acting on an object;

includes a _____ part and a _____ part

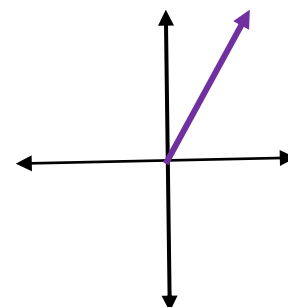
• Recall:

If _____, then the horizontal and vertical components of \vec{v} in terms of θ and $\|\vec{v}\|$ are :

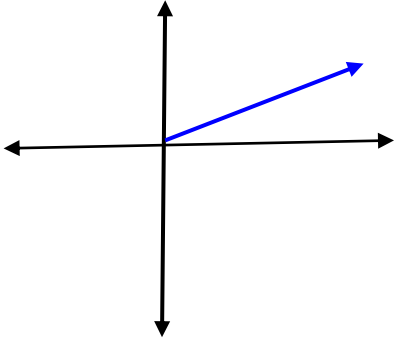
$\vec{v} =$ _____

Define a Force Vector as: _____

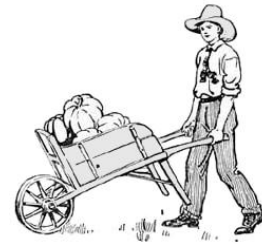
Ex 1. Write the vector \mathbf{v} in the form $a\mathbf{i} + b\mathbf{j}$, given its magnitude $\|\vec{v}\| = 5$ and the angle $\alpha = 60^\circ$.



Ex 2. A ball is thrown 82 mph in a direction that makes a 30° angle with the positive x-axis. What is the initial speed in both the horizontal and vertical directions?

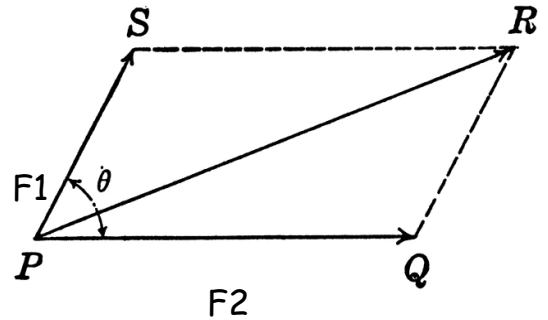


Ex 3. A man pushes a wheelbarrow up an incline of 20° with a force of 100 pounds. Express the force vector \mathbf{F} in terms of \mathbf{i} and \mathbf{j} .

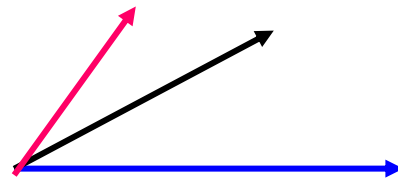


- Recall: Resultant Vector

_____ is a resultant vector



Ex 4. Two forces, one of 150 lb and the other of 200 lb act on a body and make an angle measuring $56^\circ 20'$ with each other.

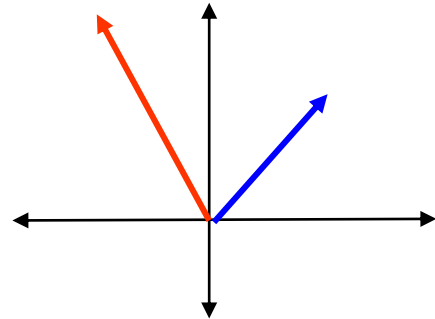


- What is the magnitude (to the nearest pound) and the direction (to the nearest minute) of the resultant of the forces?

b. What is the measure of the angle that the resultant makes with the 200-lb force?

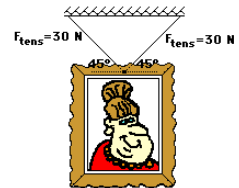
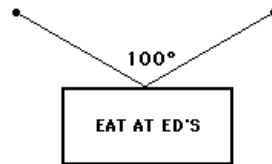
Method 2:

Ex 5. Two forces of magnitude 30 N and 70 N act on an object at angles 45° and 120° with the positive x-axis. Find the direction and magnitude of the resultant force; that is, find $F_1 + F_2$.



- Static Equilibrium --- an object is at _____; the _____ of all forces acting on the object is _____.

_____ + _____ + _____ = _____



_____ + _____ + _____ = _____

Ex. A box of supplies that weighs 1200 pounds is suspended by two cables attached to the ceiling as shown below. What is the tension in the two cables?

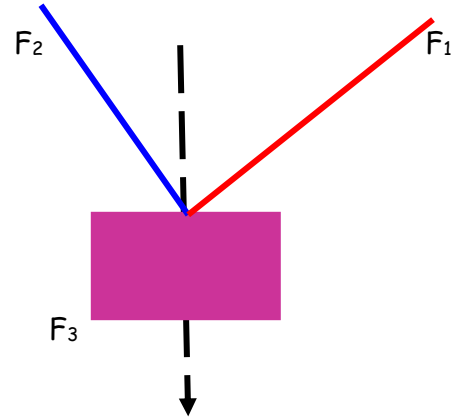
$F_1 =$ _____

$F_2 =$ _____

$F_3 =$ _____

Hor Component: _____

Vert Component: _____



Recall: Systems of Equations

$$Ax + By = 0$$

$$Cx + Dy = 0$$

Solving for x , $\|F_1\|$ and y , $\|F_2\|$.

$$\text{_____}x + \text{_____}y = \text{_____}$$

$$\text{_____}x + \text{_____}y = \text{_____}$$

HOW?

Set up a matrix equation and solve using your graphing calculator.

$$\begin{bmatrix} \text{-----} & \text{-----} \\ \text{-----} & \text{-----} \end{bmatrix} X = \begin{bmatrix} \text{-----} \\ \text{-----} \end{bmatrix}$$

$$X = \begin{bmatrix} \text{-----} \\ \text{-----} \end{bmatrix}$$

$\|F_1\|$ or tension on right cable = _____

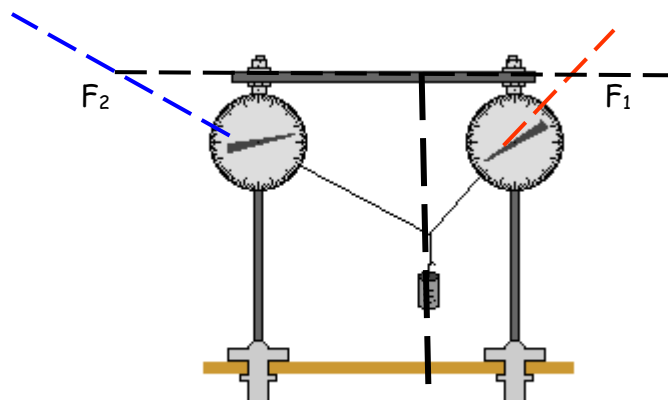
$\|F_2\|$ or tension on left cable = _____

Ex. A weight of 800 pounds is suspended from two cables as shown below. What is the tension on the cables?

$F_1 =$ _____

$F_2 =$ _____

$F_3 =$ _____



Hor Component: _____

F_3

Vert Component: _____

$$\text{_____}x + \text{_____}y = \text{_____}$$

$$\text{_____}x + \text{_____}y = \text{_____}$$

$$\begin{bmatrix} \text{-----} & \text{-----} \\ \text{-----} & \text{-----} \end{bmatrix} X = \begin{bmatrix} \text{-----} \\ \text{-----} \end{bmatrix}$$

$$X = \begin{bmatrix} \text{-----} \\ \text{-----} \end{bmatrix}$$

$\|F_1\|$ or tension on right cable = _____

$\|F_2\|$ or tension on left cable = _____

Assignment: Practice Worksheet: Force Vectors And Static Equilibrium