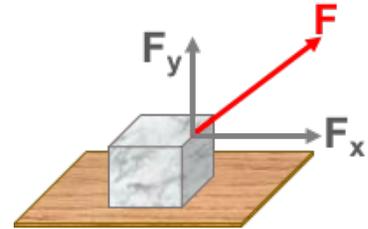


## Vector Resolution

### Lesson Notes

#### What is a Component?

A vector drawn *at an angle* can be thought of as having two parts - here, a north and an east part. These parts are called **vector components**. A vector's components describe the **effect of a vector in a given direction**. The **components** of a vector can be determined as perpendicular projections of the vector onto the x- and the y-axis.



#### Vector Resolution:

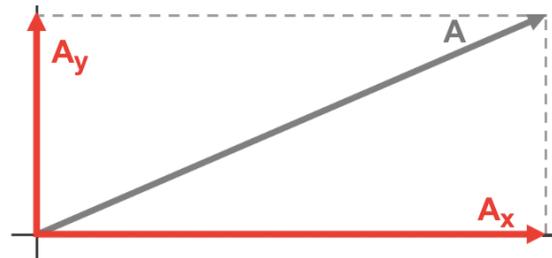
The process of determining the mathematical value and direction of a vector's components.

#### Two Methods of Vector Resolution

1. Graphical Method
2. Trigonometric Method

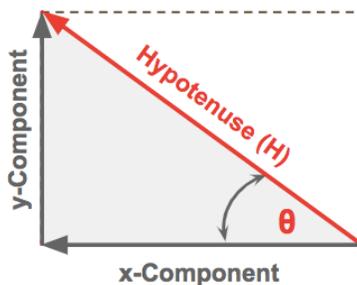
#### Graphical Method of Vector Resolution:

1. Select a scale and draw the vector to scale in the appropriate direction.
2. Extend x- and y-axes from the tail of the vector to the entire length of the vector and beyond.
3. From the arrowhead of the vector, construct perpendicular projections to the x- and the y-axes.
4. Draw the x-component from the tail of the vector to the intersection of the perpendicular projection with the x-axis. Label this component as  $A_x$ .
5. Draw the y-component from the tail of the vector to the intersection of the perpendicular projection with the y-axis. Label this component as  $A_y$ .
6. Measure the length of the two components and use the scale to determine the magnitude of the components.



#### Trigonometric Method of Vector Resolution:

The **trigonometric method** of vector resolution relies on an understanding of the sine, cosine, and tangent functions.



#### SOH CAH TOA

$$\text{Sin } \theta = \text{Opposite/Hypotenuse}$$

$$\text{Cos } \theta = \text{Adjacent/Hypotenuse}$$

$$\text{Tan } \theta = \text{Opposite/Adjacent}$$

### Example 1

Determine the components of the vector ...

$$F = 215 \text{ N}, 128^\circ \text{ CCW}$$

### Example 2

Determine the components of the vector ...

$$F = 162 \text{ N}, 254^\circ \text{ CCW}$$

### Vector Resolution and the CCW Convention

A shortcut for calculating the components of **A**:

$$A_x = A \cdot \cos\theta$$

$$A_y = A \cdot \sin\theta$$

where **A** is the magnitude and  $\theta$  is the CCW from East direction of vector A (a must).

### Sign Conventions

When using the CCW from East convention to calculate a vector's components, a + or - sign will indicate the direction of the vector.

