

# Vectors

Mr. Sudbury

## Quantities

- ▶ Vector Quantities
  - A quantity that requires *both* **MAGNITUDE** and **DIRECTION**.
- ▶ Scalar Quantities
  - A quantity that requires *only* a **MAGNITUDE**.

Magnitude = How Much?

Direction = Which Way?

## Quantities

- ▶ **Vector Quantity Examples**
  - Velocity
  - Acceleration
  - Force
- ▶ **Scalar Quantity Examples**
  - Mass
  - Volume
  - Time

}

Direction Matters & Magnitude Matters

}

Only has a magnitude... NO Direction!!

## Vectors

- ▶ An arrow is used to represent a vector.
- ▶ Scaled so the *length* of the arrow represents the *magnitude*.
- ▶ The *direction* of the arrow represents the *direction of the motion*.

## Vectors

- ▶ Vectors can be combined...
  - Velocity of plane 100km/h N
  - Velocity of wind 20 km/h N
- NET Velocity
- 120 km/h N

## Vectors

- ▶ Vectors can be combined...
  - Velocity of plane 100km/h N
  - Velocity of wind 20 km/h S
- NET Velocity
- 80 km/h N

### Solving Vectors

- Graphically (Parallelogram)
  - Draw parallel vectors.
  - Draw resultant vector magnitude and direction.
  - Solve if  $90^\circ$  ( $a^2 + b^2 = c^2$ )

### Solving Vectors

- Head to Tail
  - Pick a spot (origin)
  - Draw vectors head to tail.
  - Draw the resultant (from starting point to finishing point).

### Solving Vectors

- Solve this vector (3)

### Vectors

Plane Velocity + Wind Velocity = Resultant Velocity

### Vector Addition

- What if the wind is not a tailwind or headwind
- But a.... Crosswind
- The result of adding 2 vectors is called the **resultant**.

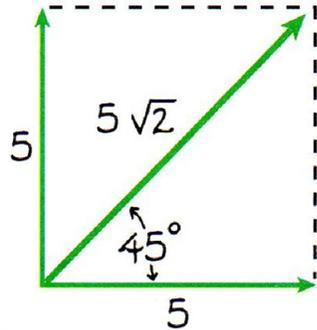
### How 2 Find the Resultant

$a^2 + b^2 = c^2$

- Draw your component vectors
- Draw lines to create a parallelogram.
- Draw your resultant vector.
- Lastly, solve for the magnitude of the resultant.

### Finding the Resultant of a Square

- ▶ If the vectors are equal and form a 90 angle, then the resultant is the magnitude of the side multiplied by sq root of 2



### Vectors - Find the Resultants

### Vectors - Find the Resultants

### Components of Vectors

- ▶ So far we have known the COMPONENT vectors-what if we only know the RESULTANT vector?
- ▶ We can graphically predict the *vertical* and *horizontal* components.
- ▶ The process of determining the components of a vector is called **resolution**.

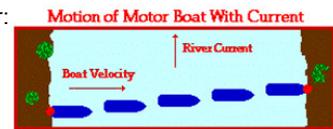
### Vector Components

- ▶ Draw the vertical and horizontal components of the following resultant vectors:

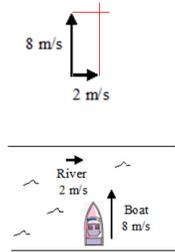


### Vector Components

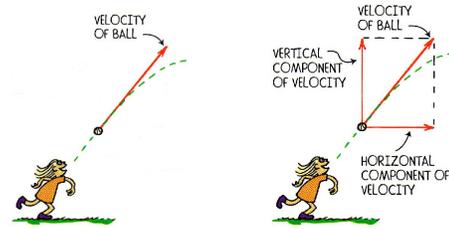
- ▶ Solve the resultant vectors for the boat crossing the river:
- ▶ Boat  $v = 5$  m/s
- ▶ River  $v = 2$  m/s



- ▶ Graph the resultant vector.
- ▶ What is the magnitude?
- ▶ Because of the 2 m/s current does the boat reach the other bank in more time, less time, or the same time.



## Vector Components



Stop

