Name: _____

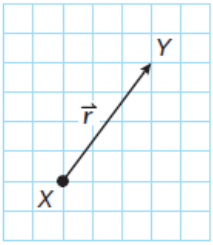
Date: _____

Period: _____

# Geometry Lesson 63

Objective: TSW be introduced to vectors.

Vector - A quantity that has both magnitude and direction.




_____ of a vector - The orientation of the vector, which is determined by the angle the vector makes with a horizontal line.

_____ - A quantity that consists only of magnitude and has no direction.

Vectors are named by an italicized, lowercase letter with the vector symbol. For example, the vector above is named $\vec{r}$.

_____ point of a vector – The starting point of a vector.

_____ point of a vector - The endpoint of a vector.

**Reading Math**

A vector can also be named by its initial point and terminal point. For example, the vector in the diagram could also be called $\overrightarrow{XY}$.

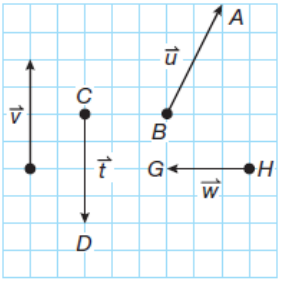
In the diagram, *X* is the initial point and *Y* is the terminal point of $\vec{r}$.

The arrow at *Y* indicates the direction of the vector.

Example 1 Identifying Vectors and Scalars

Name each vector shown. Identify the terminal points of each vector, if applicable.

SOLUTION



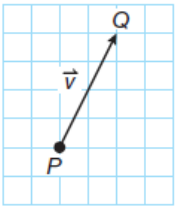

_____ of a vector - The length of a vector. Since magnitude is a length, absolute value bars are used to represent the magnitude of a vector. The magnitude of $\vec{v}$, for example, would be written $|\vec{v}|$.

The location of a vector on the coordinate plane is not fixed. It can be placed anywhere, so for simplicity the initial point of a vector is usually placed on the origin of the coordinate plane. To find the magnitude of a vector, place the initial point of the vector on the origin and use the distance formula.

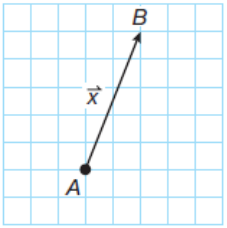
Example 2 Finding the Magnitude of a Vector

Find $|\vec{v}|$.

SOLUTION



The component form of a vector lists its horizontal and vertical change from the initial point to the terminal point.
For example, $\vec{x}$ written in component form would be ⟨2, 5⟩. The horizontal change is listed first, followed by the vertical change.




**Reading Math**

The brackets ⟨ ⟩ used in component form show that the pair indicates a vector, instead of coordinates on a grid.

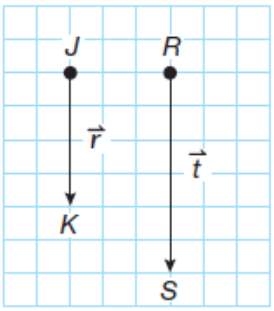
_____ vectors - Two vectors with opposite components. Vectors that have the same magnitude but opposite directions. The opposite vector of ⟨2, 5⟩ is ⟨ ___, ___⟩.

Any two vectors can be added together by summing their components. The vector that represents the sum or difference of two given vectors is a resultant vector.

Example 3 Adding Vectors

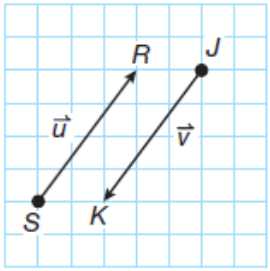
a. Add vectors $\vec{r}$ and $\vec{t}$.

SOLUTION




b. Add vectors $\vec{u}$ and $\vec{v}$.

SOLUTION

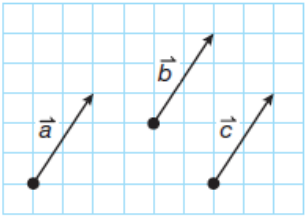



_____ vectors - Vectors that have the same magnitude and direction. An easy way to add equal vectors is to multiply the vector by a constant. This is known as scalar multiplication of a vector. For example, to add ⟨1, 2⟩ and ⟨1, 2⟩, simply multiply ⟨1, 2⟩ by the scalar 2. The resultant vector is ⟨2, 4⟩, which has a magnitude that is twice that of ⟨1, 2⟩.

Example 4 Adding Equal Vectors

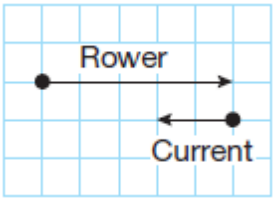
Add the equal vectors $\vec{a}$, $\vec{b}$, and $\vec{c}$.

SOLUTION



Example 5 Application: Currents

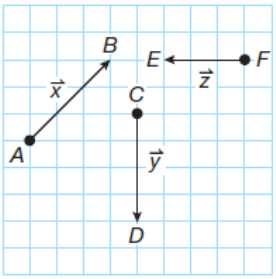
A rower on a lake is rowing a boat at a rate of 5 miles per hour. A current is moving at 2 miles per hour in the opposite direction as the boat. How fast is the rower traveling over the ground below?



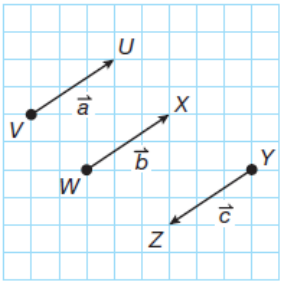

SOLUTION

You Try!!!!

a.Name the vectors and identify the initial point of each one.

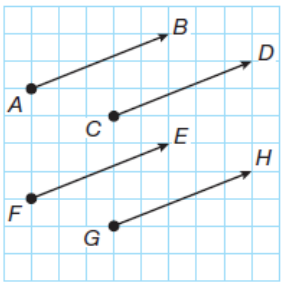



b.Find the magnitude of the vector ⟨5, 3⟩ in simplified radical form.




c.Add vectors $\vec{a}$ and $\vec{b}$.

d.Add vectors $\vec{b}$ and $\vec{c}$.




e.Add the four vectors.

f.A canoe is traveling down a river. In still water, the canoe would be traveling at 2 miles per hour. The river is flowing 1.5 miles per hour in the same direction as the canoe.

How fast is the canoe actually traveling?