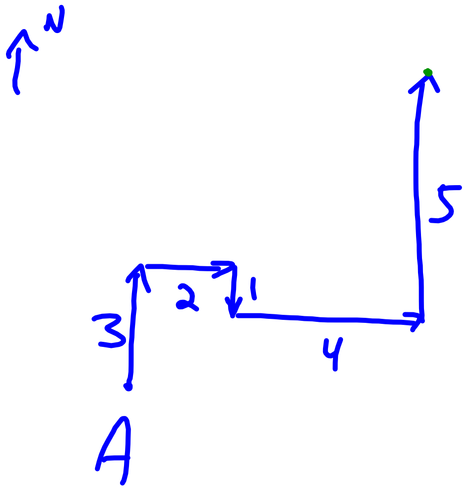
Before we begin, are there any questions from last day's work?

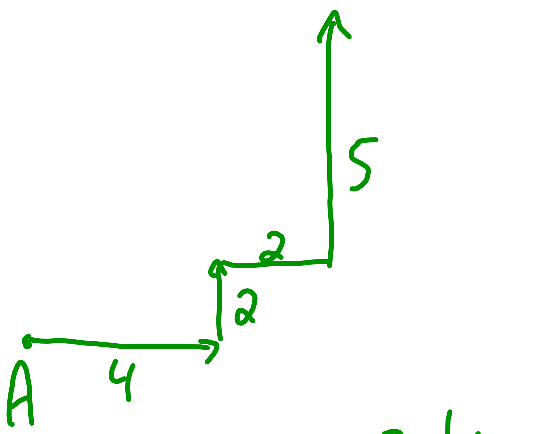
Today's Learning Goal(s):

By the end of the class, I will be able to:

a) represent a vector as a directed line segment, with directions expressed in different ways.

b) resolve a vector into horizontal and vertical components.





$d = 15$ km

$d = 13$ km

$d = st$

$t = \frac{d}{s}$

$= \frac{15}{3}$

$= 5$ hours

$t_c = \frac{13}{3}$

$= 4\frac{1}{3}$ hr

$= 4$h. 20min.

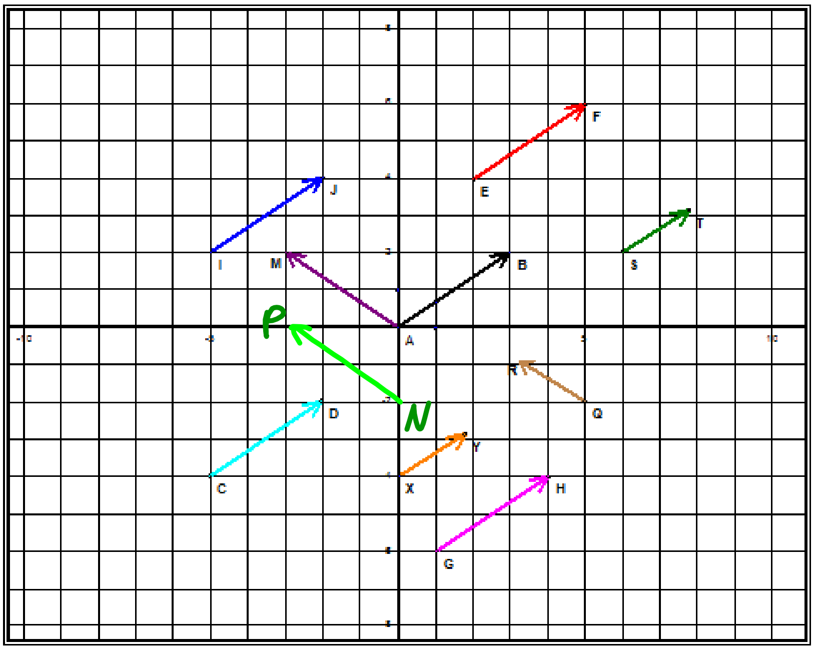
5.7.1: All Vectors are not Created Equal

Date: May 4/17

1. Complete the following statement:
   A vector is a quantity which has **magnitude** and **direction**.

2. Examine the vectors in the diagram. Classify the vectors in the table below using appropriate vector notation (e.g. $\overrightarrow{AB}$)

Same Magnitude Only	Same Direction Only	Same Magnitude And Direction	No Similarities
$\overrightarrow{AB}, \overrightarrow{EF}, \overrightarrow{IJ}$ $\overrightarrow{CD}, \overrightarrow{GH}$ $\overrightarrow{AM}$ $\overrightarrow{XY}$ $\overrightarrow{QR}$ $\overrightarrow{ST}$	$\overrightarrow{AB}, \overrightarrow{CD}, \overrightarrow{EF}, \overrightarrow{GH}, \overrightarrow{IJ}$ $\overrightarrow{ST}, \overrightarrow{XY}$ choose 1 red, 1 Blue $\overrightarrow{QR}$ + $\overrightarrow{AM}$	$\overrightarrow{AB} = \overrightarrow{CD} = \overrightarrow{EF} = \overrightarrow{GH} = \overrightarrow{IJ}$ $\overrightarrow{ST} = \overrightarrow{XY}$	choose 1: $\overrightarrow{AB}, \overrightarrow{CD}, \overrightarrow{EF}, \overrightarrow{GH}, \overrightarrow{IJ}$ w/ $\overrightarrow{QR}$ $\overrightarrow{ST}, \overrightarrow{XY}$ with $\overrightarrow{AM}$



3. On the grid, construct a vector with the same magnitude and direction as $\overrightarrow{AM}$

   See $\overrightarrow{NP}$ on grid

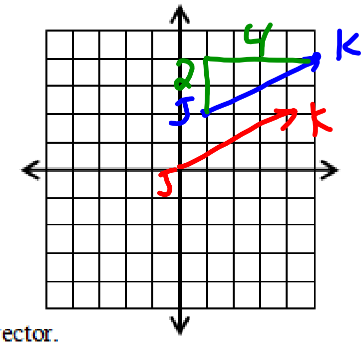
4. Without measuring, how would you determine that $\overrightarrow{AB}$ and $\overrightarrow{EF}$ have equal magnitudes?

   Both are 2 units up and 3 units over from tail to tip. (using grid lines and PT.)

5. $\overrightarrow{AB}$ and $\overrightarrow{EF}$ are an example of equal vectors. What conditions are necessary for equal vectors?

   The vectors must have equal magnitude and same direction.

5.7.2: Vector Components



1. Sketch the vector $\overrightarrow{JK}$ with tail at J(1, 2) and head at K(5 , 4).
   x_J y_J x_K y_K

   The directed line segment $\overrightarrow{JK}$ represents a displacement of some magnitude in the direction indicated by the arrow.

   We can describe $\overrightarrow{JK}$ by giving its horizontal and vertical components.

2. Create a right triangle with the rise and run of the line segment that represents the vector.

3a) Determine the horizontal component of $\overrightarrow{JK}$ by subtracting the x-coordinates of the endpoints of the vector.

$x = x_K - x_J$
$= 5-1$
$= 4$

b) Determine the vertical component of $\overrightarrow{JK}$ by subtracting the y-coordinates of the endpoints of the vector.

$y = y_K - y_J$
$= 4-2$
$= 2$

4. We can also define a vector by stating its components as an ordered pair of numbers. In this example, $\overrightarrow{JK}$ = [horizontal component, vertical component]. State the components of vector $\overrightarrow{JK}$, and sketch it on the grid above.

   $JK = [4, 2]$

Note: Square brackets are used to avoid confusion between the coordinates of a point, and the components of a vector.

5. Use the above information and your knowledge of the Pythagorean theorem to determine the magnitude of vector $\overrightarrow{JK}$.

$|\overrightarrow{JK}| = \sqrt{4^2+2^2}$
$= \sqrt{16+4}$
$= \sqrt{20}$ units

Recall: $\sqrt{20}$
$= \sqrt{4}\sqrt{5}$
$= 2\sqrt{5}$

Further Practice Questions

6. Given the points L(1, 2), M(5, 11), P(2, –3), and R(5, –2), state the components of vectors $\overline{LM}$ and $\overline{PR}$.

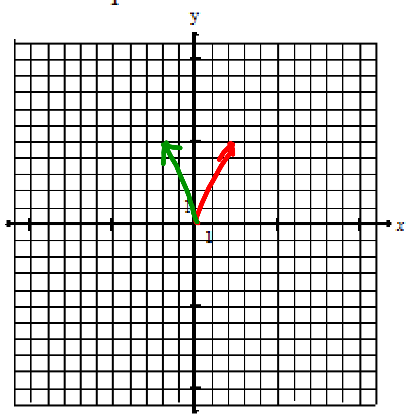
$\overrightarrow{LM} = [5-1, 11-2]$
$= [4, 9]$

7. Sketch a diagram AND determine the magnitude of the following vectors given their components.

a) $\overrightarrow{AB}$ = [2, 5] b) $\overrightarrow{CD}$ = [-2, 5] c) $\overrightarrow{EF}$ = [3, 2] d) $\overrightarrow{GH}$ = [-2, 3]

$|\overrightarrow{AB}| = \sqrt{2^2+5^2}$
$= \sqrt{29}$ units

$|\overrightarrow{CD}| = \sqrt{(-2)^2+5^2}$
$= \sqrt{29}$ units



8. Consider the following statement:
"If $\overrightarrow{AB}$ = [2, 5] and $\overrightarrow{ST}$ = [2, 5], then $\overrightarrow{AB}$ and $\overrightarrow{ST}$ are equal."
Is this: ☑ always true ❐ sometimes true ❐ never true?
Justify your choice.

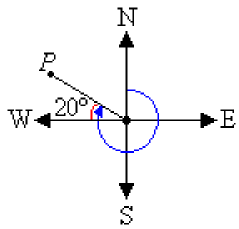
5.7.3: Seeking Direction

Scaled vector diagrams are used in navigation to represent the motion of ships and aircraft. The direction is often stated as a bearing.

A **true bearing** to a point is the angle between due north and the line of travel of an object measured in degrees in a clockwise direction. We will refer to this as **bearing**.

A **conventional bearing** of a point is stated as the number of degrees east or west of the north-south line. We will refer to this as **direction**.

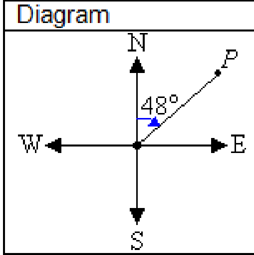
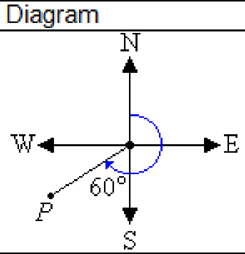
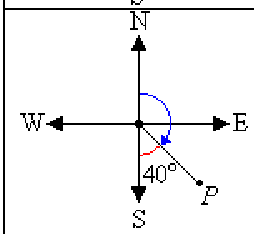
In the diagram below, the bearing of point P is 290°.



The direction method can be stated in two ways:

- W20°N (point P is 20° north of west)
- N70°W (point P is 70° west of north)

1. Complete the following table with reference to point P.

Diagram	Bearing	Direction	Diagram	Bearing	Direction
	048°	N48°E E42°N			
			Provide a sketch here.	235°	

2. Describe each of the following bearings as directions in two different ways.

a) 073° N73°E or E17°N

b) 145°

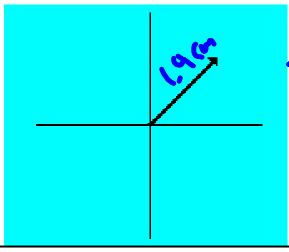
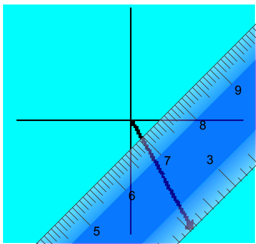
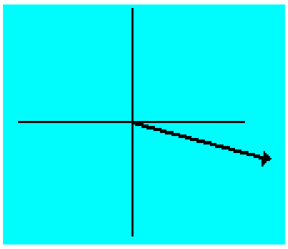
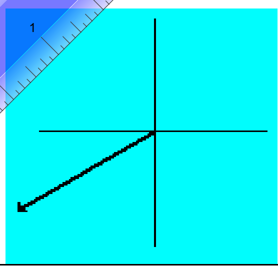
c) 219°

d) 305°

5.7.4: "Scalers" NOT Scalars

We know that a vector requires both magnitude and direction.
Scale diagrams are useful in presenting geometric vectors.

1. Given the scale, determine the **magnitude** of each vector.

a) SCALE: 1 cm = 10 m  ∴ 19 m	b) SCALE: 1 cm = 50 km 
c) SCALE: 1 cm = 10 m/s 	d) SCALE: 1 cm = 50 km/hr 

2. Use an accurately-drawn scaled vector diagram to represent the magnitude and direction for the following vectors.

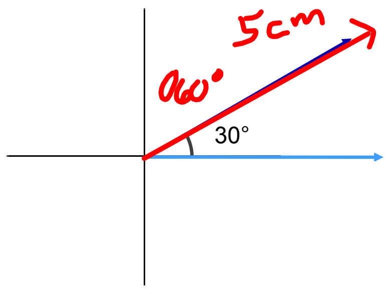
a) Given the SCALE: 1 cm = 10 m, represent the vector 50 m, with a bearing of 60° by a scaled vector diagram.

b) Given the SCALE: 1 cm = 10 m, represent the vector 60 m, W30°N by a scaled vector diagram.

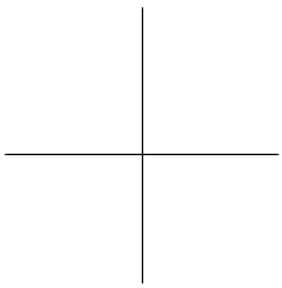
c) Given the SCALE: 1 cm = 15 m/s, represent the vector 120 m/s, S30°W by a scaled vector diagram.

d) Given the SCALE: 1 cm = 20 m/s, represent the vector 140 m/s, N30°E by a scaled vector diagram

a)



b)



c) d)