Geometry 8.7

Perform vector operations geometrically

Perform vector operations on the coordinate plane

vector

magnitude distance

direction angle

resultant combine vectors

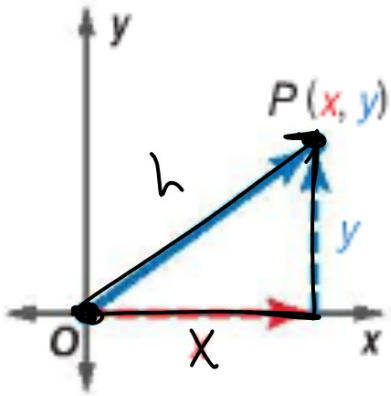
☆ triangle method

standard position Initial pt (0,0)

component form <x,y>

2 Vectors on the Coordinate Plane Vectors can also be represented coordinate plane.

A vector is in **standard position** if its initial point is at the origin. In this position, a vector can be uniquely described by its terminal point $P(x, y)$.



$$x^2 + y^2 = h^2$$

$$\tan = \frac{y}{x}$$

$$\tan^{-1}$$

<x,y>

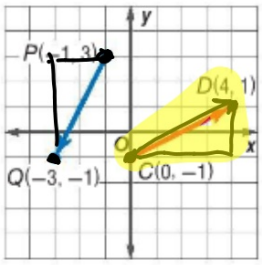
Example 3 Write a Vector in Component Form

Write the component form of $\overrightarrow{CD}$. <4,2>

$\overrightarrow{CD} = \langle x_2 - x_1, y_2 - y_1 \rangle$ Component form of a vector

$= \langle 4 - 0, 1 - (-1) \rangle$ $(x_1, y_1) = (0, -1)$ and $(x_2, y_2) = (4, 1)$

$= \langle 4, 2 \rangle$ Simplify.



Guided Practice

3. Write the component form of $\overrightarrow{PQ}$. <-2,-4>

GuidedPractice

4. Find the magnitude and direction of $\vec{p} = \langle -1, 4 \rangle$.

SohCahToa
Pythagorean theorem

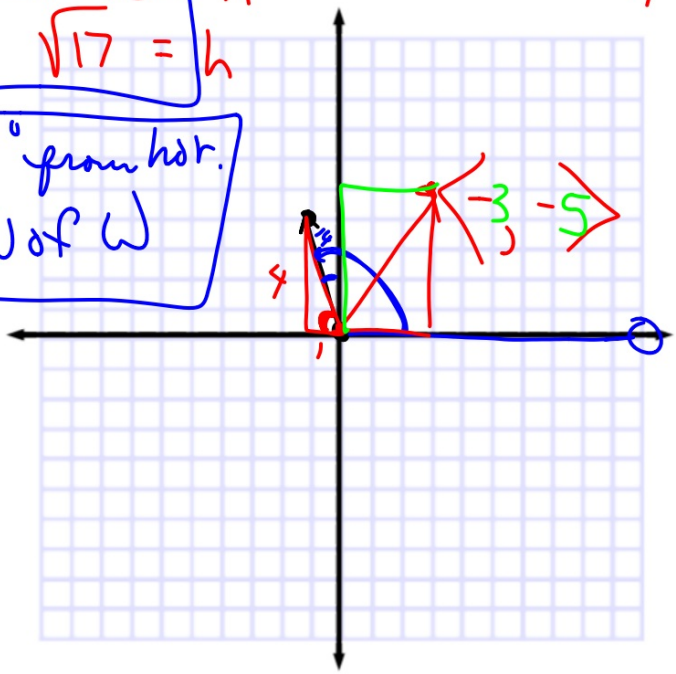
$1^2 + 4^2 = h^2$

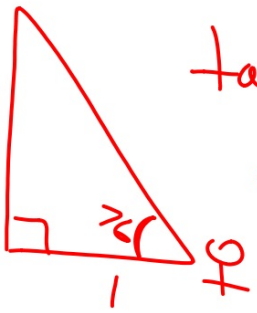
$1 + 16 = h^2$

$h \approx 4.1 \quad \sqrt{17} = h$

104° from hor.

76° N of W





$\tan = \frac{o}{a}$

$\tan\left(\frac{4}{1}\right)$

KeyConcept Vector Operations

If $\langle a, b\rangle$ and $\langle c, d\rangle$ are vectors and k is a scalar, then the following are true.

Vector Addition $\langle a, b\rangle + \langle c, d\rangle = \langle a + c, b + d\rangle$

Vector Subtraction $\langle a, b\rangle - \langle c, d\rangle = \langle a - c, b - d\rangle$

Scalar Multiplication $k\langle a, b\rangle = \langle ka, kb\rangle$

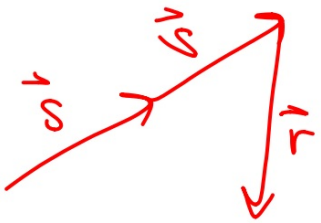
Is it an ordered pair (x,y)? or component form <x,y>?
(because it matters...could be either...)

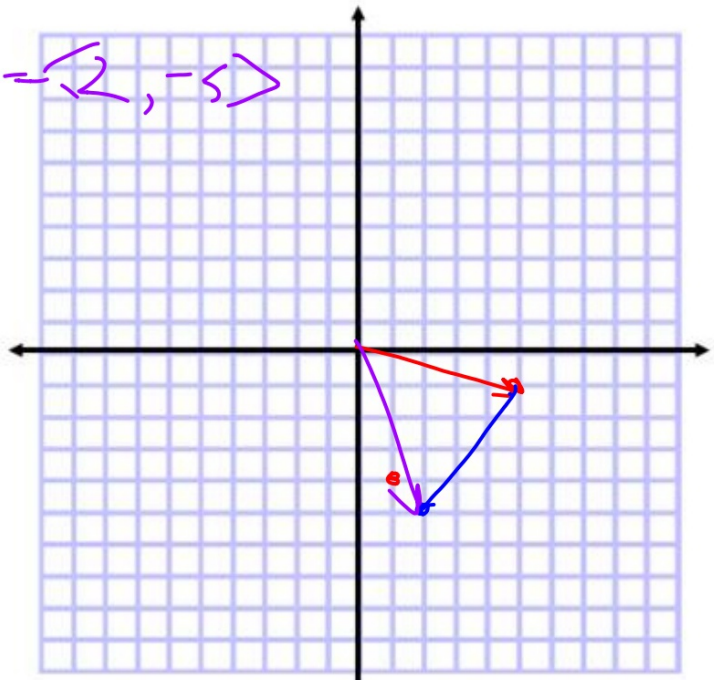
Find each of the following for $\vec{r} = \langle 3, 4 \rangle$, $\vec{s} = \langle 5, -1 \rangle$, and $\vec{t} = \langle 1, -2 \rangle$.

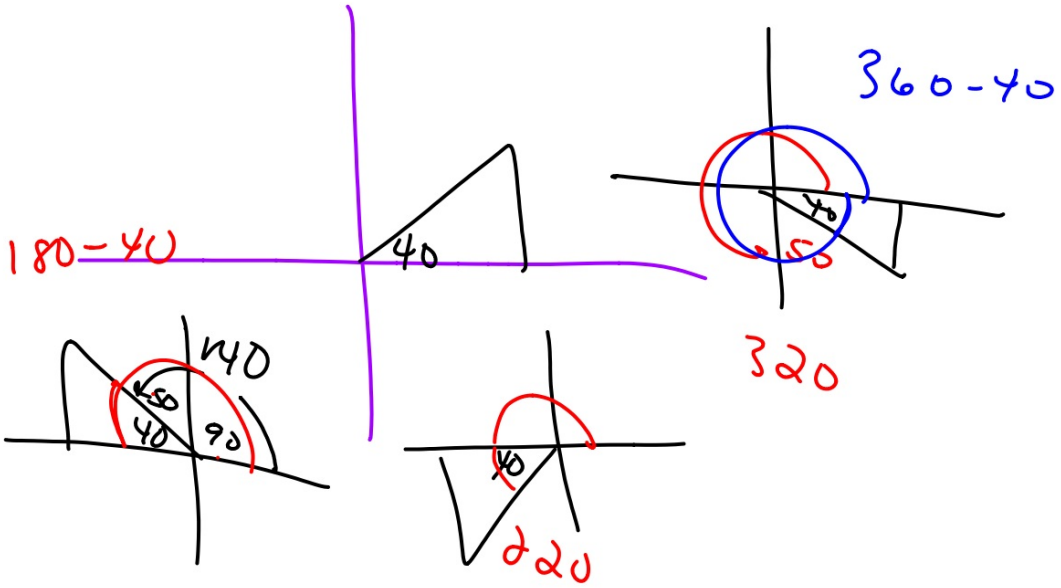
b. $\vec{s} - \vec{r}$

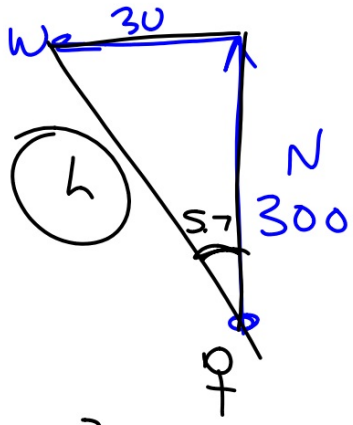
$\vec{s} + -\vec{r}$

$\langle 5, -1 \rangle + \langle -3, -4 \rangle = \langle 2, -5 \rangle$






180-40
40
360-40
40
50
320
140
50
40
90
40
220



5.7° W of N

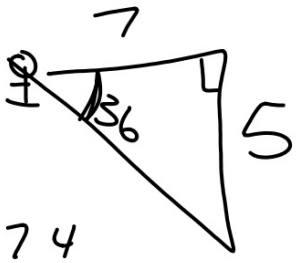
$\tan \frac{30}{300}$

Find each of the following for $\vec{r} = \langle 3, 4 \rangle$, $\vec{s} = \langle 5, -1 \rangle$, and $\vec{t} = \langle 1, -2 \rangle$.

c. $2\vec{t} + \vec{s}$

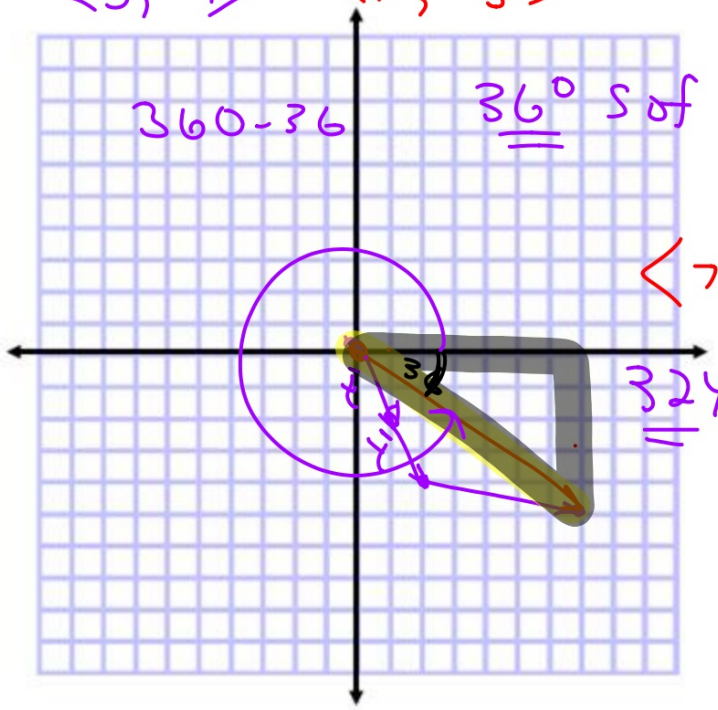
$\langle 1, -2 \rangle + \langle 1, -2 \rangle + \langle 5, -1 \rangle = \langle 7, -5 \rangle$

$\tan = \frac{5}{7}$



$7^2 + 5^2 = 74$

$h = \sqrt{74} \approx 8.6$



Whiteboards

GuidedPractice

Find each of the following for $\vec{r} = \langle 3, 4 \rangle$, $\vec{s} = \langle 5, -1 \rangle$, and $\vec{t} = \langle 1, -2 \rangle$.

5A. $\vec{t} - \vec{r}$

5B. $\vec{s} + 2\vec{t}$

5C. $\vec{s} - \vec{t}$