Name: Key Period: ______

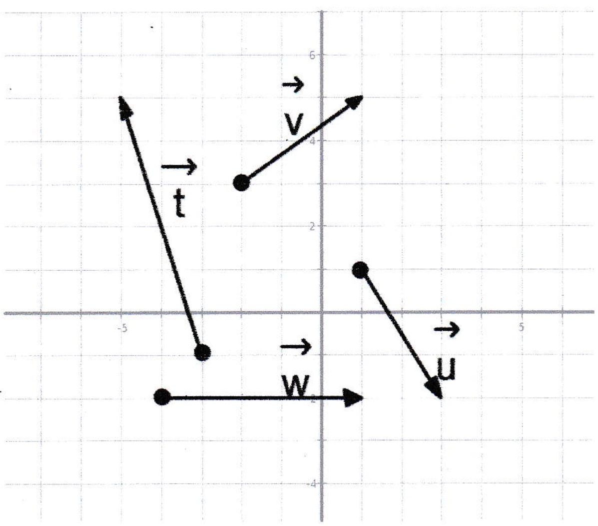
VECTORS IN TWO-DIMENSION PRACTICE

1. What is the difference between a vector quantity and a scalar quantity?

A vector quantity has both magnitude & direction, while a scalar quantity only has magnitude.

2. What are the two main vector quantities?

magnitude & direction



3. Write the component form of each of the vectors shown on the graph to the left.

$\vec{t} = \langle -2, 6 \rangle$

$\vec{u} = \langle 2, -3 \rangle$

$\vec{w} = \langle 5, 0 \rangle$

$\vec{v} = \langle 3, 2 \rangle$

4. Refer to the graph to the left.

$\|\vec{t}\| = \sqrt{(-2)^2+(6)^2} = \sqrt{4+36} = \sqrt{40} = 2\sqrt{10}$

$\|\vec{u}\| = \sqrt{(2)^2+(-3)^2} = \sqrt{4+9} = \sqrt{13}$

$\|\vec{w}\| = \sqrt{(5)^2+(0)^2} = 5$

$\|\vec{v}\| = \sqrt{(3)^2+(2)^2} = \sqrt{9+4} = \sqrt{13}$

5. The initial point of $\vec{v}$ is $(-3,2)$. The component form of $\vec{v}$ is $\langle 1,-3 \rangle$. What is the terminal point of $\vec{v}$?

$\vec{v} = \langle 1, -3 \rangle = \langle x-(-3), y-2 \rangle$

$x-(-3) = 1$
$x+3 = 1$
$x = -2$

$y-2 = -3$
$+2 \quad +2$
$y = -1$

$(-2,-1) \leftarrow$ terminal point

6. Find the direction angle and magnitude for $\vec{v} = 6\vec{\imath} - 5\vec{\jmath}$. ← Q IV

$\|\vec{v}\| = \sqrt{(6)^2+(-5)^2}$
$= \sqrt{36+25}$
$= \sqrt{61}$

magnitude

$\tan(\theta) = -\frac{5}{6}$
$\tan^{-1}(-\frac{5}{6}) = \theta$
$\theta \approx -0.69 + 2\pi$

coterminal

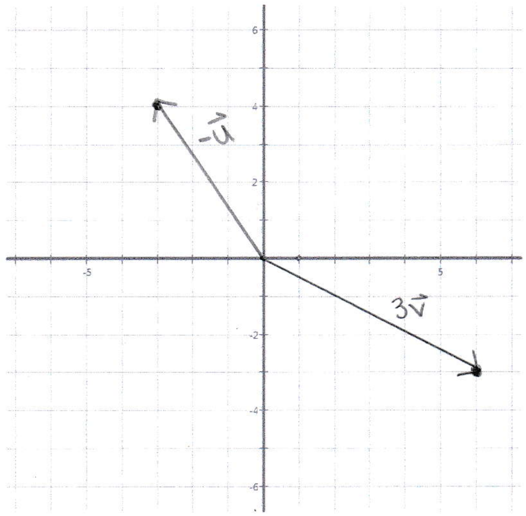
$\theta \approx 5.59$ rad

direction

7. Given $\vec{v} = \langle 2, -1 \rangle$ and $\vec{u} = \langle 3, -4 \rangle$, sketch:

$3\vec{v}$ and $-\vec{u}$

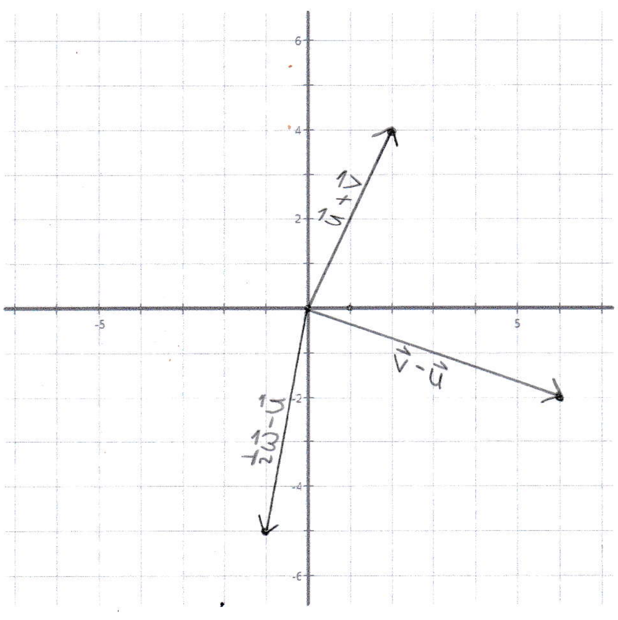
$3\vec{v} = \langle 2(3), -1(3) \rangle$
$= \langle 6, -3 \rangle$
$-\vec{u} = \langle (3)(-1), (-4)(-1) \rangle$
$= \langle -3, 4 \rangle$



Given: $\vec{v} = \langle 4,1 \rangle$, $\vec{u} = \langle -2,3 \rangle$, and $\vec{w} = \langle -6,-4 \rangle$ $\vec{u}+\vec{v} = \langle 2,4 \rangle$ $\vec{v}-\vec{u} = \langle 6,-2 \rangle$ $\frac{1}{2}w-\vec{u} = \langle -1,-5 \rangle$

8. *Sketch the following:*

$\vec{u} + \vec{v}$ $\vec{v} - \vec{u}$ $\frac{1}{2}\vec{w} - \vec{u}$



9. *Find the direction angle for each:*

a. $\vec{v} = \langle 4,1 \rangle$ ← QI

$\tan(\theta) = \frac{1}{4}$
$\tan^{-1}(\frac{1}{4}) = \theta$
$\theta \approx 0.24$ rad

b. $\vec{u} = \langle -2,3 \rangle$ ← QII

$\tan(\theta) = \frac{3}{-2}$
$\tan^{-1}(-\frac{3}{2}) = \theta$ ← QIV not QII
$\theta = \pi + \tan^{-1}(-\frac{3}{2}) \approx 2.16$ rad

c. $\vec{w} = \langle -6,-4 \rangle$ ← QIII

$\tan(\theta) = \frac{-4}{-6} = \frac{2}{3}$
$\tan^{-1}(\frac{2}{3}) = \theta$ ← QI not QIII
$\theta = \pi + \tan^{-1}(\frac{2}{3}) \approx 3.73$ rad

10. Find the component form of $\vec{u}$ if $\|\vec{u}\| = 8$ and the direction angle for $\vec{u}$ is 120°. Give **exact** values.

$a = \|\vec{u}\|\cos(\theta) = 8\cos(120°) = 8(-\frac{1}{2}) = -4$

$b = \|\vec{u}\|\sin(\theta) = 8\sin(120°) = 8(\frac{\sqrt{3}}{2}) = 4\sqrt{3}$

$\langle -4, 4\sqrt{3} \rangle$