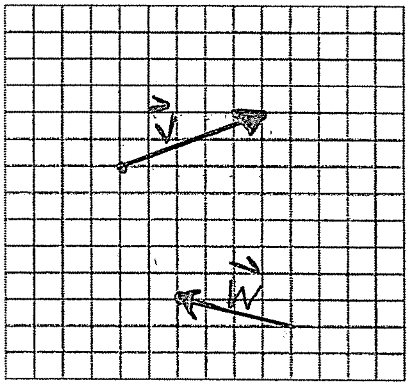
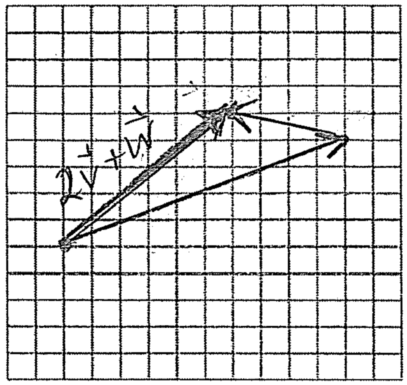
Accel Math III Review Worksheet: Vectors Name Key
Unit #7: Extended Trigonometry

I. Use the diagram of vectors **u** and **v** to sketch the graph of 1) 2**v** + **w** and 2) **v** – 3**w** .



1.


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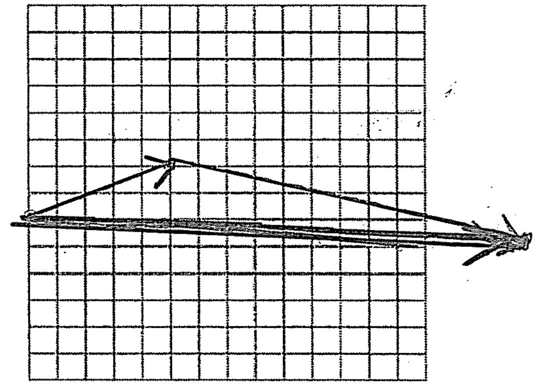
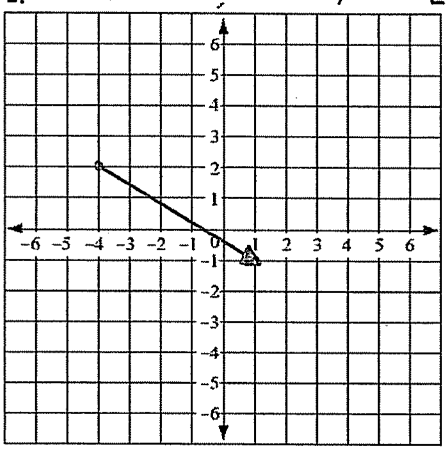
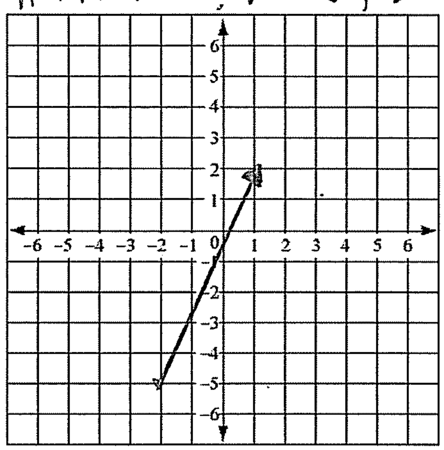


II. Find the component form $\langle a,b \rangle$ and magnitude of each vector **v**.

1. $\|\vec{v}\| = \sqrt{34}$ $\vec{v} = \langle 5,-3 \rangle$


2. $\|\vec{v}\| = \sqrt{58}$ $\vec{v} = \langle 3,7 \rangle$


3. initial pt: (-7, 3) terminal pt: (4, 1) $\vec{v} = \langle 11,-2 \rangle$ $\|\vec{v}\| = 5\sqrt{5}$

4. initial pt: (-2, -4) terminal pt: (-5, 3) $\vec{v} = \langle -5,3 \rangle$ $\|\vec{v}\| = \sqrt{34}$

III. Write vectors #1 - 4 in Part II as a position vector in the form **v** = a**i** + b**j**.

1. $\vec{v} = 5i - 3j$ 2. $\vec{v} = 3i + 7j$ 3. $\vec{v} = 11i - 2j$ 4. $\vec{v} = -5i + 3j$

5. The component form $\langle a,b \rangle$ of a vector represents a vector whose initial point is the origin.

IV. Find the magnitude of each vector.

1. $v = \langle 1,-2 \rangle$ $\|\vec{v}\| = \sqrt{5}$
2. $v = 4i - 3j$ $\|\vec{v}\| = 5$
3. $v = \langle 5,3 \rangle$ $\|\vec{v}\| = \sqrt{34}$
4. $v = i + j$ $\|\vec{v}\| = \sqrt{2}$
5. $v = \left\langle \frac{3}{5}, \frac{4}{5} \right\rangle$ $\|\vec{v}\| = 1$ * unit vector magnitude = 1 !

V. Find a unit vector, **u**, in the direction of the given vector.

1. **v** = 2i + j $\vec{v} = \langle 2, 1 \rangle$ $\|\vec{v}\| = \sqrt{5}$
$\boxed{\vec{\mu} = \frac{2\sqrt{5}}{5} i + \frac{\sqrt{5}}{5} j}$

2. **v** = $\langle 3,0 \rangle$ $\|\vec{v}\| = 3$
$\boxed{\vec{\mu} = i}$

3. **v** = $\langle -5,4 \rangle$ $\|\vec{v}\| = \sqrt{41}$
$\boxed{\vec{\mu} = \frac{-5\sqrt{41}}{41} i + \frac{4\sqrt{41}}{41} j}$

VI. Find a) **u** + **v** b) 2**u** − **v** c) 3**u** − 2**v**

1. **u** = $\langle 2,-7 \rangle$, **v** = $\langle 0,3 \rangle$
a) $\langle 2,-4 \rangle$
b) $\langle 4,-17 \rangle$
c) $\langle 6,-27 \rangle$

2. **u** = 2i − 4j, **v** = i + 5j
a) $3i + j$
b) $3i - 13j$
c) $4i - 22j$

3. **u** = $\langle -3,-1 \rangle$, **v** = $\langle -6,0 \rangle$
a) $\langle -9,-1 \rangle$
b) $\langle 0,-2 \rangle$
c) $\langle 3,-3 \rangle$

VII. Find the magnitude and the direction angle of each vector. Give angles in decimal degrees to the nearest whole degree.

1. **v** = $\langle 1,-1 \rangle$ $\|\vec{v}\| = \sqrt{2}$ $\theta = 315°$
2. **v** = $\langle -3,\sqrt{3} \rangle$ $\|\vec{v}\| = 2\sqrt{3}$ $\theta = 150°$
3. **v** = $\langle -4\sqrt{2},4\sqrt{2} \rangle$ $\|\vec{v}\| = 8$ $\theta = 135$
4. **v** = $\langle -3,-3 \rangle$ $\|\vec{v}\| = 3\sqrt{2}$ $\theta = 225°$
5. **v** = $\langle -8,15 \rangle$ $\|\vec{v}\| = 17$ $\theta = 118°$
6. **v** = $\langle 6,8 \rangle$ $\|\vec{v}\| = 10$ $\theta = 53°$
7. **v** = $\langle -5,0 \rangle$ $\|\vec{v}\| = 5$ $\theta = 180$
8. **v** = $\langle 0,4 \rangle$ $\|\vec{v}\| = 4$ $\theta = 90°$

VIII. Find the component form $\langle a,b \rangle$ of the vector, **v**, given its magnitude and direction angle.

$$\vec{v} = \langle \|\vec{v}\|\cos\theta, \|\vec{v}\|\sin\theta \rangle$$

1. $\theta = 30°$ $\|v\| = 24$ $\langle 12\sqrt{3}, 12 \rangle$
2. $\theta = 84.7°$ $\|v\| = 52.9$ $\langle 4.89, 56.67 \rangle$
3. $\theta = 60°$ $\|v\| = 80$ $\langle 40, 40\sqrt{3} \rangle$
4. $\theta = 45°$ $\|v\| = 5$ $\langle \frac{5\sqrt{2}}{2}, \frac{5\sqrt{2}}{2} \rangle$
5. $\theta = 136°$ $\|v\| = 7$ $\langle -5.04, 4.86 \rangle$
6. $\theta = 210°$ $\|v\| = 6$ $\langle -3\sqrt{3}, -3 \rangle$

IX. Find the angle, α, between the vectors. Law of Cosines OR Use Dot Product

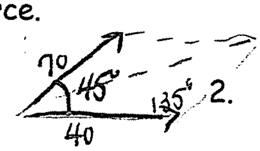
1. **v** = 2i + j, **w** = -3i - 4j
$\alpha = 153.4°$

2. **v** = i + 3j, **w** = -2i + 2j
$\alpha = 63.4°$

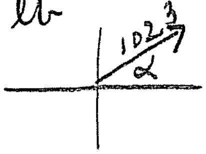
3. **v** = 6i − j, **w** = -4i - 2j
$\alpha = 144°$

X. Vectors **v** and **w** represent two forces acting at the same point and θ is the smallest positive angle between **v** and **w**. Find the magnitude (tenths) and direction angle (whole) of the resultant force.

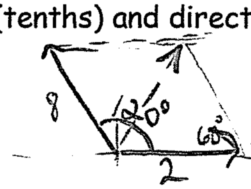
1. **w** = 40 lbs., **v** = 70 lbs, θ = 45°



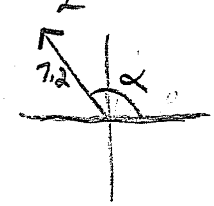
$\|w+v\| = 102.3$ lb
$\alpha = 28.9°$



2. **w** = 2 kg, **v** = 8 kg, θ = 120°



$\|w+v\| = 7.2$ kg
$\alpha = 106.5°$



3. **w** = 30 lbs, **v** = 50 lbs, θ = 150°

$\|w+v\| = 28.3$ lb
$\alpha = 118.1°$