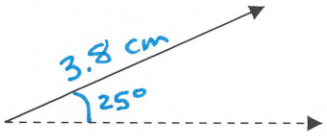
Section 8.1 Homework

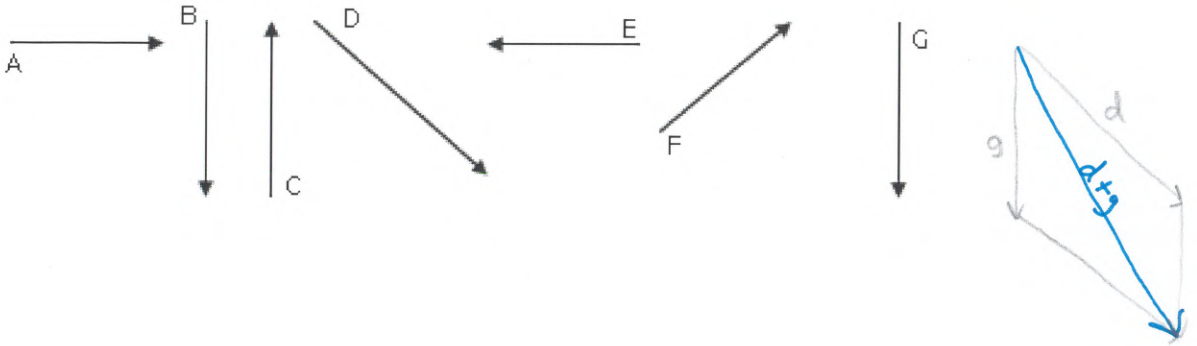
Name Key

Find the magnitude and direction of each vector below.

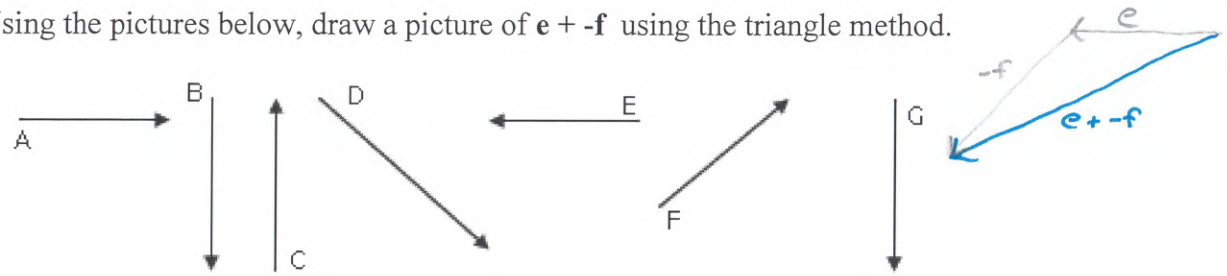
1. 

2. 

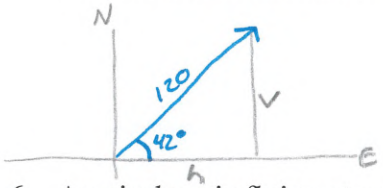
3. Using the pictures below, draw a picture of **d** + **g** using the parallelogram method.



4. Using the pictures below, draw a picture of **e** + **-f** using the triangle method.



5. A ship leaving port sails for 120 miles in a direction 42° north of due east. Find the magnitude of the vertical and horizontal components.



$\sin 42 = \frac{V}{120}$ $\quad V = 80.3$

$\cos 42 = \frac{h}{120}$ $\quad h = 89.2$

6. An airplane is flying at a velocity of 500 miles per hour due north when it encounters a wind blowing out of the west at 50 mph. What is the magnitude of the airplane's resultant velocity?

$\sqrt{50^2 + 500^2}$

$= 502.49$ mph

Section 8.2 Homework Name Key

Find the magnitude and direction of **AB** for the given coordinates. Round your answers to the nearest tenth.

1. $A(3, 1)$ $B(-2, 3)$

$\langle -5, 2 \rangle$

$\sqrt{(-5)^2+2^2} = \sqrt{29}$

$\tan^{-1}\left(\frac{2}{-5}\right) = -21.8$

$180 - 21.8 = 158.2°$

2. $A(0, 0)$ $B(-2, 1)$

$\langle -2, 1 \rangle$ $\sqrt{(-2)^2+(1)^2} = \sqrt{5}$

$\tan^{-1}\left(\frac{1}{-2}\right) = -26.6$

$180 - 26.6 = 153.4°$

3. $A(0, 1)$ $B(3, 5)$

$\sqrt{(3)^2+(4)^2} = \sqrt{25} = 5$

$\langle 3, 4 \rangle$ $\tan^{-1}\left(\frac{4}{3}\right) = 53.1°$

2. $A(-2, 2)$ $B(3, 1)$

$\sqrt{5^2+(-1)^2} = \sqrt{26}$

$\langle 5, -1 \rangle$ $\tan^{-1}\left(-\frac{1}{5}\right) = -11.3°$ $360 - 11.3 = 348.7°$

Given that $\mathbf{m} = \langle 1, -2 \rangle$ and $\mathbf{n} = \langle -3, -4 \rangle$, represent each of the following as a single vector.

5. $\mathbf{m} + \mathbf{n}$

$\langle -2, -6 \rangle$

6. $\mathbf{n} - \mathbf{m}$

$\langle -4, -2 \rangle$

Find an ordered pair to represent $\mathbf{u}$ in each equation if $\mathbf{v} = \langle 2, -1 \rangle$ and $\mathbf{w} = \langle -3, 5 \rangle$.

7. $\mathbf{u} = 3\mathbf{v}$

$u = \langle 6, -3 \rangle$

8. $\mathbf{u} = \mathbf{w} - 2\mathbf{v}$

$u = \langle -7, 7 \rangle$

Find the magnitude and direction of each vector. Write each vector as the sum of unit vectors.

9. $\langle 2, 6 \rangle$

$\sqrt{40} = 2\sqrt{10}$

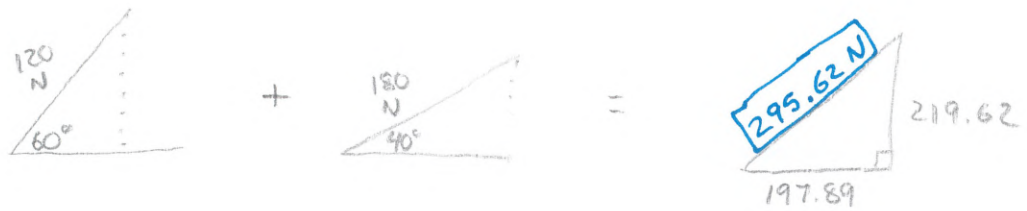
$\tan^{-1}\left(\frac{6}{2}\right) = 71.6°$

10. $\langle 4, -5 \rangle$

$\sqrt{41}$

$\tan^{-1}\left(\frac{-5}{4}\right) = -51.3$ $360 - 51.3 = 308.7°$

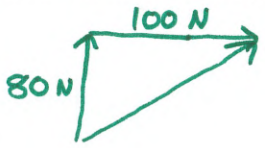
11. Nancy and Harry are lifting a stone statue and moving it to a new location in their garden. Nancy is pushing the statue with a force of 120 newtons at a 60° angle with the ground while Harry is pulling the statue with a force of 180 newtons at a 40° angle with the ground. What is the magnitude of the combined force they exert on the statue?



$(60, 103.92) + (137.89, 115.7) = (197.89, 219.62)$

Section 8.5 Homework Name Key

1. Two children are attempting to capture a loose dog. One of the children is exerting a force of 80N due north and the other is pulling with a force of 100N due east. What is the resultant force on the dog?
   a. Draw a labeled diagram that represents the forces.



   b. Determine the resultant force exerted on the dog by the two children.

$\sqrt{100^2+80^2}$

$\sqrt{16400} \approx \boxed{128.1\ N}$

   c. Find the angle the resultant force (direction) makes with the east-west axis.

$\tan^{-1}\left(\frac{80}{100}\right) \approx \boxed{38.7^\circ}$

2. Two paramedics are moving a person on a stretcher. Bob is pushing the stretcher with a force of 120N at 50° with the ground, while Ed is pulling the stretcher with a force of 200N at 40° with the ground. What is the magnitude of the force exerted on the stretcher?

$x = 120\cos 50$
$y = 120\sin 50$

$x = 200\cos 40$
$y = 200\sin 40$

$\langle 77.1, 91.9\rangle + \langle 153.2, 128.6\rangle = \langle 230.3, 220.5\rangle$

$\sqrt{230.3^2 + 220.5^2}$

$\boxed{318.8\ N}$

3. An airplane is flying at a velocity of 475 miles per hour at an angle of 60° north of east when it encounters a wind blowing out of the west at 45 mph. What is the magnitude of the airplane's resultant velocity?

$\langle 237.5, 411.4\rangle + \langle 45, 0\rangle = \langle 282.5, 411.4\rangle$

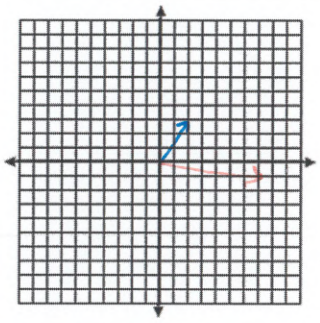
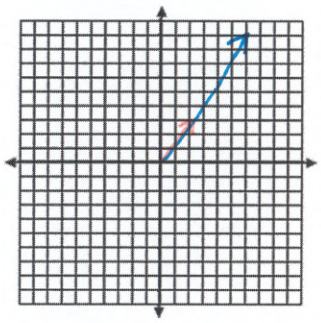
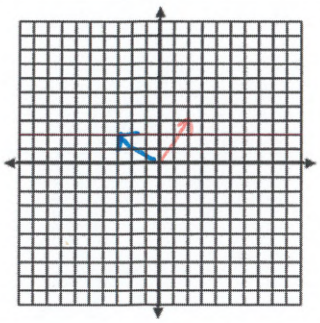
$\sqrt{282.5^2 + 411.4^2}$

$\boxed{499.1\ mph}$

8.4 Worksheet Name Key

Recall that:	Dot product: $\vec{u} \cdot \vec{v} = u_1v_1 + u_2v_2$	Angle Between: $\cos x = \frac{\vec{u} \cdot \vec{v}}{\lvert\vec{u}\rvert\lvert\vec{v}\rvert}$

1. Fill out the table for each vector pair

	a = <2, 3> and **b** = <7, -1>	**c** = <6, 9> and **d** = <2, 3>	**e** = <-3, 2> and **f** = <2, 3>
Calculate the dot product	$2(7) + 3(-1)$ 11	$6(2) + 9(3)$ 39	$-3(2) + 2(3)$ 0
Graph each vector pair on the same set of axes			
Determine if each set is parallel, orthogonal, or neither.	$\vec{a} = \frac{3}{2}$ $\vec{b} = -\frac{1}{7}$ Neither	$\vec{c} = \frac{9}{6} = \frac{3}{2}$ $\vec{d} = \frac{3}{2}$ Parallel	$\vec{e} = -\frac{2}{3}$ $\vec{f} = \frac{3}{2}$ Orthogonal

2. Recall that perpendicular lines have opposite reciprocal slopes. Suppose that vector **u** = <6, 8>.
   a. Find two vectors that are orthogonal (perpendicular) to **u**.

<-8, 6> <8, -6>

   b. "Scale-change" your answers from part (a) so that the vectors have a length of 20.

$|\vec{u}| = 10$ scale change of 2

$2\langle -8, 6\rangle = \langle -16, 12\rangle$

$2\langle 8, -6\rangle = \langle 16, -12\rangle$

8.6 Worksheet **Name** Key

Write the parametric equation of the line that passes through point P and is parallel to <a>.

1. P(-2, 1), a = <3, -4>

$x = -2 + 3t$

$y = 1 - 4t$

2. 2. P(3, 7), a = <4, 5>

$x = 3 + 4t$

$y = 7 + 5t$

3. P(2, -4), a = <1, 3>

$x = 2 + t$

$y = -4 + 3t$

Write the parametric equation of the line:

4. $y = 3x - 8$

$x = t$

$y = 3t - 8$

5. $y = -x + 4$

$x = t$

$y = -t + 4$

6. $5x + 4y = 20$ $4y = -5x + 20$

$y = -\frac{5}{4}x + 5$

$x = t$

$y = -\frac{5}{4}t + 5$

Write an equation in point-slope form of the line with the given parametric equation.

7. $x = 2t + 3$
   $y = t - 4$

Point: (3, -4) Slope: <2, 1>

$m = \frac{1}{2}$

$y + 4 = \frac{1}{2}(x - 3)$

8. $x = t + 5$
   $y = -3t$

Point: (5, 0) Slope: <1, -3>

$m = -3$

$y - 0 = -3(x - 5)$

$y = -3(x - 5)$

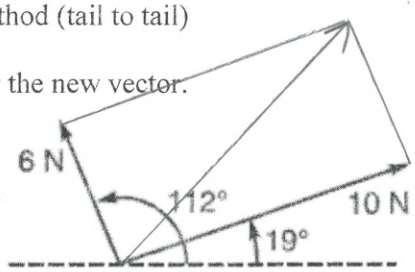
Name Key Hour _____

Chapter 8 Review SHOW ALL WORK!!

1. Find the magnitude and direction of the resultant vector for the figure below. This means:
   a. Draw the resultant with Triangle (Tip to tail) or Parallelogram method (tail to tail)
   b. Find the components for each vector and add them
   c. Given the new components, construct magnitude and direction for the new vector.

(-2.25, 5.56) + (9.46, 3.26) (7.21, 8.82)

Mag: 11.39 N
Direction: 50.7°



2. Let r = (-4, -3), s = (-3, 1), and t = (3, 2). Compute:
   a. Find |s| and |t| $|s| = \sqrt{10}$ $|t| = \sqrt{13}$
   b. Find a vector of length 40 that is parallel to r. $|r| = 5$ $8(-4,-3) = \boxed{(-32,-24)}$
   c. $s \bullet (r - t)$ $(-3,1)\cdot[(-4,-3)-(3,2)] = 21 + -5 = \boxed{16}$
   d. Find 5t + r $(15,10)+(-4,-3) = \boxed{(11,7)}$
   e. Given the formula $\cos x = \frac{\vec{u}\cdot\vec{w}}{|\vec{u}||\vec{w}|}$, find the angle, x, between r and t.

$\cos x = \frac{-18}{5(\sqrt{13})} \approx 176.8°$

3. Let $\vec{m} = \langle 2, -3\rangle$, $\vec{n} = \langle 1, 5\rangle$, and $\vec{p} = \langle -2, 4\rangle$. Find each of the following.

   a. $\vec{n} + \vec{p}$ $\langle -1, 9\rangle$

   b. $\vec{m} - \vec{p}$ $\langle 4, -7\rangle$

   c. $3\vec{n}$ $\langle 3, 15\rangle$

   d. $2\vec{m} + 3\vec{p}$ $\langle -2, 6\rangle$

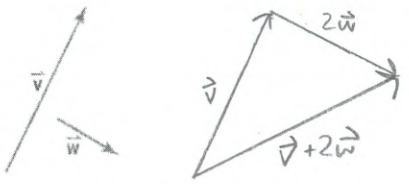
4. Use a ruler and protractor to determine the magnitude (in centimeters) and the direction of $\vec{n}$. Then find the coordinate point that represents the vector.

Mag: 1.9 cm
Direction: 20°

$x = 1.9 \cos 20$
$y = 1.9 \sin 20$

(1.79, .65)

5. Draw the resultant vector of $\vec{v}+2\vec{w}$:



6. A hang-glider traveled forward at 4 m/s and descended at 2 m/s. Determine the magnitude of the resultant velocity of the hang-glider.

$\sqrt{4^2+(-2)^2} = \sqrt{20}$ or $2\sqrt{5}$ m/s

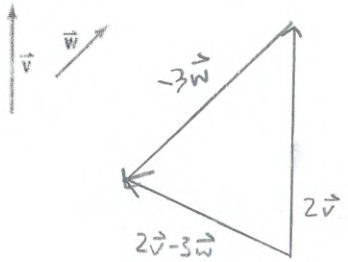
7. Write the ordered pair that represents the vector from $X(-2, 4)$ to $Y(4, -6)$. Then find the magnitude of $\overrightarrow{XY}$.

+2 -4 +2 -4

$(6, -10)$

$\sqrt{136} \approx 11.7$

8. Use the triangle method to draw $2\vec{v} - 3\vec{w}$.



9. Given the formula $\cos x = \frac{\vec{u}\cdot\vec{w}}{|\vec{u}||\vec{w}|}$, find the angle, x, between u = ⟨9, 7⟩ and v = ⟨2, -3⟩.

$\cos x = \frac{-3}{\sqrt{130}\sqrt{13}} \approx 94.2°$

10. Vector b is defined as (2, -9) to (-3, 7).

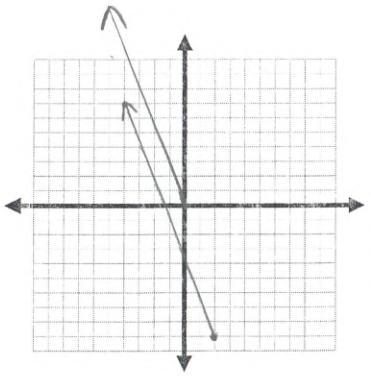
-2 +9 -2 +9

i. Draw vector b (on graph to the right)

ii. Draw the standard position of vector b.

i. Find the component representation of b.

$\langle -5, 16 \rangle$



11. Complete the second vector to make the pairs parallel or perpendicular

a. Finish "t" in order to make the two vectors parallel.

k = (9, 12) and t = (-3, -4)

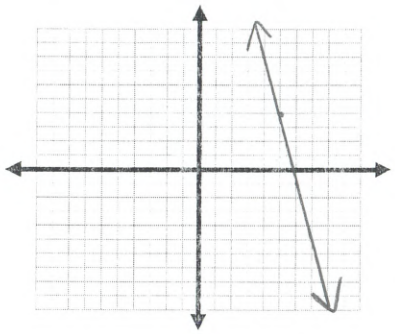
b. Finish "s" in order to make the two vectors perpendicular

k = (-9, 8) and t = (-8.$\overline{8}$, -10)

$\frac{9}{8} = \frac{-10}{x}$ $x = -8.\overline{8}$

12. Graph the line represented by the parametric equations :

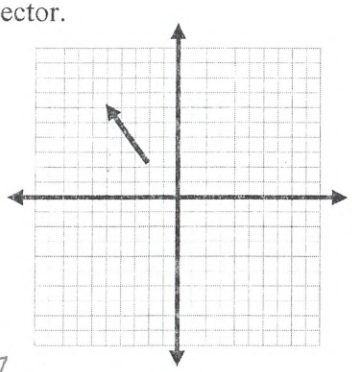
$x = 5 - 2t$
$y = 4 + 10t$



P: (5, 4)

v = (-2, 10) $m = \frac{10}{-2} = -5$

13. Use the graph of the vector (to the right) to find the magnitude and direction of the vector.



(-2, 2) (-5, 6) +2 -2 +2 -2 $\langle -3, 4 \rangle$

$|\vec{v}| = \sqrt{25} = 5$

Direction : 126.9°

$\tan x = \frac{4}{-3} = -53.13$

$180 - 53.13 = 126.87$

14. Write the **parametric** equations for the line through the point P = (2, 6) and is parallel to the vector **v** = (5, 1).

$x = 2 + 5t$
$y = 6 + t$

15. Write the equation of the line containing the point (-9, 3) and orthogonal to vector (-1, 4) in each of the following forms:

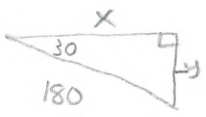
$\perp$

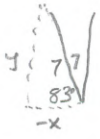
a. parametric form
b. Point-slope form

a. $x = -9 + 4t$
$y = 3 + t$

b. $y - 3 = \frac{1}{4}(x + 9)$

16. A bullet is shot at a speed of 180 m/s in the direction of 30° South of East, while the wind blows at a speed of 7 m/s in the direction of 7° West of North. Find the x and y components of the vector representing the bullets actual velocity.





$(155.88, -90) + (-.85, 6.95) = \langle 155.03, -83.05 \rangle$

17. Write a vector equation describing a line passing through $P_1(3, 2)$ and orthogonal to vector (4, -1). Then, write the equivalent parametric equation.

SKIP

18. Find the parametric equation for a line parallel to vector (4, 2) and passing through the point (-1, -3). Then make a table of values and graph the line.

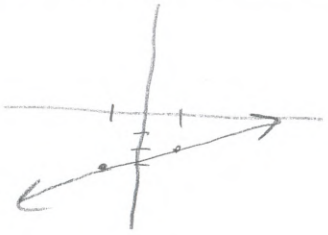
$v \langle 4, 2 \rangle$

$P (-1, -3)$

$x = -1 + 4t$

$y = -3 + 2t$

$m = \frac{1}{2}$



19. Write the parametric equation of $y = 3x - 5$.

$v = \langle 1, 3 \rangle$

$P = (1, -2)$

$x = 1 + t$

$y = -2 + 3t$

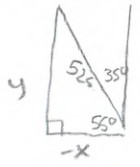
20. Write an equation in slope-intercept form and vertex form of the line whose parametric equation is:

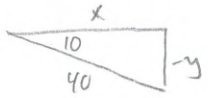
$x = 3 + 2t$

$y = -1 - 4t$

SKIP

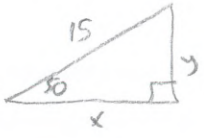
21. An airplane is set to travel at a speed of 525 mph in the direction 35° west of north. The plane encounters a tail wind at a speed of 40 mph in the direction 10° south of east. Find the x and y components of the vector representing the airplane's actual velocity relative to the land.





$(-301.13, 430.05) + (39.39, -6.95) = (-261.73, 423.1)$

22. A hiker leaves her camp and walks for 15 miles in a direction 50° north of due east. Find the magnitude of her vertical and horizontal components.



$(9.64, 11.49)$