More Vector Practice!

Name <u>Key</u>

2020

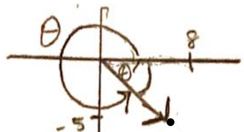
For each of the following vectors, find ...

a. component form, sum of unit vectors form, sketch in standard position, magnitude, and direction.

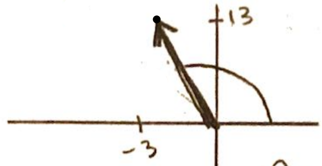
$_2-x_1, y_2-y_1\rangle$ $\quad x_1\ y_1 \quad x_2\ y_2$

Look at the direction of the arrow
S = Initial point T = Terminal point

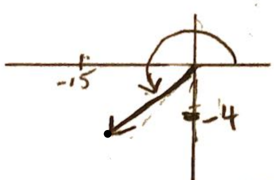
1. Point S is at (–3, –2) and T is at (5, –7). Find $\overrightarrow{ST}$.

a. component form	c. sketch in standard position	d. magnitude (nearest hundredth) $\sqrt{x^2+y^2}$	e. direction (nearest hundredth)
$\langle 5-{}^-3, -7-{}^-2\rangle$ $\langle 8, -5\rangle$	 Q IV	$\sqrt{8^2+(-5)^2}$ $\sqrt{64+25} = \sqrt{89}$ $= \boxed{9.43}$	$\theta' = \tan^{-1}\left(-\frac{5}{8}\right) = -32.01$ $\theta = 360° - 32.01°$ $\boxed{\theta = 327.99°}$
b. sum of unit vectors $8\vec{i} - 5\vec{j}$			

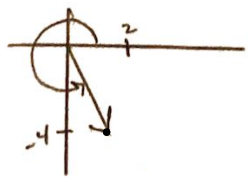
2. Point F is at (–5, 2) and G is at (–8, 15). Find $\overrightarrow{FG}$.

a. component form	c. sketch in standard position	d. magnitude (nearest hundredth)	e. direction (nearest hundredth)
$\langle -8-{}^-5, 15-2\rangle$ $\langle -3, 13\rangle$	 Q II	$\sqrt{(-3)^2+(13)^2}$ $\sqrt{9+169}$ $\sqrt{178} = \boxed{13.34}$	$\theta' = \tan^{-1}\left(\frac{13}{-3}\right) = -77.01°$ $\theta = 180° - 77.01°$ $\boxed{\theta = 102.99°}$
b. sum of unit vectors $-3\vec{i} + 13\vec{j}$			

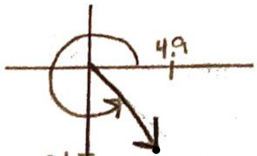
3. Point J is at (6, –7) and K is at (–9, –11). Find $\overrightarrow{JK}$.

a. component form	c. sketch in standard position	d. magnitude (nearest hundredth)	e. direction (nearest hundredth)
$\langle -9-6, -11-{}^-7\rangle$ $\langle -15, -4\rangle$	 Q III	$\sqrt{(-15)^2+(-4)^2}$ $\sqrt{225+16}$ $\sqrt{241} = \boxed{15.52}$	$\theta' = \tan^{-1}\left(\frac{-4}{-15}\right) = 14.93°$ $\theta = 180° + 14.93°$ $\boxed{\theta = 194.93°}$
b. sum of unit vectors $-15\vec{i} - 4\vec{j}$			

4. Point L is at (0, 6) and M is at (2, 2). Find $\overrightarrow{LM}$.

a. component form	c. sketch in standard position	d. magnitude (nearest hundredth)	e. direction (nearest hundredth)
$\langle 2-0, 2-6\rangle$ $\langle 2, -4\rangle$	 Q IV	$\sqrt{(2)^2+(-4)^2}$ $\sqrt{4+16}$ $\sqrt{20} = \boxed{4.47}$	$\theta' = \tan^{-1}\left(-\frac{4}{2}\right) = -63.43$ $\theta = 360 - 63.43$ $\boxed{\theta = 296.57°}$
b. sum of unit vectors $2\vec{i} - 4\vec{j}$			

5. Point Q is at (1.9, –4.7) and R is at (6.8, –12.3). Find $\overrightarrow{QR}$.

a. component form	c. sketch in standard position	d. magnitude (nearest hundredth)	e. direction (nearest hundredth)
$\langle 6.8-1.9, -12.3-{}^-4.7\rangle$ $\langle 4.9, -7.6\rangle$	 Q IV	$\sqrt{(4.9)^2+(-7.6)^2}$ $\sqrt{24.01+57.76}$ $\sqrt{81.77} = \boxed{9.04}$	$\theta' = \tan^{-1}\left(\frac{-7.6}{4.9}\right) = -57.19°$ $\theta = 360° - 57.19°$ $\boxed{\theta = 302.81°}$
b. sum of unit vectors $4.9\vec{i} - 7.6\vec{j}$			

Find: a) $-\frac{1}{2}\vec{u}-5\vec{v}$ and b) $-3\vec{u}+6\vec{v}$ for each of the following. Write your answer in the form of the given vectors.

6. $\vec{u}=<4,-4>$ *and* $\vec{v}=<6,9>$

a) $-\frac{1}{2}<4,-4>-5<6,9>$

$=<-2,2>+<-30,-45>=\boxed{<-32,-43>}$

b) $-3<4,-4>+6<6,9>$

$=<-12,12>+<36,54>=\boxed{<24,66>}$

7. $\vec{u}=2\vec{i}-3\vec{j}$ *and* $\vec{v}=-\vec{i}+5\vec{j}$

$<2,-3>$ $<-1,5>$

a) $-\frac{1}{2}<2,-3>-5<-1,5>$

$=<-1,\frac{3}{2}>+<5,-25>=<-1,\frac{3}{2}>+<5,\frac{-50}{2}>$

$=<4,{-47}/{2}>=\boxed{4\vec{i}-\frac{47}{2}\vec{j}}$

b) $-3<2,-3>+6<-1,5>$

$=<-6,9>+<-6,30>$

$=<-12,39>$

$=\boxed{-12\vec{i}+39\vec{j}}$

For the following find the unit vector in the direction of the given vector. Use simplified radicals, not decimals. $\frac{\vec{u}}{\|\vec{u}\|}$

8. $\vec{v}=<-3,9>$

$\|\vec{v}\|=\sqrt{(-3)^2+9^2}=\sqrt{9+81}=\sqrt{90}=3\sqrt{10}$

$\vec{u}=\frac{<-3,9>}{3\sqrt{10}}=\frac{1}{3\sqrt{10}}<-3,9>=<\frac{-3}{3\sqrt{10}},\frac{9}{3\sqrt{10}}>$

$=<\frac{-1}{\sqrt{10}},\frac{3}{\sqrt{10}}>=\boxed{<-\frac{\sqrt{10}}{10},\frac{3\sqrt{10}}{10}>}$

9. $\vec{v}=<8,2>$

$\|\vec{v}\|=\sqrt{8^2+2^2}=\sqrt{64+4}=\sqrt{68}=2\sqrt{17}$

$\vec{u}=\frac{<8,2>}{2\sqrt{17}}=\frac{1}{2\sqrt{17}}<8,2>=<\frac{8}{2\sqrt{17}},\frac{2}{2\sqrt{17}}>$

$=<\frac{4}{\sqrt{17}},\frac{1}{\sqrt{17}}>=\boxed{<\frac{4\sqrt{17}}{17},\frac{\sqrt{17}}{17}>}$

10. $\vec{w}=<-5,5>$

$\|\vec{w}\|=\sqrt{(-5)^2+(5)^2}=\sqrt{25+25}=\sqrt{50}=5\sqrt{2}$

$\vec{u}=\frac{<-5,5>}{5\sqrt{2}}=<\frac{-5}{5\sqrt{2}},\frac{5}{5\sqrt{2}}>=<-\frac{1}{\sqrt{2}},\frac{1}{\sqrt{2}}>$

$=\boxed{<-\frac{\sqrt{2}}{2},\frac{\sqrt{2}}{2}>}$

11. $\vec{w}=3\vec{i}+3\vec{j}$ $<3,3>$

$\|\vec{w}\|=\sqrt{3^2+3^2}=\sqrt{9+9}=\sqrt{18}=3\sqrt{2}$

$\vec{u}=\frac{<3,3>}{3\sqrt{2}}=<\frac{3}{3\sqrt{2}},\frac{3}{3\sqrt{2}}>=<\frac{1}{\sqrt{2}},\frac{1}{\sqrt{2}}>$

$=<\frac{\sqrt{2}}{2},\frac{\sqrt{2}}{2}>=\boxed{\frac{\sqrt{2}}{2}\vec{i}+\frac{\sqrt{2}}{2}\vec{j}}$

12. $\vec{v}=-\frac{1}{2}\vec{i}+\frac{3}{2}\vec{j}$ $<-\frac{1}{2},\frac{3}{2}>$

$\|\vec{v}\|=\sqrt{(-\frac{1}{2})^2+(\frac{3}{2})^2}=\sqrt{\frac{1}{4}+\frac{9}{4}}=\sqrt{\frac{10}{4}}=\frac{\sqrt{10}}{2}$

$\vec{u}=\frac{<-\frac{1}{2},\frac{3}{2}>}{\sqrt{10}/2}=\frac{2}{\sqrt{10}}<-\frac{1}{2},\frac{3}{2}>=<-\frac{1}{\sqrt{10}},\frac{3}{\sqrt{10}}>$

$=<-{\sqrt{10}}/{10},{3\sqrt{10}}/{10}>=\boxed{-\frac{\sqrt{10}}{10}\vec{i}+\frac{3\sqrt{10}}{10}\vec{j}}$

13. $\vec{w}=-7\vec{j}$ $<0,-7>$

$\|\vec{w}\|=\sqrt{(-7)^2}=\sqrt{49}=7$

$\vec{u}=\frac{<0,-7>}{7}=<0,-1>=\boxed{-\vec{j}}$

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1) $\langle 8,-5\rangle$; 9.43; 327.99°

2) $\langle -3,13\rangle$; 13.34; 102.99°

3) $\langle -15,-4\rangle$; 15.52; 194.93°

4) $\langle 2,-4\rangle$; 4.47; 296.57°

5) $\langle 4.9,-7.6\rangle$; 9.04; 302.81°

6) $\langle -32,-43\rangle$; $\langle 24,66\rangle$

7) $4\vec{i}-\frac{47}{2}\vec{j}$; $-12\vec{i}+39\vec{j}$

8) $\left\langle \frac{-\sqrt{10}}{10},\frac{3\sqrt{10}}{10}\right\rangle$

9) $\left\langle \frac{4\sqrt{17}}{17},\frac{\sqrt{17}}{17}\right\rangle$

10) $\left\langle \frac{-\sqrt{2}}{2},\frac{\sqrt{2}}{2}\right\rangle$

11) $\frac{\sqrt{2}}{2}\vec{i}+\frac{\sqrt{2}}{2}\vec{j}$

12) $-\frac{\sqrt{10}}{10}\vec{i}+\frac{3\sqrt{10}}{10}\vec{j}$

13) $-\vec{j}$