

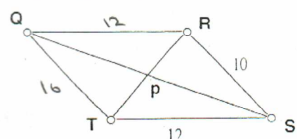
Note: There are two different first pages – the second is on the last page. If you think you would like more practice on a particular problem, try the other version.

Math 614 - Vector Quiz #1
Sections 12.1-12.2 (D)

Name _____

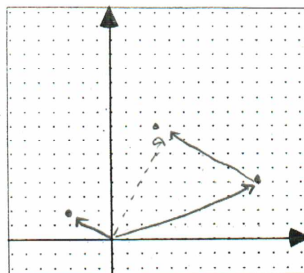
1 point each blank in problems that have blanks. Otherwise, 2 points each.

1. Given the parallelogram shown, complete the following statements.



- a. $|QT| + |TS| = 16 + 12 = 28$
b. $\vec{PR} - \vec{PT} = \vec{TR}$
c. $\vec{QP} + \vec{SP} = \vec{0}$
d. $\vec{PQ} + \vec{QR} + \vec{RS} + \vec{ST} = \vec{PS}$
e. $\vec{PR} - \vec{TQ} = \vec{PS}$

2. Given $\mathbf{u} = (10, 4)$ and $\mathbf{v} = (-3, 2)$: Show on a vector diagram the vectors \mathbf{u} , \mathbf{v} , and $\mathbf{u} + \mathbf{v}$



3. Given $A(3, 8)$ and $B(-1, 3)$:

- a. Express \vec{AB} in component form. $(-4, -5)$
b. Find $|\vec{AB}| = \sqrt{16 + 25} = \sqrt{41}$

4. Let $\mathbf{u} = (-4, 6)$ and $\mathbf{v} = (-1, -2)$.

- a. Find $\frac{1}{2}\mathbf{u} + 3\mathbf{v} = \frac{1}{2}(-4, 6) + 3(-1, -2) = (-2, 3) + (-3, -6) = (-5, -3)$
b. $|\frac{1}{2}\mathbf{u} + 3\mathbf{v}| = \sqrt{25 + 9} = \sqrt{34}$
c. $|\frac{1}{2}\mathbf{u}| + |3\mathbf{v}| = \sqrt{4 + 9} + \sqrt{9 + 36} = \sqrt{13} + \sqrt{45}$

5. Find a vector of length 1 in the same direction as $(-24, 7)$.

$$\left(-\frac{24}{25}, \frac{7}{25}\right)$$

6. Find real numbers r and s such that

$$r(3, 7) + s(2, -1) = (3, -10)$$

$$\begin{pmatrix} 3r \\ 7r \end{pmatrix} + \begin{pmatrix} 2s \\ -s \end{pmatrix} = \begin{pmatrix} 3 \\ -10 \end{pmatrix}$$

$$3r + 2s = 3$$

$$7r - s = -10 \Rightarrow$$

$$r = -1 \quad s = 3$$

7. Find the coordinates of the point P described:
 $A(-1, 8)$, $B(9, 6)$; $\frac{3}{5}$ of the way from A to B .

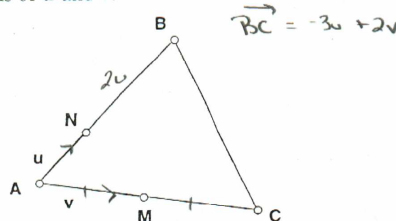
$$\vec{AB} = (10, -2)$$

$$(-1, 8) + \frac{3}{5}(10, -2)$$

$$(-1, 8) + (6, -\frac{6}{5})$$

$$(5, 6\frac{4}{5})$$

8. In the given diagram, $\frac{AN}{NB} = \frac{1}{2}$ and $AM = MC$.
If $\mathbf{u} = \vec{AN}$ and $\mathbf{v} = \vec{AM}$, express the following in terms of \mathbf{u} and \mathbf{v} .



$$17r = 17$$

$$r = 1$$

✓

1. An object moves with constant velocity along a line from A(-3, 1) at time $t=0$ through B(5,7) at time $t=2$. Give a vector equation of line AB.

$$(x, y) = (-3, 1) + t(4, 3)$$

$$\vec{AB} = (8, 6) \quad t=2$$

$$\frac{1}{2}(8, 6) = (4, 3) \quad t=1$$

2. An object moves so that its position at time t is $(x, y) = (7, -3) + t(-2, 5)$.

- a.) Find the velocity of the object. (vector)

$$(-2, 5)$$

- b.) Find the speed of the object.

$$\sqrt{(-2)^2 + 5^2} = \sqrt{4 + 25} = \sqrt{29}$$

- c.) Find the parametric equations for the line along which this object moves.

$$x = 7 - 2t$$

$$y = -3 + 5t$$

- d.) Find the Cartesian equation of the line along which this object moves.

$$m = \frac{5}{-2} \quad y + 3 = \frac{-5}{2}(x - 7)$$

3. A ship is on a course of 112° at a speed of 22 knots. What is the north-south component of its velocity vector?



$$\cos 68 = \frac{h}{22}$$

$$22 \cos 68 = h$$

$$\sin 68 = \frac{v}{22}$$

$$22 \sin 68 = v$$

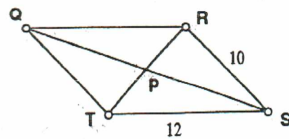
4. Find a Cartesian equation for the parametric equations: $x = 3 + 4 \cos t$ and $y = -2 + 3 \sin t$.

$$\frac{x-3}{4} = \cos t$$

$$\frac{y+2}{3} = \sin t$$

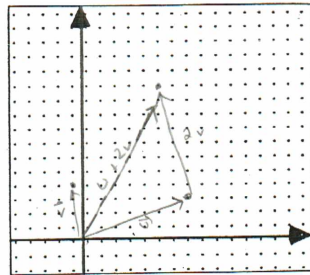
2 point each blank in problems that have blanks. Otherwise, 3 points each.

1. Given the parallelogram shown, complete the following statements.



- a. $|\vec{SR}| + |\vec{RQ}| = 22$
 b. $\vec{PR} + \vec{RS} = \vec{PS}$
 c. $\vec{QP} - \vec{SP} = \vec{0}$
 d. $\vec{PR} + \vec{RQ} + \vec{QT} + \vec{TS} = \vec{PS}$
 e. $\vec{PT} - \vec{RS} = \vec{PQ}$

2. Given $\mathbf{u} = (7,3)$ and $\mathbf{v} = (-1,4)$: Show on a vector diagram the vectors \mathbf{u} , \mathbf{v} , and $\mathbf{u} + 2\mathbf{v}$



3. Given $A(-2,4)$ and $B(1,1)$:

- a. Express \vec{AB} in component form. $(3, -3)$
 b. Find $|\vec{AB}| = \sqrt{18} = 3\sqrt{2}$

4. Let $\mathbf{u} = (-3,5)$ and $\mathbf{v} = (-4,-8)$.

- a. Find $2\mathbf{u} + \frac{1}{2}\mathbf{v} = (-8,6)$
 $(-6,10) + (-2,-4) = (-8,6)$
 b. $|2\mathbf{u} + \frac{1}{2}\mathbf{v}| = \sqrt{8^2 + 6^2} = 10$
 c. $|2\mathbf{u}| + |\frac{1}{2}\mathbf{v}| = \sqrt{136} + \sqrt{20}$

5. Find a vector of length 1 in the same direction as $(5,-12)$.

$$\left(\frac{5}{13}, -\frac{12}{13}\right)$$

6. Find real numbers r and s such that

$$\begin{aligned} r(2,7) + s(3,-1) &= (1,15) \\ 2r + 3s &= 1 \\ 7r - s &= 15 \end{aligned}$$

$$r = 2, s = -1$$

7. Find the coordinates of the point P described:
 $A(-1,9)$, $B(14,6)$; $\frac{2}{5}$ of the way from A to B .

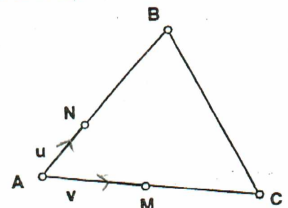
$$\vec{AB} = (15, -3)$$

$$(-1,9) + \frac{2}{5}(15, -3)$$

$$(-1+6, 9-\frac{6}{5})$$

$$(5, 7\frac{4}{5})$$

8. In the given diagram, $\frac{\vec{AN}}{\vec{NB}} = \frac{1}{2}$ and $\vec{AM} = \vec{MC}$.
If $\mathbf{u} = \vec{AN}$ and $\mathbf{v} = \vec{AM}$, express the following in terms of \mathbf{u} and \mathbf{v} .



- a. $\vec{BN} = -2\vec{u}$ b. $\vec{BC} = -3\vec{u} + 2\vec{v}$