

PRETEST - VECTORS

Find the component form of the resultant vector.

1) $\mathbf{u} = \langle 12, -35 \rangle$

Find the vector opposite \mathbf{u}

2) $\mathbf{f} = \langle -20, 21 \rangle$

Find the vector opposite \mathbf{f}

3) $\mathbf{u} = \langle -7\sqrt{37}, 6 \rangle$

Find: $10\mathbf{u}$

4) $\mathbf{u} = \langle 8, -11 \rangle$

Find: $8\mathbf{u}$

5) $\mathbf{u} = \langle -4, -5 \rangle$

$\mathbf{v} = \langle -6, 5 \rangle$

Find: $\mathbf{u} + \mathbf{v}$

6) $\mathbf{f} = \langle 12, 6 \rangle$

$\mathbf{g} = \langle -9, 6 \rangle$

Find: $-\mathbf{f} + \mathbf{g}$

7) $\mathbf{u} = \langle 12, 3 \rangle$

$\mathbf{b} = \langle -3, -9 \rangle$

Find: $10\mathbf{u} + 6\mathbf{b}$

8) $\mathbf{f} = \langle -6, 8 \rangle$

$\mathbf{b} = \langle 12, -2 \rangle$

Find: $-7\mathbf{f} + 4\mathbf{b}$

9) $\mathbf{f} = \langle 2, 8 \rangle$

Unit vector in the opposite direction of \mathbf{f}

10) $\mathbf{f} = \langle 7, -1 \rangle$

Unit vector in the opposite direction of \mathbf{f}

Find the magnitude and direction angle of the resultant vector.

11) $\mathbf{a} = \langle -1, -7 \rangle$

$\mathbf{v} = \langle -7, 0 \rangle$

Find: $\mathbf{a} - \mathbf{v}$

12) $\mathbf{u} = \langle 1, -6 \rangle$

$\mathbf{v} = \langle -1, -7 \rangle$

Find: $-\mathbf{u} + \mathbf{v}$

Find the dot product of the given vectors.

13) $\mathbf{u} = \langle 3, -4 \rangle$

$\mathbf{v} = \langle 5, -3 \rangle$

14) $\mathbf{u} = \langle -5, 2 \rangle$

$\mathbf{v} = \langle -8, 5 \rangle$

Find the measure of the angle between the two vectors.

15) $\mathbf{u} = \langle 8, 9 \rangle$

$\mathbf{v} = \langle -3, -3 \rangle$

16) $\mathbf{u} = \langle -4, -2 \rangle$

$\mathbf{v} = \langle 8, -9 \rangle$

Find the projection of \mathbf{u} onto \mathbf{v} .

17) $\mathbf{u} = \langle -3, 5 \rangle$

$\mathbf{v} = \langle 3, -3 \rangle$

18) $\mathbf{u} = \langle -7, 7 \rangle$

$\mathbf{v} = \langle -8, 4 \rangle$

State if the two vectors are parallel, orthogonal, or neither.

19) $\mathbf{u} = \langle 5, -40 \rangle$

$\mathbf{v} = \langle -8, -1 \rangle$

20) $\mathbf{u} = \langle -20, -8 \rangle$

$\mathbf{v} = \langle 6, -9 \rangle$

21) $\mathbf{u} = \langle 8, -9 \rangle$

$\mathbf{v} = \langle 40, -45 \rangle$

22) $\mathbf{u} = \langle 15, -15 \rangle$

$\mathbf{v} = \langle -3, -3 \rangle$

- (23) Given $A = (-2, 4)$
 $B = (18, 34)$
Find C if C divides \vec{AB} in a ratio of $3:2$

- (24) Simplify:

$$\vec{AB} - \vec{CB} - b \vec{CA}$$

- (25) Express $\vec{t} = (34, 37)$, as a linear combination
of $\vec{s} = (3, 1)$ and $\vec{r} = (4, 5)$

PRETEST - VECTORS

Find the component form of the resultant vector.

1) $\mathbf{u} = \langle 12, -35 \rangle$

Find the vector opposite \mathbf{u}

$(-12, 35)$ ✓

2) $\mathbf{f} = \langle -20, 21 \rangle$

Find the vector opposite \mathbf{f}

$(20, -21)$ ✓

3) $\mathbf{u} = \langle -7\sqrt{37}, 6 \rangle$

Find: $10\mathbf{u}$

$(-70\sqrt{37}, 60)$ ✓

4) $\mathbf{u} = \langle 8, -11 \rangle$

Find: $8\mathbf{u}$

$(64, -88)$ ✓

5) $\mathbf{u} = \langle -4, -5 \rangle$

$\mathbf{v} = \langle -6, 5 \rangle$

Find: $\mathbf{u} + \mathbf{v}$

$(-10, 0)$ ✓

6) $\mathbf{f} = \langle 12, 6 \rangle$

$\mathbf{g} = \langle -9, 6 \rangle$

Find: $-\mathbf{f} + \mathbf{g}$

$(-12, -6) + (-9, 6)$
 $= (-21, 0)$ ✓

7) $\mathbf{u} = \langle 12, 3 \rangle$

$\mathbf{b} = \langle -3, -9 \rangle$

Find: $10\mathbf{u} + 6\mathbf{b}$

$(120, 30) + (-18, -54)$

$(102, -24)$ ✓

8) $\mathbf{f} = \langle -6, 8 \rangle$

$\mathbf{b} = \langle 12, -2 \rangle$

Find: $-7\mathbf{f} + 4\mathbf{b}$

$(42, -56) + (48, -8)$

$(90, -64)$ ✓

9) $\mathbf{f} = \langle 2, 8 \rangle$

Unit vector in the opposite direction of \mathbf{f}

$\|\mathbf{f}\| = \sqrt{4+64} = \sqrt{68} = 2\sqrt{17}$

$-\mathbf{f} = (-2, -8)$

10) $\mathbf{f} = \langle 7, -1 \rangle$

Unit vector in the opposite direction of \mathbf{f}

$\|\mathbf{f}\| = \sqrt{49+1} = \sqrt{50} = 5\sqrt{2}$

$-\mathbf{f} = (-7, 1)$

Unit vector = $\left(\frac{-7}{5\sqrt{2}}, \frac{1}{5\sqrt{2}} \right) = \left(-\frac{\sqrt{17}}{17}, \frac{\sqrt{17}}{17} \right)$

-1-

Unit vector = $\left(\frac{-7}{5\sqrt{2}}, \frac{1}{5\sqrt{2}} \right)$

$= \left(-\frac{7\sqrt{2}}{10}, \frac{\sqrt{2}}{10} \right)$ ✓

Find the magnitude and direction angle of the resultant vector.

11) $\mathbf{a} = \langle -1, -7 \rangle$
 $\mathbf{v} = \langle -7, 0 \rangle$
 Find: $\mathbf{a} - \mathbf{v} = \langle 6, -7 \rangle$

$$\|\mathbf{a} - \mathbf{v}\| = \sqrt{36 + 49} = \sqrt{85}$$

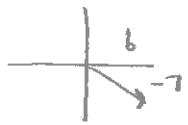
$$\theta = \tan^{-1} \left| \frac{7}{6} \right| = 49.4^\circ$$

$$\therefore \sqrt{85}, 310.6^\circ \quad \checkmark$$

Find the dot product of the given vectors.
 (Scalar product)

13) $\mathbf{u} = \langle 3, -4 \rangle$
 $\mathbf{v} = \langle 5, -3 \rangle$

$$(3)(5) + (-4)(-3) \\ = 27$$



12) $\mathbf{u} = \langle 1, -6 \rangle$
 $\mathbf{v} = \langle -1, -7 \rangle$
 Find: $-\mathbf{u} + \mathbf{v} = \langle -2, -1 \rangle$

$$\|\mathbf{-u} + \mathbf{v}\| = \sqrt{4 + 1} = \sqrt{5}$$

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

$$\therefore \sqrt{5}, 206.6^\circ \quad \checkmark$$

14) $\mathbf{u} = \langle -5, 2 \rangle$
 $\mathbf{v} = \langle -8, 5 \rangle$

$$(-5)(-8) + (2)(5) \\ = 50$$

Find the measure of the angle between the two vectors.

15) $\mathbf{u} = \langle 8, 9 \rangle$
 $\mathbf{v} = \langle -3, -3 \rangle$

$$\mathbf{u} \cdot \mathbf{v} = \|\mathbf{u}\| \|\mathbf{v}\| \cos \theta$$

$$\theta = \cos^{-1} \left(\frac{\mathbf{u} \cdot \mathbf{v}}{\|\mathbf{u}\| \|\mathbf{v}\|} \right) \\ = \cos^{-1} \left(\frac{-51}{\sqrt{145} \sqrt{18}} \right) \\ = \cos^{-1} (-0.9983) \\ = 176.63^\circ$$

16) $\mathbf{u} = \langle -4, -2 \rangle$
 $\mathbf{v} = \langle 8, -9 \rangle$

$$\theta = \cos^{-1} \left(\frac{\mathbf{u} \cdot \mathbf{v}}{\|\mathbf{u}\| \|\mathbf{v}\|} \right)$$

$$= \cos^{-1} \left(\frac{-14}{\sqrt{20} \sqrt{145}} \right)$$

$$= \cos^{-1} (-0.2599) = 105.07^\circ$$

Find the projection of \mathbf{u} onto \mathbf{v} .

17) $\mathbf{u} = \langle -3, 5 \rangle$
 $\mathbf{v} = \langle 3, -3 \rangle$

$$\overrightarrow{\mathbf{u}} \cdot \overrightarrow{\mathbf{v}} = \frac{\mathbf{u} \cdot \mathbf{v}}{\|\mathbf{v}\|^2} \overrightarrow{\mathbf{v}}$$

$$= \frac{-24}{18} \langle 3, -3 \rangle$$

$$= -\frac{4}{3} \langle 3, -3 \rangle = \langle -4, 4 \rangle$$

18) $\mathbf{u} = \langle -7, 7 \rangle$
 $\mathbf{v} = \langle -8, 4 \rangle$

$$\overrightarrow{\mathbf{u}} \cdot \overrightarrow{\mathbf{v}} = \frac{\mathbf{u} \cdot \mathbf{v}}{\|\mathbf{v}\|^2} \overrightarrow{\mathbf{v}}$$

$$= \frac{84}{80} \langle -8, 4 \rangle$$

$$= \frac{21}{20} \langle -8, 4 \rangle = \left(-\frac{42}{5}, \frac{21}{5} \right) \quad \checkmark$$

State if the two vectors are parallel, orthogonal, or neither.

19) $\mathbf{u} = \langle 5, -40 \rangle$
 $\mathbf{v} = \langle -8, -1 \rangle$

Orthogonal \checkmark

20) $\mathbf{u} = \langle -20, -8 \rangle$
 $\mathbf{v} = \langle 6, -9 \rangle$

$$\overrightarrow{\mathbf{u}} \cdot \overrightarrow{\mathbf{v}} = -48$$

$$\overrightarrow{\mathbf{u}} \neq k \overrightarrow{\mathbf{v}}$$

neither

21) $\mathbf{u} = \langle 8, -9 \rangle$
 $\mathbf{v} = \langle 40, -45 \rangle$

$$\overrightarrow{\mathbf{v}} = 5 \overrightarrow{\mathbf{u}}$$

Parallel \checkmark

22) $\mathbf{u} = \langle 15, -15 \rangle$
 $\mathbf{v} = \langle -3, -3 \rangle$

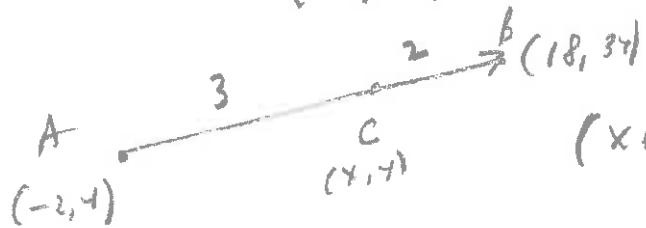
$$\overrightarrow{\mathbf{u}} \cdot \overrightarrow{\mathbf{v}} = -45 + 45 = 0$$

Orthogonal \checkmark

(23)

$$\overrightarrow{AB} = (20, 20)$$

$$\overrightarrow{AC} = (x+2, y-4)$$



$$(x+2, y-4) = \frac{3}{5} (20, 20)$$

$$x+2 = 12$$

$$y-4 = 18$$

$$x = 10$$

$$y = 22$$

$$C = (10, 22)$$

(24)

$$\overrightarrow{AB} + \overrightarrow{BC} + 6\overrightarrow{AC}$$

$$= \overrightarrow{AC} + 6\overrightarrow{AC}$$

$$= 7\overrightarrow{AC}$$

$$(25) (34, 37) = a(3, 1) + b(4, 5)$$

$$3a + 4b = 34$$

$$a + 5b = 37$$

$$3a + 4b = 34$$

$$-3a - 15b = -111$$

$$-11b = -77$$

$$\boxed{b = 7}$$

$$a + 35 = 37$$

$$\boxed{a = 2}$$

$$(34, 37) = 2(3, 1) + 7(4, 5)$$

$$\overrightarrow{t} = 2\overrightarrow{s} + 7\overrightarrow{r}$$