

Vector Operations Notes

Find the component form of the resultant vector.

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

Find the vector opposite \mathbf{u}

$$\vec{u} = \langle 4, -\sqrt{11} \rangle$$

2) Given: $A = (3, 4)$ $B = (-3, 6)$

Find the vector opposite \overrightarrow{AB}

$$\vec{AB} = \langle -3-3, 6-4 \rangle$$

$$\langle -6, 2 \rangle$$

$$\vec{BA} = \langle 6, -2 \rangle$$

$$\mathbf{i} = \langle 1, 0 \rangle$$

$$\mathbf{j} = \langle 0, 1 \rangle$$

Express the resultant vector as a linear combination of unit vectors \mathbf{i} and \mathbf{j} .

magnitude (length)

3) $|\mathbf{f}| = 8, 240^\circ$

Find the vector opposite \mathbf{f}

4) $\mathbf{f} = 6\mathbf{i} - 4\mathbf{j}$

Find: $-2\mathbf{f}$

$$\vec{f} = \langle 8\cos 240^\circ, 8\sin 240^\circ \rangle$$

$$= \langle 8(-\frac{1}{2}), 8(-\frac{\sqrt{3}}{2}) \rangle$$

$$-2\mathbf{f} = -12\mathbf{i} + 8\mathbf{j}$$

$$\text{opp } \vec{f} \text{ or } -\vec{f} = \langle 4, 4\sqrt{3} \rangle$$

$$\text{or } 4\mathbf{i} + 4\sqrt{3}\mathbf{j}$$

5) Given: $P = (-2, -7)$ $Q = (-4, -5)$

Find: $2\overrightarrow{PQ}$

$$\overrightarrow{PQ} = \langle -4 - (-2), -5 - (-7) \rangle$$

$$\overrightarrow{PQ} = \langle -2, 2 \rangle$$

$$2\overrightarrow{PQ} = \langle -4, 4 \rangle$$

Find the component form of the resultant vector.

6) $\mathbf{a} = \langle 0, 2 \rangle$

$\mathbf{g} = \langle -12, 10 \rangle$

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

$$\langle 0, 2 \rangle - \langle -12, 10 \rangle$$

$$\vec{a} - \vec{g} = \langle 12, -8 \rangle$$

7) Given: $T = (2, -8)$ $X = (1, 4)$
 $Y = (-2, 1)$ $Z = (10, 6)$
 Find: $\overrightarrow{TX} + \overrightarrow{YZ}$

$$\overrightarrow{TX} = \langle 1 - 2, 4 - (-8) \rangle$$

$$= \langle -1, 12 \rangle$$

$$\overrightarrow{YZ} = \langle 10 - (-2), 6 - 1 \rangle$$

$$= \langle 12, 5 \rangle$$

$$\overrightarrow{TX} + \overrightarrow{YZ} = \langle -1 + 12, 12 + 5 \rangle = \langle 11, 17 \rangle$$

Express the resultant vector as a linear combination of unit vectors i and j .

9) $\mathbf{f} = 7\mathbf{i} - 4\mathbf{j}$
 $\mathbf{v} = 5\mathbf{i} - 8\mathbf{j}$
 Find: $6\mathbf{f} - 7\mathbf{v}$

$$6(7\mathbf{i} - 4\mathbf{j}) - 7(5\mathbf{i} - 8\mathbf{j})$$

$$\begin{array}{r} 42\mathbf{i} - 24\mathbf{j} \\ -35\mathbf{i} + 56\mathbf{j} \\ \hline \end{array}$$

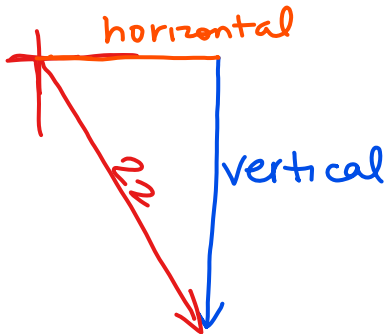
$$7\mathbf{i} + 32\mathbf{j}$$

Draw a diagram to illustrate the horizontal and vertical components of the vector. Then find the value of each component.

10) $|\mathbf{m}| = 22$, 289°

$$\overrightarrow{\mathbf{m}} = \langle 22 \cos 289^\circ, 22 \sin 289^\circ \rangle$$

$$= \langle 7.162, -20.801 \rangle$$



8) Given: $T = (-8, -3)$ $X = (-9, -6)$
 $Y = (4, 7)$ $Z = (9, 9)$
 Find: $2\overrightarrow{TX} + 4\overrightarrow{YZ}$

$$\overrightarrow{TX} = \langle -9, -6 \rangle \cdot 2 \rightarrow \langle -18, -12 \rangle$$

$$\overrightarrow{YZ} = \langle 9, 9 \rangle \cdot 4 \rightarrow \langle 36, 36 \rangle$$

$$\langle -18 + 36, -12 + 36 \rangle = \langle 18, 24 \rangle$$

$$\vec{m} + \vec{n} = \langle 20, -9 \rangle$$

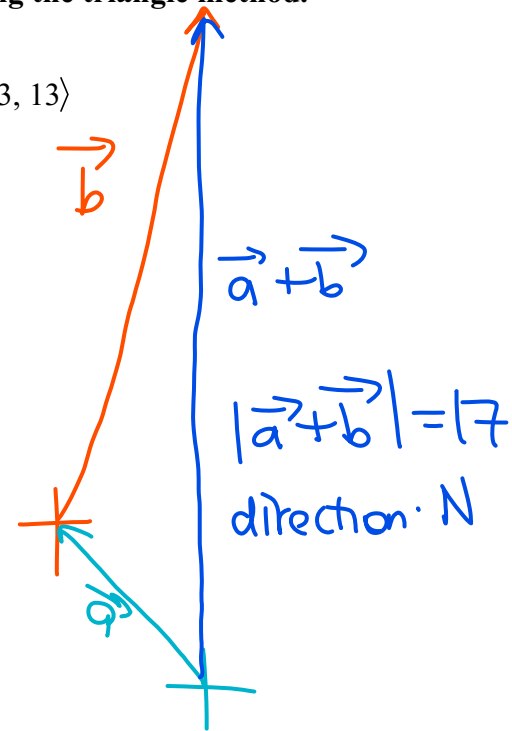
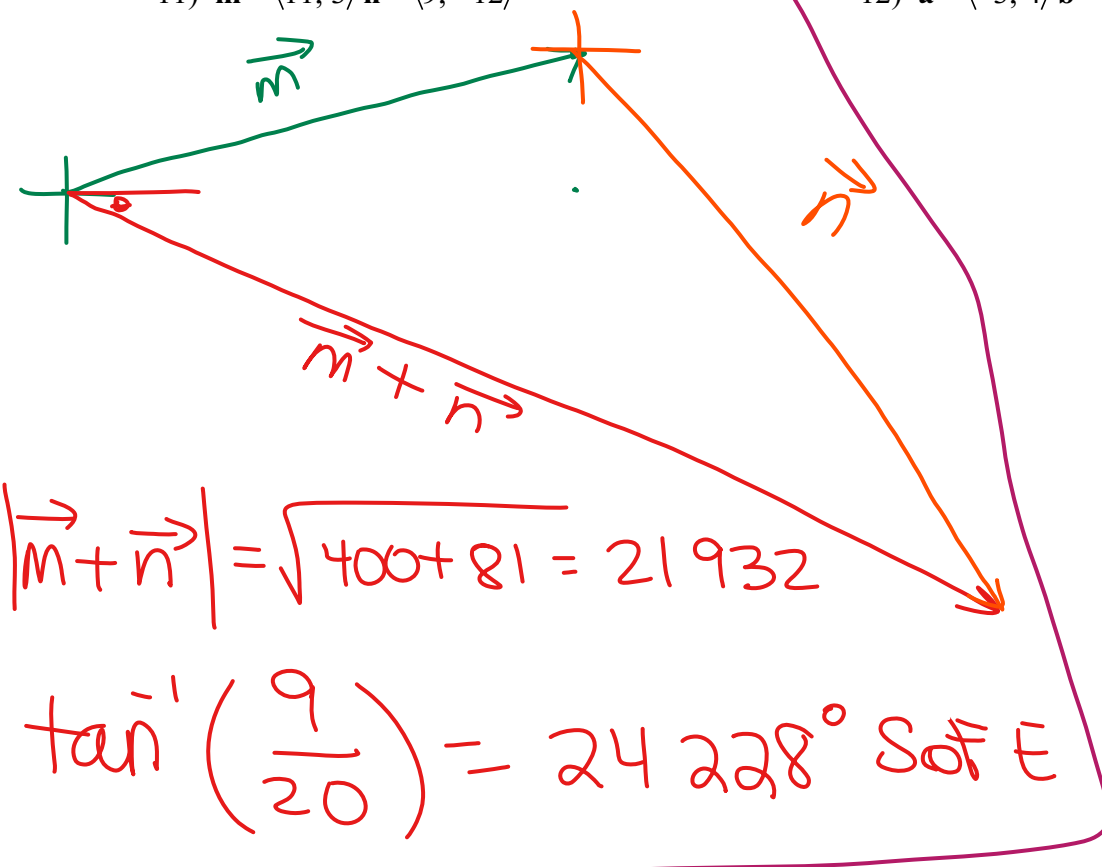
sum

$$\vec{a} + \vec{b} = \langle 0, 17 \rangle$$

Draw a vector diagram to find the resultant of each pair of vectors using the triangle method. Then state the magnitude and direction angle of the resultant.

11) $\mathbf{m} = \langle 11, 3 \rangle$ $\mathbf{n} = \langle 9, -12 \rangle$

12) $\mathbf{a} = \langle -3, 4 \rangle$ $\mathbf{b} = \langle 3, 13 \rangle$



$$13) \mathbf{m} = \langle -20, -1 \rangle \mathbf{n} = \langle 8, 15 \rangle$$

$$14) \mathbf{t} = \langle -15, 5 \rangle \mathbf{u} = \langle 4, -10 \rangle$$

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3) $|\mathbf{f}| = 8, 240^\circ$

Find the vector opposite \mathbf{f}

$4\mathbf{i} + 6.93\mathbf{j}$

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Find: $-2\mathbf{f}$

$-12\mathbf{i} + 8\mathbf{j}$

5) Given: $P = (-2, -7)$ $Q = (-4, -5)$

Find: $2\overrightarrow{PQ}$

$-4\mathbf{i} + 4\mathbf{j}$

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

$\langle 12, -8 \rangle$

7) Given: $T = (2, -8)$ $X = (1, 4)$
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 Find: $\overrightarrow{TX} + \overrightarrow{YZ}$

$\langle 11, 17 \rangle$

8) Given: $T = (-8, -3)$ $X = (-9, -6)$
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 Find: $2\overrightarrow{TX} + 4\overrightarrow{YZ}$

$\langle 18, 2 \rangle$

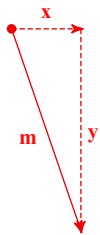
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$7\mathbf{i} + 32\mathbf{j}$

Draw a diagram to illustrate the horizontal and vertical components of the vector. Then find the value of each component.

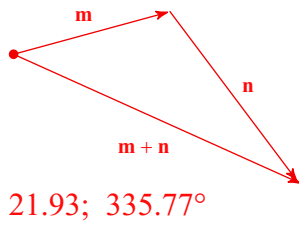
10) $|\mathbf{m}| = 22, 289^\circ$



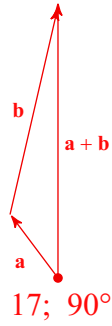
Horizontal: 7.16
 Vertical: -20.8

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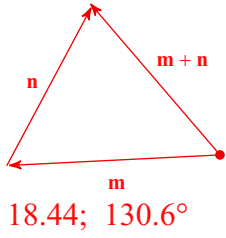
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