

Vectors Quiz One Review – Forms and Operations

Find the vector \mathbf{v} that satisfies the following conditions. Write your answer in component form.

1. Initial point (8,5); terminal point (-6,-1)

2. $\|\mathbf{v}\| = 9, \theta = 150^\circ$

Find the vector \mathbf{v} that satisfies the following conditions. Write your answer in linear combination form.

3. Initial point (8,20); terminal point (17,30)

4. $\|\mathbf{v}\| = 10, \theta = 255^\circ$

Use the vectors $\mathbf{u} = \langle -4, -8 \rangle$, $\mathbf{v} = \langle -3, 7 \rangle$, $\mathbf{w} = \langle 9, -15 \rangle$ to perform the given operations.

5. $\mathbf{w} + 2\mathbf{u}$

6. $3\mathbf{v} - 3\mathbf{w}$

7. $4 - \|\mathbf{v}\|$

Use the vector $\mathbf{u} = 8\mathbf{i} - 25\mathbf{j}$ and $\mathbf{v} = 20\mathbf{i} + 35\mathbf{j}$ to perform the given operations

8. $\frac{\mathbf{u}}{\|\mathbf{u}\|}$

9. $3\mathbf{v}$

10. $4\mathbf{u} - 5\mathbf{v}$

Find the magnitude and direction angle of each vector

11. $\mathbf{v} = -20\mathbf{i} + 18\mathbf{j}$

12. $\mathbf{v} = \langle 12, -35 \rangle$

Solve each of the following by resolving vectors.

13. A Boeing 727 can travel at a speed of 525 miles per hour in still air. If one traveling 50° east of north encounters a wind blowing at 35 miles per hour 15° south of west, find the resulting speed and direction of the plane.

14. Two people are pushing a piano. One person pushes it with 185 N at an angle of 70° while the other pushes it with 230N at an angle of 40° . In what direction does the piano move and with how much force?

15. Ms. Smith travels the second floor of the high school building walking north through the hall for 30 meters. She then heads across the bridge on the second floor for 25 meters at 120° . She then travels 15 meters north and turns in to the math department where she walks 8 meters at 6° . What is the displacement of her trip from her point of origin and the direction she traveled?

1. $v_1 = (8, 5)$ $v_2 = (-6, -1)$

$$\langle -6 - 8, -1 - 5 \rangle$$

$$\langle -14, -6 \rangle$$

2. $\|v\| = 9, \theta = 150^\circ$

$$\langle 9 \cos 150^\circ, 9 \sin 150^\circ \rangle$$

$$\langle -7.8, 4.5 \rangle$$

3. $u_1 = (8, 20), u_2 = (17, 30)$

$$u = \langle 17 - 8, 30 - 20 \rangle$$

$$u = \langle 9, 10 \rangle$$

$$9i + 10j$$

4. $\|v\| = 10, \theta = 255^\circ$

$$\langle 10 \cos 255^\circ, 10 \sin 255^\circ \rangle$$

$$\langle -2.6, -9.7 \rangle$$

$$-2.6i - 9.7j$$

5. $w + 2u$

$$\langle 9, -15 \rangle + 2 \langle -4, -8 \rangle$$

$$\langle 9, -15 \rangle + \langle -8, -16 \rangle$$

$$\langle 1, -31 \rangle$$

6. $3v - 3w$

$$3\langle -4, -8 \rangle +^{-3}\langle 9, -15 \rangle$$

$$\langle -12, -24 \rangle + \langle -27, 45 \rangle$$

$$\boxed{\langle 39, 21 \rangle}$$

7. $4 - \|v\|$

$$4 - \sqrt{3^2 + 7^2}$$

$$\boxed{4 - \sqrt{58}} \text{ OR } \approx -3.6$$

8. $\frac{u}{\|u\|}$

$$u = 8i - 25j$$

$$\|u\| = \sqrt{8^2 + 25^2}$$

$$\sqrt{64 + 625}$$

$$\sqrt{689}$$

$$\boxed{\frac{8i - 25j}{\sqrt{689}}}$$

9. $3v$

$$3(20i + 25j)$$

$$\boxed{60i + 75j}$$

10. $4u - 5v$

$$4(8i - 25j) +^{-5}(20i + 35j)$$

$$(32i - 100j) + (-100i - 175j)$$

$$\boxed{(-68i - 275j)}$$

11. $v = -20i + 18j$ Q2

magnitude : $\sqrt{20^2 + 18^2}$
 $\sqrt{400 + 324}$
 $\sqrt{724}$

$2\sqrt{181} \text{ or } \approx 26.9$

direction:

$\tan^{-1}\left(\frac{18}{-20}\right) + 180^\circ$

$\theta \approx 138.0^\circ$

12. $v = \langle 12, -35 \rangle$ Q4

magnitude : $\sqrt{12^2 + 35^2}$
 $\sqrt{144 + 1225}$
 $\sqrt{1369}$

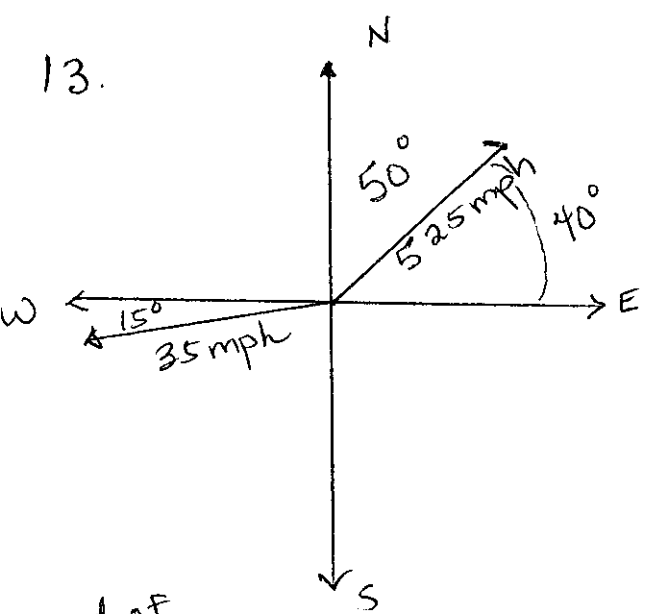
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direction

$\tan^{-1}\left(\frac{-35}{12}\right) + 360^\circ$

$\theta \approx 288.9^\circ$

13.



Speed of plane w wind

$\sqrt{368.4^2 + 328.4^2}$
 493.5 mph

Airplane $\langle 525 \cos 40^\circ, 525 \sin 40^\circ \rangle$

$\langle 402.2, 337.5 \rangle$

Wind $\langle 35 \cos 195^\circ, 35 \sin 195^\circ \rangle$

$\langle -33.8, -9.1 \rangle$

Airplane + Wind $\langle 368.4, 328.4 \rangle$

direction $\tan^{-1}\left(\frac{328.4}{368.4}\right) \approx 41.7^\circ$

$$14. P_1 < 185 \cos 70^\circ, 185 \sin 70^\circ >$$

$$< 63.3, 173.8 >$$

$$P_2 < 230 \cos 40^\circ, 230 \sin 40^\circ >$$

$$< 176.2, 147.8 >$$

$$P_1 + P_2 < 239.5, 321.6 >$$

direction:

$$\tan^{-1} \left(\frac{321.6}{239.5} \right) \approx 53.3$$

magnitude

$$\sqrt{239.5^2 + 321.6^2}$$

$$\text{Force} \approx 401$$

15. How far is she from where she started.
 What angle is formed between her starting point and stopping point?

$$< 0, 30 >$$

$$< 25 \cos 120^\circ, 25 \sin 120^\circ >$$

$$< 0, 15 >$$

$$< 8 \cos 6^\circ, 8 \sin 6^\circ >$$

x	y
0	30
-12.5	21.7
0	15
8.0	0.8

$$< -4.5, 67.5 >$$

$$\sqrt{4.5^2 + 67.5^2}$$

$$\approx 67.6 \text{ m}$$

Resultant

$$\tan^{-1} \left(\frac{67.5}{-4.5} \right) + 180^\circ$$

$$\theta \approx 93.8^\circ$$

