

Worksheet: Addition and Subtraction of Vectors



Q1: Given that $\mathbf{A} = \langle 1, 9 \rangle$ and $\mathbf{B} = \langle -4, 1 \rangle$, find $\mathbf{A} - \mathbf{B}$.

A $\langle -8, -5 \rangle$

B $\langle 8, 5 \rangle$

C $\langle 5, 8 \rangle$

D $\langle 10, -3 \rangle$

E $\langle -3, 10 \rangle$



Question Video

Q2: Given that $\mathbf{A} = \langle 9, 5 \rangle$, $\mathbf{B} = \langle -10, 3 \rangle$, and $\mathbf{C} = \langle -3, 6 \rangle$, find $\mathbf{A} + \mathbf{B} - \mathbf{C}$.

A $\langle 2, 2 \rangle$

B $\langle 16, 8 \rangle$

C $\langle -22, 4 \rangle$

D $\langle -4, 14 \rangle$

E $\langle 22, -4 \rangle$



Question Video

Q3: Given that $\mathbf{A} = \langle -2, 2 \rangle$, $\mathbf{B} = \langle 5, 2 \rangle$, and $\mathbf{C} = \langle -3, -2 \rangle$, find $-\mathbf{A} + \mathbf{B} - \mathbf{C}$.

A $\langle 4, -2 \rangle$

B $\langle 0, 2 \rangle$

C $\langle 10, 2 \rangle$

D $\langle 0, -2 \rangle$



Question Video

Q4: Given that $\mathbf{A} = \langle -1, 2 \rangle$ and $\mathbf{B} = \langle 3, -6 \rangle$, find $6\mathbf{A} + 2\mathbf{B}$.

A $\langle 0, 24 \rangle$

B $\langle 0, 0 \rangle$

C $\langle 12, 0 \rangle$

D $\langle -12, 0 \rangle$

E $\langle 0, -24 \rangle$

Q5: A woman started walking from home and walked 6 miles at 40° north of east, then 2 miles at 15° east of south, then 5 miles at 30° south of west. If she walked straight home, how far would she have to walk and in what direction? Give the distance in miles correct to 2 decimal places and the direction in degrees correct to one decimal place.

A 6.06 miles, 86.2° north of west

B 0.97 miles, 36.3° north of west

C 6.06 miles, 86.2° west of north

D 1.93 miles, 27.5° east of north

E 1.93 miles, 56.6° west of north

Q6: Given that $\mathbf{B} = \langle -9, -3 \rangle$, $\mathbf{C} = \langle -4, -2 \rangle$, and $\mathbf{D} = \langle -2, 9 \rangle$, determine the vector \mathbf{A} that satisfies the equation $\mathbf{A} = -4\mathbf{B} + 2\mathbf{C} - 6\mathbf{D}$.

A $\langle -56, 38 \rangle$

B $\langle -40, 46 \rangle$

C $\langle 56, -38 \rangle$

D $\langle 40, -46 \rangle$

Q7: Given that $\mathbf{A} = \langle 9, -12 \rangle$ and $\mathbf{B} = \langle 13, -1 \rangle$, find $\mathbf{A} + \mathbf{B}$.

A $\langle -22, 13 \rangle$

B $\langle 13, -22 \rangle$

C $\langle 22, -13 \rangle$

D $\langle -13, 22 \rangle$

Q8: If $\|\mathbf{u}\| = 5$ and $\|\mathbf{v}\| = 2$, what is the smallest that $\|\mathbf{u} + \mathbf{v}\|$ could be?

A 7

B 5

C 2

D 3

E 0

Q9: Are there any vector \mathbf{u} and \mathbf{v} for which $\|\mathbf{u} + \mathbf{v}\| > \|\mathbf{u}\| + \|\mathbf{v}\|$?

A no

B yes

Q10: Let $\mathbf{u} = \langle 3, -2 \rangle$ and $\mathbf{v} = \langle -9, 5 \rangle$.

► What are the components of $\mathbf{u} + \mathbf{v}$?

A $\langle 8, -11 \rangle$

B $\langle -6, 3 \rangle$

C $\langle 3, -6 \rangle$

D $\langle -27, -10 \rangle$

E $\langle 12, -7 \rangle$

► What are the components of $\mathbf{v} + \mathbf{u}$?

A $\langle 8, -11 \rangle$

B $\langle -6, 3 \rangle$

C $\langle 3, -6 \rangle$

D $\langle -27, -10 \rangle$

E $\langle 12, -7 \rangle$

Q11: Consider the vectors $\mathbf{u} = \langle 1, 2 \rangle$ and $\mathbf{v} = \langle -3, -1 \rangle$.

► What is the magnitude of \mathbf{u} ? Give your answer correct to two decimal places if needed.

- A 1
- B 3
- C 2.24
- D 2
- E 1.73

► What is the magnitude of \mathbf{v} ? Give your answer correct to two decimal places if needed.

- A 3
- B 2
- C 3.16
- D 1.41
- E 4

► What is the magnitude of $\mathbf{u} + \mathbf{v}$? Give your answer correct to two decimal if needed.

A 3.16

B 7.08

C 2.24

D 5

E 5.40

Q12: Consider the vectors $\mathbf{u} = \langle 5, -2 \rangle$ and $\mathbf{v} = \langle -5, 2 \rangle$.

► What is the magnitude of \mathbf{u} ? Give your answer correct to two decimal places if needed.

A 7

B 5.20

C 5.39

D 3

E 10

► What is the magnitude of \mathbf{v} ? Give your answer correct to two decimal places if needed.

A 7

B 5.20

C 5.39

D 3

E 10

► What is the magnitude of $\mathbf{u} + \mathbf{v}$? Give your answer correct to two decimal places if needed.

A 10.77

B 6

C 0

D 10.39

E 9.17

Q13: Given that $\mathbf{A} = -5\mathbf{i} + 10\mathbf{j}$ and $\mathbf{B} = -4\mathbf{i} - 5\mathbf{j}$, where \mathbf{i} and \mathbf{j} are two perpendicular unit vectors, find $\mathbf{A} - \mathbf{B}$.

A $15\mathbf{i} - \mathbf{j}$

B $-9\mathbf{i} + 5\mathbf{j}$

C $-\mathbf{i} + 15\mathbf{j}$

D $-15\mathbf{i} + \mathbf{j}$

E $5\mathbf{i} - 9\mathbf{j}$

Q14: Given that $\mathbf{A} = -5\mathbf{i} - 6\mathbf{j}$ and $\mathbf{B} = -4\mathbf{i} - 6\mathbf{j}$, where \mathbf{i} and \mathbf{j} are two perpendicular unit vectors, find $|2\mathbf{A} - 2\mathbf{B}|$.

A 4

B -2

C 2

D $-2\mathbf{i}$

E $-9\mathbf{i} - 12\mathbf{j}$

Q15: Given that $\mathbf{A} = \langle -3, -5 \rangle$, $\mathbf{B} \parallel \mathbf{A}$ and $|\mathbf{B}| = 4\sqrt{34}$, find \mathbf{B} .

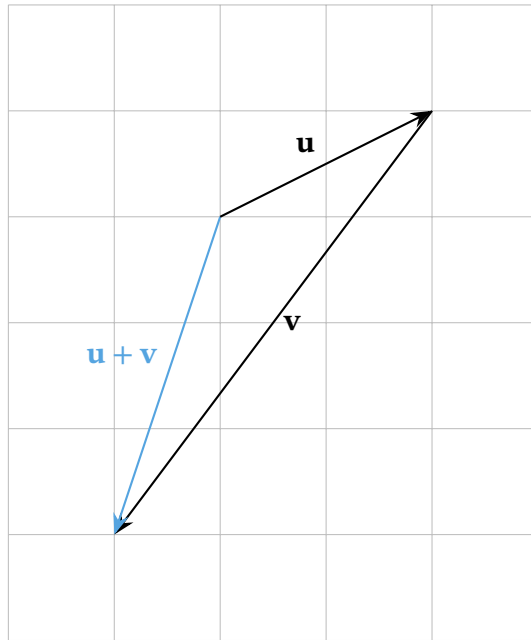
A $\langle -3, -5 \rangle$

B $\langle -12, -20 \rangle$

C $\langle -8, -16 \rangle$

D $\langle -16, -24 \rangle$

Q16: Shown on the grid of unit squares are the vectors \mathbf{u} , \mathbf{v} , and $\mathbf{u} + \mathbf{v}$.



► What are the components of \mathbf{u} ?

- A $\langle -2, 1 \rangle$
- B $\langle 2, 2 \rangle$
- C $\langle 2, 1 \rangle$
- D $\langle 2, 4 \rangle$
- E $\langle -2, 2 \rangle$

► What are the components of \mathbf{v} ?

A $\langle -3, 4 \rangle$

B $\langle 3, -4 \rangle$

C $\langle -3, -4 \rangle$

D $\langle 2, -4 \rangle$

E $\langle 3, 4 \rangle$

► What are the components of $\mathbf{u} + \mathbf{v}$?

A $\langle -1, 3 \rangle$

B $\langle 1, -3 \rangle$

C $\langle -1, -3 \rangle$

D $\langle 1, 4 \rangle$

E $\langle 1, 3 \rangle$

Q17: If $\mathbf{A} = \langle 6, -4, 7 \rangle$, and $\mathbf{B} = \langle 5, 6, 4 \rangle$, determine $\mathbf{A} + \mathbf{B}$.

A $\langle 2, 11, 11 \rangle$

B $\langle 1, -10, 3 \rangle$

C $\langle 11, 2, 11 \rangle$

D $\langle -1, 0, -3 \rangle$

Q18: A woman started walking from home and walked 4 miles east, 7 miles southeast, 6 miles south, 5 miles southwest, and 3 miles east. How far did she walk in total? If she walked in a straight line back home, how far would she have to walk? Give your answer correct to three decimal places if necessary.

A 15 miles, 21.204 miles

B 9 miles, 12.727 miles

C 25 miles, 16.752 miles

D 25 miles, 21.204 miles

E 15 miles, 16.752 miles

Q19: Fill in the blank: If \mathbf{v} is a vector in a plane, then the vector $-2\mathbf{v}$ ___.

A is perpendicular to \mathbf{v}

B makes an angle of 0 with \mathbf{v} and is twice as long

C makes an angle of π with \mathbf{v} and is twice as long

D makes an angle of $\frac{\pi}{4}$ with \mathbf{v}

Q20: Let \mathbf{z} be the zero vector. What is $\mathbf{z} + \mathbf{u}$ equal to for any vector \mathbf{u} ?

A \mathbf{z}

B \mathbf{u}

Q21: Is it always true that $\overrightarrow{AB} + \overrightarrow{CD} = \overrightarrow{AD}$?

A yes

B no

Q22: Is it always true that $\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$?

A No

B Yes

Q23: Does the vector sum $\langle 1, 2 \rangle + \langle 2, 3, 1 \rangle$ have a solution?

A yes

B no

Q24: Let \mathbf{z} be the zero vector. What is $\mathbf{u} + \mathbf{z}$ equal to for any vector \mathbf{u} ?

A \mathbf{z}

B \mathbf{u}

Q25: Given that $(3, y) + x(3, 5) - (0, 7) = \mathbf{0}$, find the values of x and y .

A $x = 1, y = 12$

B $x = -1, y = 12$

C $x = 1, y = 2$

D $x = -1, y = 2$