

Vector Moves

Use components to model direction and distance.

HIGH SCHOOL • HSN-VM.A

CCSS.Math.Content.HSN-VM.A "Represent and model with vector quantities."

NAME _____

DATE _____

COMPONENT RULES

A vector describes a quantity with both magnitude and direction. Write a vector as $\langle \text{horizontal component, vertical component} \rangle$. Add or subtract matching components, and multiply each component by a scalar.

WORKED EXAMPLE

Find $2\langle 11, -13 \rangle$.

1. Multiply each component by 2.
2. $2\langle 11, -13 \rangle = \langle 2(11), 2(-13) \rangle$.
3. $= \langle 22, -26 \rangle$.

Answer: $\langle 22, -26 \rangle$

PRACTICE 6 problems

1 Write the vector from A(-1,4) to B(7,9).

ANSWER _____

2 Find $\langle 3, -6 \rangle + \langle -4, 10 \rangle$.

ANSWER _____

3 Find $\langle 9, 5 \rangle - \langle 1, -7 \rangle$.

ANSWER _____

4 Find $-3\langle 4, -5 \rangle$.

ANSWER _____

5 Find the magnitude of $\langle 9, 12 \rangle$.

ANSWER _____

6 A vector has components $\langle 0, -7 \rangle$. State its magnitude and direction.

ANSWER _____

APPLY IT Show your work

- 1** In a video game's map editor, a player moves an object 12 squares east and 18 squares north. Then the player moves it 4 squares west and 3 squares south. Let east be positive x and north be positive y . Write the net displacement vector and its magnitude.

WORK SPACE

ANSWER _____

- 2** A school media club sets a camera slider to move $\langle 6, -9 \rangle$ feet for each time-lapse shot. It makes the same move 3 times. Write the total displacement vector.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A delivery robot has a net displacement of $\langle 16, 20 \rangle$. Its first move is $\langle 9, -4 \rangle$. Find its second move and explain why your vector is correct.

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Write the vector from A(-1,4) to B(7,9).	<8,5>
2	Find $\langle 3, -6 \rangle + \langle -4, 10 \rangle$.	<-1,4>
3	Find $\langle 9, 5 \rangle - \langle 1, -7 \rangle$.	<8,12>
4	Find $-3\langle 4, -5 \rangle$.	<-12,15>
5	Find the magnitude of $\langle 9, 12 \rangle$.	15
6	A vector has components $\langle 0, -7 \rangle$. State its magnitude and direction.	Magnitude 7, downward

PART 2 · APPLY IT

1. **<8,15>; magnitude 17** Combine the horizontal changes and the vertical changes to get $\langle 8, 15 \rangle$. Its magnitude is $\sqrt{8^2 + 15^2} = 17$.
2. **<18,-27>** Multiply each component of $\langle 6, -9 \rangle$ by 3.

CHALLENGE

The second move is **<7,24>** because $\langle 9, -4 \rangle + \langle 7, 24 \rangle = \langle 16, 20 \rangle$.

Accept equivalent component notation, such as (8,5), when the order of horizontal and vertical components is clear. For direction, accept down, south, or negative y-direction where appropriate.