LESSON MAKER PRO

Vector Direction Lab

Show magnitude and direction with vectors.

HIGH SCHOOL · HSN-VM.A.1

CCSS.Math.Content.HSN-VM.A.1 "(+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., v, | v |, || v ||, v)."

NAME _____ DATE _____

MAGNITUDE AND DIRECTION

A vector has magnitude, or length, and direction. Show a vector with a directed segment such as →AB or with components such as v = <a, b>. Write magnitude with vertical bars, |v|, and find the magnitude of <a, b> with $\sqrt{(a^2 + b^2)}$.

WORKED EXAMPLE

A runner's displacement is the directed segment from A(1, 2) to B(4, 6). Write the component vector, its magnitude, and its direction.

1. Subtract the coordinates: →AB = <4 - 1, 6 - 2> = <3, 4>.
2. Find the magnitude: |→AB| = $\sqrt{(3^2 + 4^2)}$ = $\sqrt{25}$ = 5.
3. Both components are positive, so the direction is northeast.

Answer: →AB = <3, 4>; |→AB| = 5 units; northeast.

PRACTICE 6 problems

1 Directed segment →JK goes from J(-9, 8) to K(-2, 8). Write →JK as a component vector and find |→JK|.

ANSWER _____

2 A force vector is f = <9, -12>. Find |f| and state its direction using compass words.

ANSWER _____

3 A directed segment →RS has magnitude 16 units and points straight south. Write a component vector for →RS.

ANSWER _____

4 Point T is (11, -7), and point U is (31, 14). Write →TU and find |→TU|.

ANSWER _____

5 Which quantity has magnitude but no direction: speed 28 mph, or velocity 28 mph north? Explain.

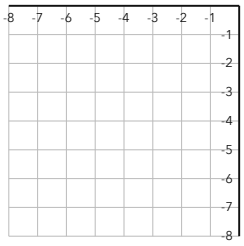
ANSWER _____

6 A drone's displacement is d = <-24, 10>. Give its magnitude and compass direction.

ANSWER _____

APPLY IT Show your work

1 On a game map, plot A(-8, -7) and B(0, -7) on the grid. A player's avatar moves from A to B. Write the displacement vector, then give its magnitude and direction.



WORK SPACE

ANSWER _____

2 A fitness app reports that a biker's displacement is b = <12, 35> blocks. Find |b| and state the direction using compass words.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Two routes on a music festival map are represented by p = <16, 30> and q = <-16, 30>. A student says p and q are the same vector because they have the same magnitude. Is the student correct? Find both magnitudes and explain your reasoning.

WORK SPACE AND ANSWER

ANSWER KEY

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Directed segment →JK goes from J(-9, 8) to K(-2, 8). Write →JK as a component vector and find |→JK|.	**→JK = <7, 0>; |→JK| = 7 units.**
2	A force vector is f = <9, -12>. Find |f| and state its direction using compass words.	**|f| = 15 units; southeast.**
3	A directed segment →RS has magnitude 16 units and points straight south. Write a component vector for →RS.	**→RS = <0, -16>.**
4	Point T is (11, -7), and point U is (31, 14). Write →TU and find |→TU|.	**→TU = <20, 21>; |→TU| = 29 units.**
5	Which quantity has magnitude but no direction: speed 28 mph, or velocity 28 mph north? Explain.	**Speed 28 mph has magnitude but no direction. Velocity 28 mph north has both magnitude and direction.**
6	A drone's displacement is d = <-24, 10>. Give its magnitude and compass direction.	**|d| = 26 units; northwest.**

PART 2 · APPLY IT

1. **→AB = <8, 0>; |→AB| = 8 units; east.** Subtract A from B to get <0 - (-8), -7 - (-7)> = <8, 0>. The horizontal displacement has length 8 and points east.
2. **|b| = 37 blocks; northeast.** Compute $\sqrt{(12^2 + 35^2)} = \sqrt{1369} = 37$. Both components are positive, so the direction is northeast.

CHALLENGE

No. |p| = 34 units and |q| = 34 units, but p points northeast and q points northwest. Vectors must have the same magnitude and the same direction to be equal.

Accept equivalent vector notation, including component notation without the vector name. Accept direction descriptions such as right for east, down for south, or up and left for northwest when they match the components.