LESSON MAKER PRO

Vectors on the Move

Find a vector's direction and length.

HIGH SCHOOL · PC.NQ.E.8

PC.NQ.E.8 "Explain that vector quantities have both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes."

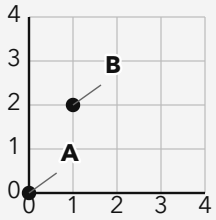
NAME _____ DATE _____

DIRECTION AND MAGNITUDE

A vector has both a direction and a magnitude, or length. A directed segment starts at its first point and ends at its second. For a vector v on a grid, use its horizontal and vertical moves to find its length, written |v|.

WORKED EXAMPLE

Vector $\vec{v}$ goes from A to B. Give its direction as horizontal and vertical moves, then find $|\vec{v}|$.



1. From A(0,0) to B(1,2), move right 1 and up 2.
2. $|\vec{v}|^2 = 1^2 + 2^2 = 5$.
3. $|\vec{v}| = \sqrt{5}$ units.

Answer: Right 1, up 2; $|\vec{v}| = \sqrt{5}$ units.

PRACTICE 4 problems

1 Vector p goes from (0,0) to (6,8). Give its direction as moves and find |p|.

ANSWER _____

2 Vector q goes from (8,9) to (0,3). Give its direction as moves and find |q|.

ANSWER _____

3 Vector r goes from (4,9) to (4,3). Give its direction and find |r|.

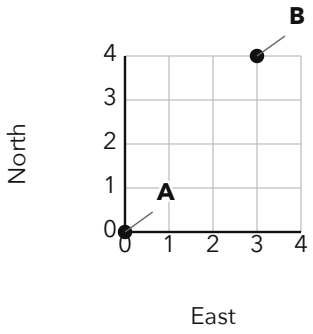
ANSWER _____

4 Vector t moves left 12 units and up 9 units. Find |t| and state its direction.

ANSWER _____

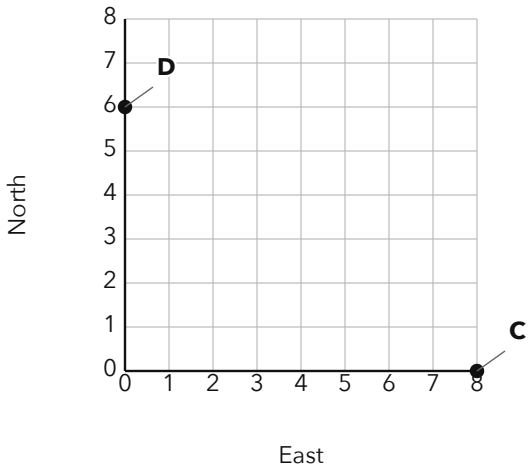
APPLY IT Show your work

1 On a school festival map, each grid unit is 10 m. A camera operator walks from A to B. Give the east and north moves in meters, then find the length of the walk.



ANSWER _____

2 In a game map, each grid unit is 1 m. A player dashes from C to D. Give the west and north moves, then find the dash's length.



ANSWER _____

CHALLENGE One step up

A runner goes from A(0,0) to B(3,4), then from B to C(3,0). Each unit is 1 m. Find the total distance run and |A→C|. Explain the difference.

WORK SPACE AND ANSWER

Vectors on the Move

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Vector $\vec{p}$ goes from (0,0) to (6,8). Give its direction as moves and find $\lvert\vec{p}\rvert$.	**Right 6, up 8; $\lvert\vec{p}\rvert$ = 10 units.**
2	Vector $\vec{q}$ goes from (8,9) to (0,3). Give its direction as moves and find $\lvert\vec{q}\rvert$.	**Left 8, down 6; $\lvert\vec{q}\rvert$ = 10 units.**
3	Vector $\vec{r}$ goes from (4,9) to (4,3). Give its direction and find $\lvert\vec{r}\rvert$.	**Down; $\lvert\vec{r}\rvert$ = 6 units.**
4	Vector $\vec{t}$ moves left 12 units and up 9 units. Find $\lvert\vec{t}\rvert$ and state its direction.	**$\lvert\vec{t}\rvert$ = 15 units; left 12 and up 9.**

PART 2 · APPLY IT

1. **30 m east, 40 m north; 50 m.** The moves form a right triangle with legs of 30 m and 40 m. Its hypotenuse is 50 m.
2. **8 m west, 6 m north; 10 m.** The horizontal and vertical moves are 8 m and 6 m. The dash's length is $\sqrt{(8^2 + 6^2)} = 10$ m.

CHALLENGE

The runner travels 9 m: 5 m from A to B and 4 m from B to C. |A→C| is 3 m because the runner ends 3 m to the right of the start.

Accept equivalent direction language, such as northeast when the horizontal and vertical moves are also given. Magnitude is always nonnegative.