LESSON MAKER PRO

Vector Direction Quest

Part 1: Practice. Part 2: Apply. Part 3: Challenge.

HIGH SCHOOL · MA.912.NSO.3.1

MA.912.NSO.3.1 "Apply appropriate notation and symbols to represent vectors in the plane as directed line segments. Determine the magnitude and direction of a vector in component form."

NAME _____ DATE _____

PART 1: VECTOR RULES

For a directed segment from (x1, y1) to (x2, y2), write the component vector as <x2 - x1, y2 - y1>. For vector <a, b>, magnitude is $\sqrt{(a^2 + b^2)}$, and direction is measured counterclockwise from the positive x-axis.

WORKED EXAMPLE

Points P(-2, 1) and Q(3, 6) form directed segment PQ. Find vector PQ, its magnitude, and its direction.

1. Subtract coordinates: <3 - (-2), 6 - 1> = <5, 5>.
2. Find magnitude: $\sqrt{(5^2 + 5^2)} = \sqrt{50} = 5\sqrt{2}$.
3. Equal positive components give a direction of 45°.

Answer: PQ = <5, 5>; magnitude = $5\sqrt{2}$; direction = 45°.

PRACTICE 5 problems

1 1. For directed segment CD with C(-8, 9) and D(-1, 9), write vector CD in component form. Then give its magnitude and direction.

ANSWER _____

2 2. Vector v = <7, -7>. Find its magnitude and direction measured counterclockwise from the positive x-axis.

ANSWER _____

3 3. E(0, -11) and F(-14, -4) are endpoints of directed segment EF. Write vector EF in component form.

ANSWER _____

4 4. Vector w = <-8, 0>. Find its magnitude and direction measured counterclockwise from the positive x-axis.

ANSWER _____

5 5. Point G(8, -11) is the start of directed segment GH. If GH = <-4, 7>, find H.

ANSWER _____

APPLY IT Show your work

1 Part 2 Apply, 1. In a game design project, an avatar moves 14 grid units left and 14 grid units up. Write its displacement vector, magnitude, and direction measured counterclockwise from the positive x-axis.

WORK SPACE

ANSWER _____

2 2. During a virtual campus tour, a camera moves 18 grid units left and 18 grid units down. Write its displacement vector, magnitude, and direction measured counterclockwise from the positive x-axis.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Part 3 Challenge. A route goes from A(-16, 8) to B(-8, 16). Start at C(20, -10) and create directed segment CD with the same magnitude as AB but the opposite direction. Find D. State CD in component form, its magnitude, and its direction. Explain why your vector works.

WORK SPACE AND ANSWER

ANSWER KEY

Vector Direction Quest

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	1. For directed segment CD with C(-8, 9) and D(-1, 9), write vector CD in component form. Then give its magnitude and direction.	**CD = <7, 0>; magnitude = 7; direction = 0°.**
2	2. Vector v = <7, -7>. Find its magnitude and direction measured counterclockwise from the positive x-axis.	**Magnitude = 7√2; direction = 315°.**
3	3. E(0, -11) and F(-14, -4) are endpoints of directed segment EF. Write vector EF in component form.	**EF = <-14, 7>.**
4	4. Vector w = <-8, 0>. Find its magnitude and direction measured counterclockwise from the positive x-axis.	**Magnitude = 8; direction = 180°.**
5	5. Point G(8, -11) is the start of directed segment GH. If GH = <-4, 7>, find H.	**H(4, -4).**

PART 2 · APPLY IT

1. **<-14, 14>; magnitude = 14√2; direction = 135°.** Left gives a negative x-component and up gives a positive y-component. Equal component magnitudes place the vector at 135°.
2. **<-18, -18>; magnitude = 18√2; direction = 225°.** Both components are negative, so the vector is in Quadrant III. Equal component magnitudes give a 45° reference angle.

CHALLENGE

D(12, -18); CD = <-8, -8>; magnitude = 8√2; direction = 225°. AB = <8, 8>, so CD has opposite components and therefore the same magnitude with opposite direction.

Accept component vectors written with angle brackets. Accept positive x-axis or east for 0°, and negative x-axis or west for 180°.