LESSON MAKER PRO

Coordinate Connections

Use coordinates to measure and analyze segments and polygons.

HIGH SCHOOL · G.2D.1.6

G.2D.1.6 "Use coordinate geometry and algebraic reasoning to represent and analyze line segments and polygons, including determining lengths, midpoints, and slopes of line segments."

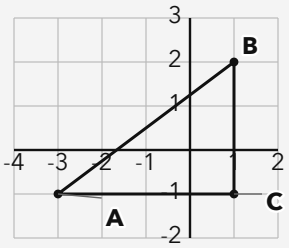
NAME _____ DATE _____

THREE COORDINATE TOOLS

For two points, subtract their x-coordinates and y-coordinates to find the horizontal and vertical changes. Use those changes to find length with the Pythagorean theorem and slope by dividing vertical change by horizontal change. To find a midpoint, average the x-coordinates and average the y-coordinates; a vertical segment has undefined slope.

WORKED EXAMPLE

Find the length, slope, and midpoint of side AB in the triangle shown.

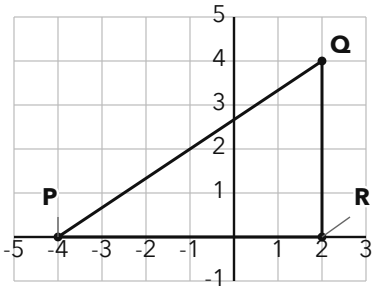


1. From A to B, the horizontal change is 1 - (-3) = 4, and the vertical change is 2 - (-1) = 3.
2. Length: sqrt($4^2 + 3^2$) = sqrt(25) = 5.
3. Slope: 3/4.
4. Midpoint: ((-3 + 1)/2, (-1 + 2)/2) = (-1, 1/2).

Answer: Length: 5; slope: 3/4; midpoint: (-1, 1/2).

PRACTICE 6 problems

1 Find the length of side PQ in the triangle shown.



ANSWER _____

2 Find the slope of the segment with endpoints (-4, 5) and (4, 1).

ANSWER _____

3 Find the midpoint of the segment with endpoints (-6, 4) and (0, -4).

ANSWER _____

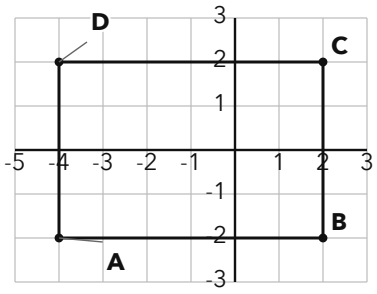
4 Find the slope of the segment with endpoints (3, -4) and (3, 4).

ANSWER _____

5 Find the length of the segment with endpoints (-6, -4) and (0, 4).

ANSWER _____

6 Find the perimeter of rectangle ABCD and the slope of diagonal AC.



ANSWER _____

APPLY IT Show your work

1 At a concert, a technician runs a straight cable from a speaker at (0, 0) to one at (6, 8). Each coordinate unit represents 1 meter. How long is the cable, and what are the coordinates of its midpoint?

WORK SPACE

ANSWER _____

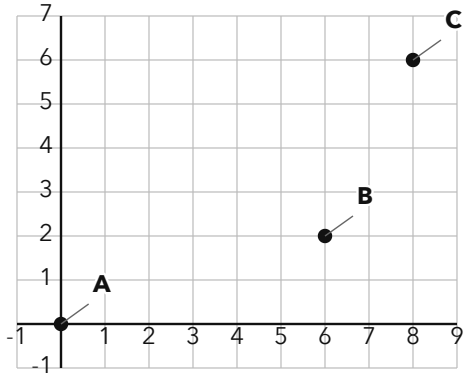
2 On a game map, a player moves directly from (0, 0) to (6, 2). Find the slope of the route and its straight-line distance in grid units.

WORK SPACE

ANSWER _____

CHALLENGE One step up

A, B, and C are consecutive vertices of parallelogram ABCD. Find the coordinates of D and the length of diagonal BD. Explain how the diagonal midpoints help.



WORK SPACE AND ANSWER

ANSWER KEY

Coordinate Connections

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the length of side PQ in the triangle shown.	**2sqrt(13)**
2	Find the slope of the segment with endpoints (-4, 5) and (4, 1).	**-1/2**
3	Find the midpoint of the segment with endpoints (-6, 4) and (0, -4).	**(-3, 0)**
4	Find the slope of the segment with endpoints (3, -4) and (3, 4).	**Undefined**
5	Find the length of the segment with endpoints (-6, -4) and (0, 4).	**10**
6	Find the perimeter of rectangle ABCD and the slope of diagonal AC.	**Perimeter: 20 units; slope of AC: 2/3.**

PART 2 · APPLY IT

1. **Length: 10 meters; midpoint: (3, 4).** The coordinate changes are 6 and 8, so the length is sqrt(6^2 + 8^2) = 10 meters. Averaging the endpoints gives (3, 4).
2. **Slope: 1/3; distance: 2sqrt(10) grid units.** The slope is 2/6 = 1/3. The distance is sqrt(6^2 + 2^2) = sqrt(40) = 2sqrt(10) grid units.

CHALLENGE

D = (2, 4), and BD = 2sqrt(5) units. Diagonals AC and BD share midpoint (4, 3), so D is the point opposite B across that midpoint.

Accept equivalent exact radical forms, such as sqrt(52) for 2sqrt(13). The slope of a vertical segment is undefined, not zero.