LESSON MAKER PRO

Distance by Design

Build a right triangle to find distance.

HIGH SCHOOL · GDA.AF.C.6.b

GDA.AF.C.6.b "Derive the distance formula from the Pythagorean Theorem."

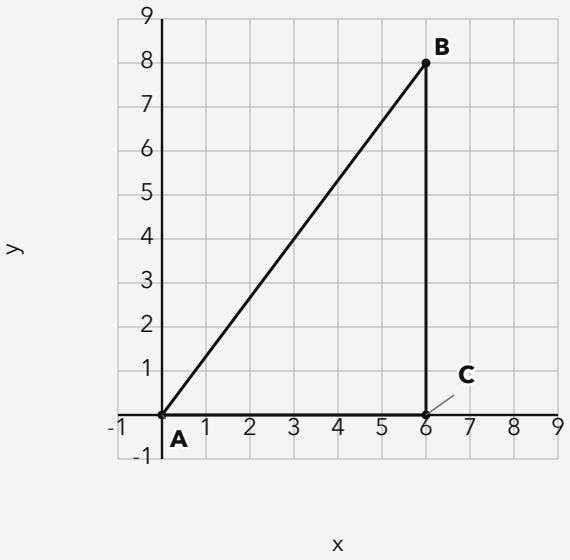
NAME _____ DATE _____

THE BIG IDEA

A horizontal move and a vertical move between two points form the legs of a right triangle. If their lengths are $|x_2 - x_1|$ and $|y_2 - y_1|$, the Pythagorean Theorem gives $d = \text{sqrt}((x_2 - x_1)^2 + (y_2 - y_1)^2)$.

WORKED EXAMPLE

Use the right triangle shown to find distance AB.



1. The horizontal leg is 6 units; the vertical leg is 8 units.
2. $AB^2 = 6^2 + 8^2 = 100$.
3. $AB = \text{sqrt}(100) = 10$.

Answer: 10 units

PRACTICE 4 problems

1 Find the distance between (2, 2) and (5, 5).

ANSWER _____

2 Find the distance between (-3, 2) and (2, 4).

ANSWER _____

3 Find the distance between (-5, -3) and (7, 2).

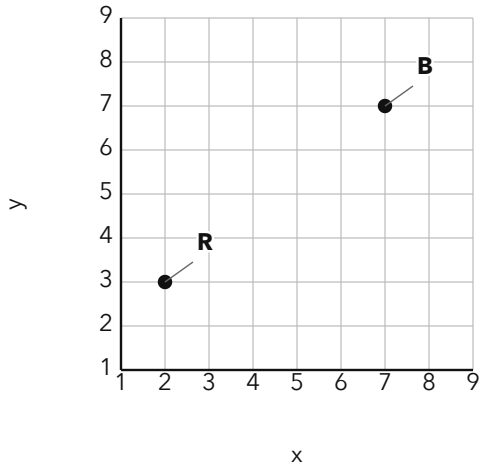
ANSWER _____

4 Find the distance between (9, -3) and (2, 9).

ANSWER _____

APPLY IT Show your work

1 On this skate park map, each grid unit is one meter. What is the straight-line distance from the ramp, R, to the bench, B?



ANSWER _____

2 On a festival map, each coordinate unit represents 20 meters. Two stages are at (-5, -2) and (7, 7). How far apart are they in a straight line?

WORK SPACE

ANSWER _____

CHALLENGE One step up

For points P(a, b) and Q(c, d), derive a distance formula from the Pythagorean Theorem. Explain why it still works when $c < a$.

WORK SPACE AND ANSWER

ANSWER KEY

Distance by Design

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the distance between (2, 2) and (5, 5).	**3sqrt(2) units**
2	Find the distance between (-3, 2) and (2, 4).	**sqrt(29) units**
3	Find the distance between (-5, -3) and (7, 2).	**13 units**
4	Find the distance between (9, -3) and (2, 9).	**sqrt(193) units**

PART 2 · APPLY IT

1. **sqrt(41) meters** The horizontal and vertical distances are 5 and 4 meters. The straight-line distance is sqrt(5^2 + 4^2) = sqrt(41) meters.
2. **300 meters** The coordinate differences are 12 and 9, so the map distance is sqrt(12^2 + 9^2) = 15 units. At 20 meters per unit, the distance is 300 meters.

CHALLENGE

The horizontal and vertical leg lengths are |c - a| and |d - b|. Thus PQ^2 = $|c - a|^2$ + $|d - b|^2$, so PQ = sqrt($(c - a)^2$ + $(d - b)^2$). When c < a, c - a is negative, but squaring gives the same result as squaring the positive leg length.

Accept equivalent exact radical forms. The challenge explanation must connect the coordinate differences to perpendicular legs and explain why the sign of a difference does not change its square.