

The Distance Formula: Pythagorean Theorem on the Coordinate Plane

Name: _____ Date: _____

LEARNING OBJECTIVE

Students will derive and use the distance formula by constructing right triangles between two plotted points on a coordinate grid.

MATERIALS NEEDED

- graph paper
- ruler
- pencil
- colored pencils
- calculator

HANDS-ON ACTIVITY

1. On graph paper, plot point P at (2,1) and point Q at (7,9). Draw a straight segment connecting P and Q -- this is your hypotenuse.
2. From point P, draw a horizontal line to the right, and from point Q, draw a vertical line down, so they meet at a right angle at point R, forming a right triangle PRQ.
3. Count grid squares (or use your ruler) to find the length of leg PR (horizontal distance) and leg RQ (vertical distance).
4. Use the Pythagorean Theorem with your two leg lengths to calculate the length of PQ (the straight-line distance between the two original points).
5. Write the general distance formula, $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$, and use it to verify your answer by plugging in the coordinates of P and Q directly.

QUESTIONS

1. What are the lengths of legs PR and RQ?
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2. What is the distance between P and Q? Show your Pythagorean Theorem work.
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3. How does the distance formula relate to the Pythagorean Theorem?

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4. Use the distance formula to find the distance between points $(0,0)$ and $(6,8)$ without graphing. Show your work.
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