LESSON MAKER PRO

Coordinate Distance Quest

Build the right triangle before calculating its diagonal.

GRADE 8 · TEKS 8.7.D

8.7.D "determine the distance between two points on a coordinate plane using the Pythagorean Theorem."

NAME _____ DATE _____

Connect the representations

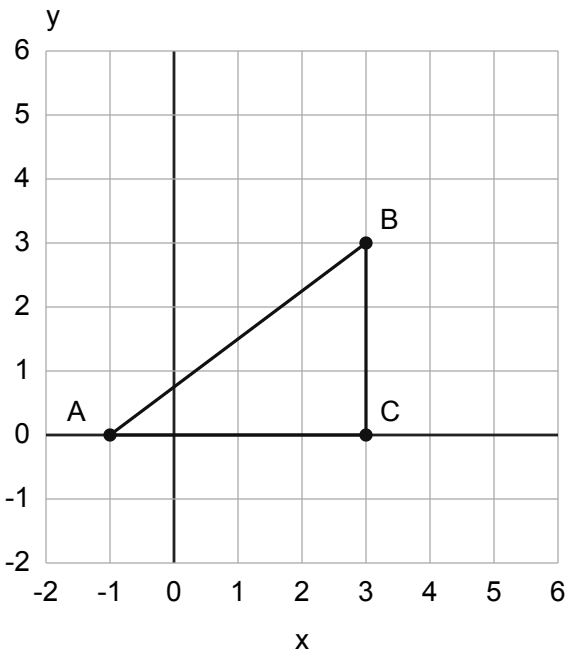
Horizontal and vertical coordinate differences form perpendicular legs. Distance is the nonnegative square root of their squared lengths. Distinguish a diagonal from a two-leg route, and apply map units after calculating.

Worked example

Use plotted A(-1,0), B(3,3) and C(3,0) to find AB. Explain why the coordinate differences form perpendicular legs.

C shares A's y and B's x, so AC is horizontal and CB vertical. These legs are perpendicular. AB is the diagonal, not AC + CB.

AC = 4 and CB = 3; $AB^2 = 4^2 + 3^2 = 25$, so AB = 5 units.



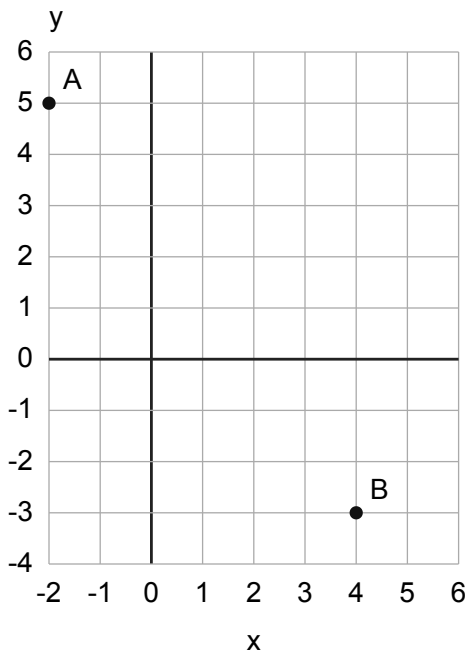
Use the stated units. Label plotted points, draw requested models, and show equations and reasoning.

1. Practice

Translate the worked points A and B by 2 units right and 3 up. Give their new coordinates and prove the distance is unchanged using coordinate differences.

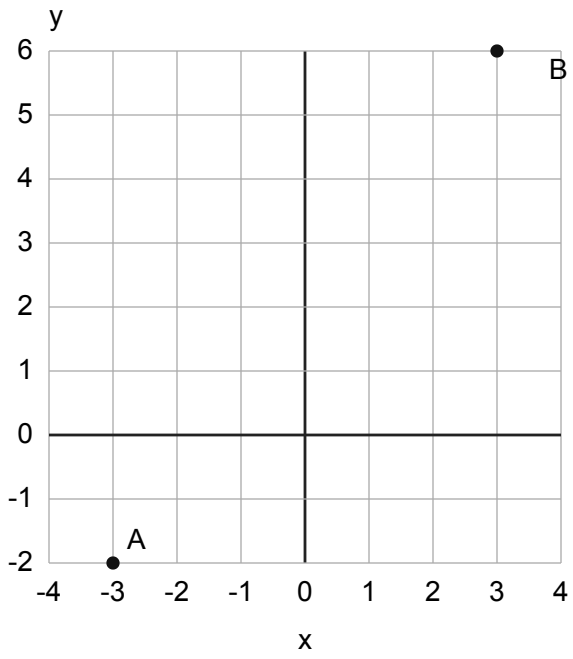
2. Practice

Find the distance from A(-2,5) to B(4,-3). A student uses -6 and 8 as coordinate differences; must the final distance be negative? Explain.



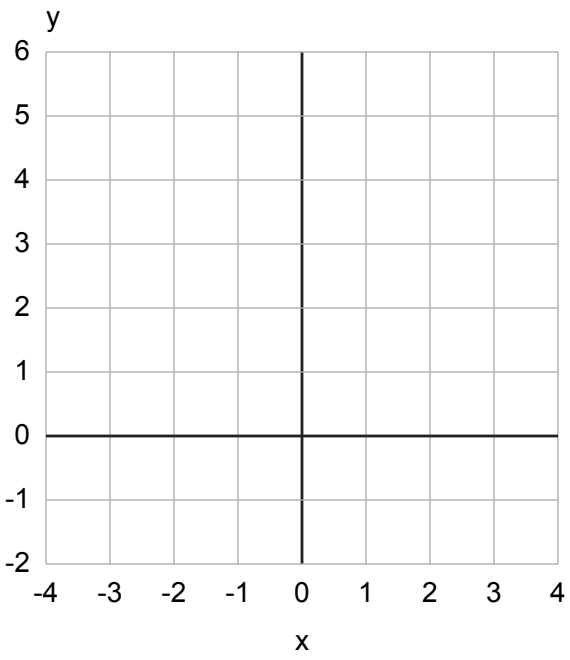
3. Practice

Read A(-3,-2) and B(3,6). Add C(3,-2), draw the right triangle and find AB. Show both coordinate differences and a Pythagorean equation.



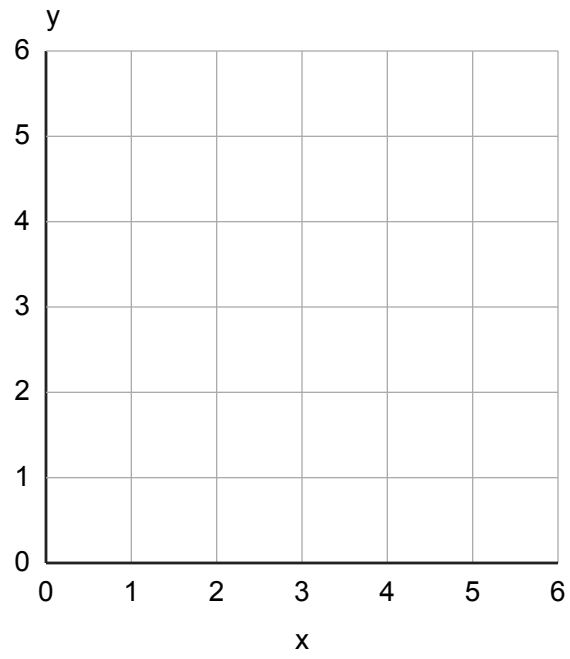
4. Practice

Plot A(-4,2) and B(2,2). Find their distance and explain how the Pythagorean calculation works when one coordinate difference is zero.



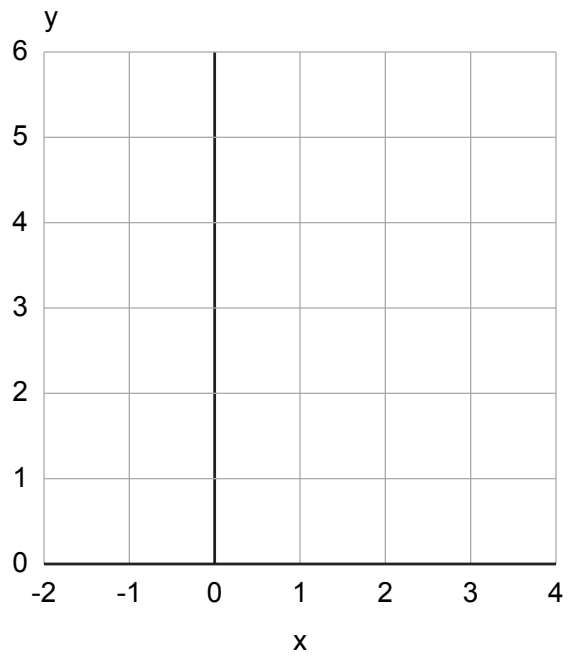
5. Apply

For A(1,1) and B(5,3), construct a right triangle on the grid. Find the exact distance and explain why adding the two leg lengths gives a different route.



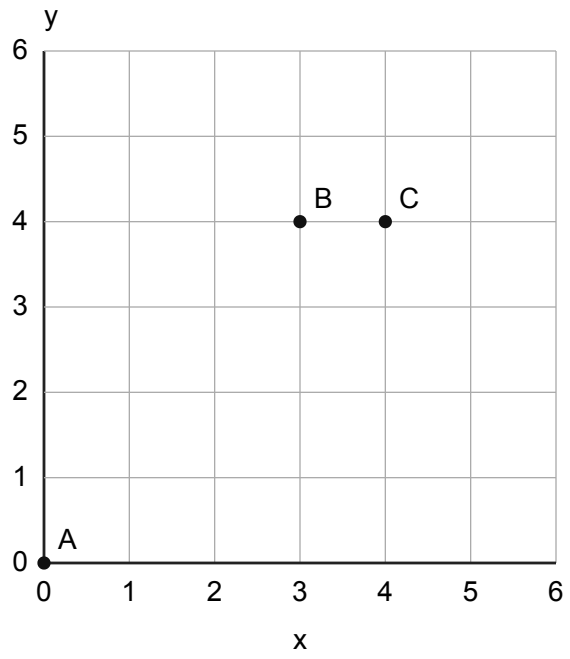
6. Apply

A park map has A(-2,0) and B(1,4). Each coordinate unit is 20 m. Draw a right-triangle model on the grid and find both the straight path AB and the horizontal-then-vertical route in meters.



7. Challenge

A is (0,0), B is (3,4), and C is (4,4). Without decimal square roots, decide which point is farther from A. Use the plotted model and compare squared distances.



ANSWER KEY

Coordinate Distance Quest

GRADE 8 · TEKS 8.7.D

Accept equivalent correct reasoning. Check plotted points and constructed representations as well as written answers. Numbered solutions match the student tasks.

Task 1

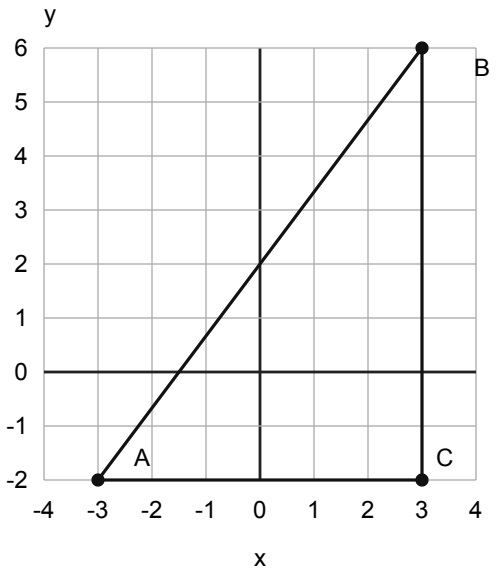
A′(1,3), B′(5,6). The changes remain 5 - 1 = 4 and 6 - 3 = 3, so the distance is still 5 units. Adding the same amount to both coordinates cancels in each difference.

Task 2

Distance is 10 units: $(-6)^2 + 8^2 = 100$. Reversing subtraction changes signs, but squaring removes them. Distance is the nonnegative square root.

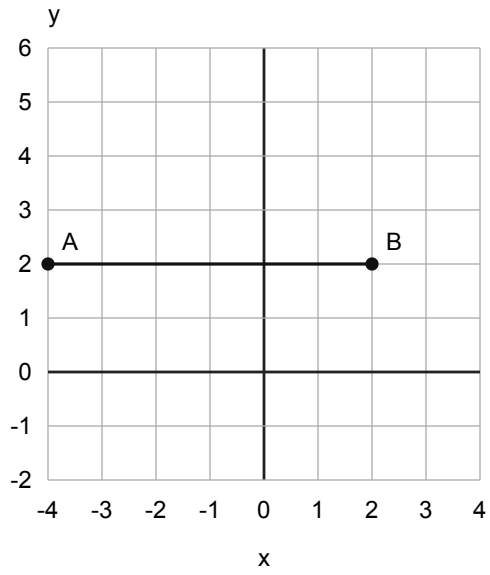
Task 3

AC = 6, CB = 8; $AB^2 = 36 + 64 = 100$, so AB = 10 units. C is at (3,-2); draw AC, CB and AB.



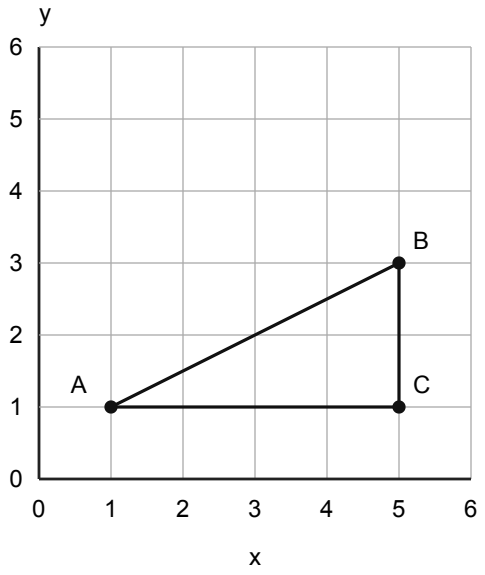
Task 4

The vertical change is 0 and horizontal distance is 6. $AB = \sqrt{(6^2 + 0^2)} = 6$ units; the points lie on one horizontal line.



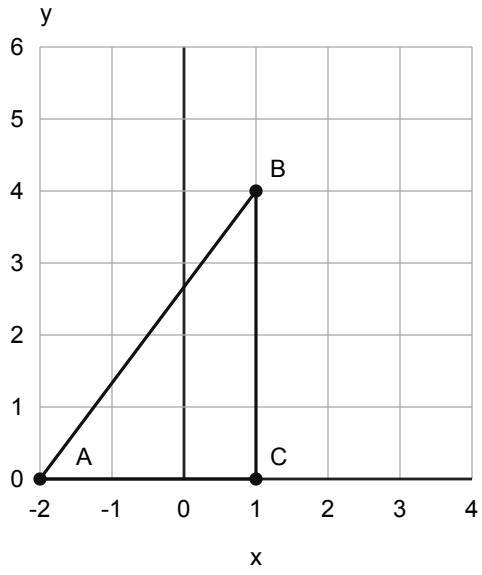
Task 5

Use C(5,1): legs 4 and 2 give AB = √20 = 2√5 units. Adding gives 6 units along AC then CB, not the shorter diagonal AB.



Task 6

The straight path is 100 m; the two-leg route is 140 m. The model has legs 3 and 4 units and diagonal 5 units; multiply each route length by 20.



Task 7

C is farther. $AB^2 = 3^2 + 4^2 = 25$; $AC^2 = 4^2 + 4^2 = 32$. Since $32 > 25$, the nonnegative square root is larger for C.