LESSON MAKER PRO

Where Lines Meet

Read the crossing, then verify it in both equations.

GRADE 8 · TEKS 8.9

8.9 "Expressions, equations, and relationships. The student applies mathematical process standards to use multiple representations to develop foundational concepts of simultaneous linear equations. The student is expected to identify and verify the values of x and y that simultaneously satisfy two linear equations in the form y = mx + b from the intersections of the graphed equations."

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Connect the representations

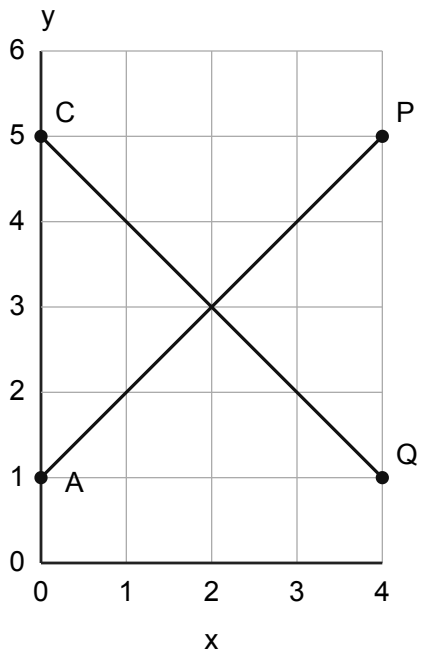
A common solution is an ordered pair on both graphed lines. Graphing reveals the point; substitution checks it. Some pairs never cross, and equivalent equations describe the same line. All drawn segments represent lines continuing beyond the graph window.

Worked example

Read the intersection of P: y = x + 1 and Q: y = -x + 5 from the graph. Check the same ordered pair in both equations.

The two lines cross at x = 2 and y = 3. Read both coordinates. Check P: 3 = 2 + 1. Check Q: 3 = -2 + 5. One point satisfies both.

(2,3). Both equations are true at the shared graph point.



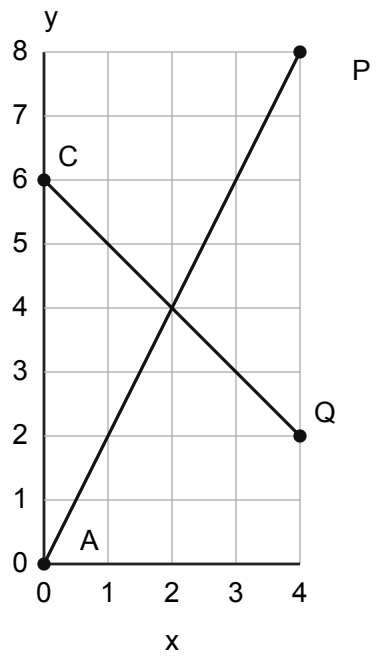
Read or draw the graphs as directed. Label each line and check common points in both equations.

1. Practice

Two equations are P: y = 2x + 1 and Q: y = 2(x + 1) - 1. Explain what their complete graphs share. Give two common points and decide whether there is exactly one common solution.

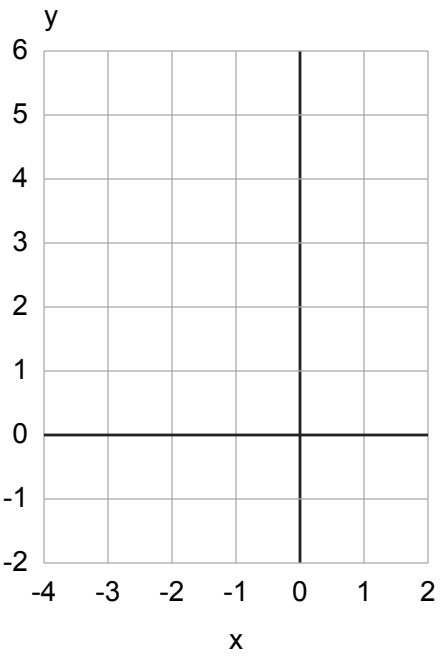
2. Practice

From the graph read the intersection of P: y = 2x and Q: y = -x + 6. Verify its coordinates in each equation.



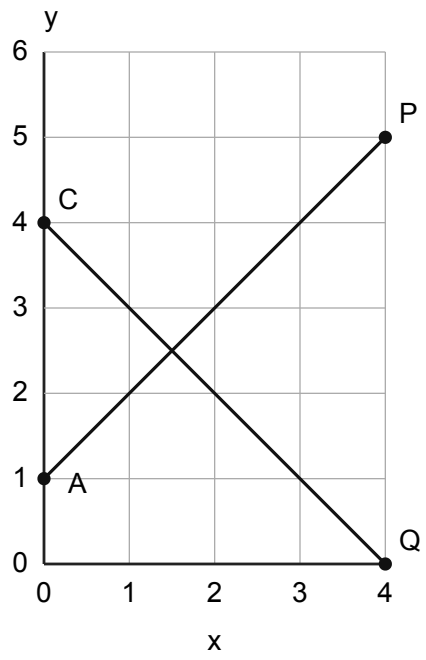
3. Practice

Graph P: y = x + 2 and Q: y = -x on the grid. Label the lines, identify the intersection and substitute its coordinates into both equations.



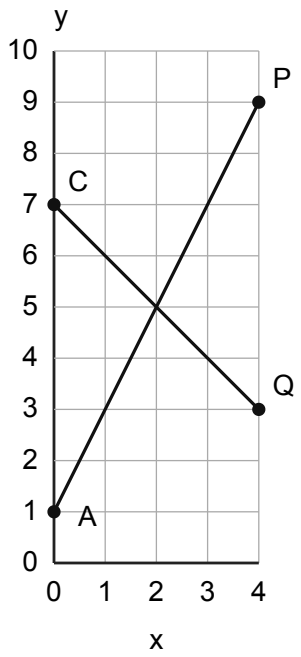
4. Practice

Read the crossing of P: y = x + 1 and Q: y = -x + 4. State both coordinates exactly, including any fractions, and verify them.



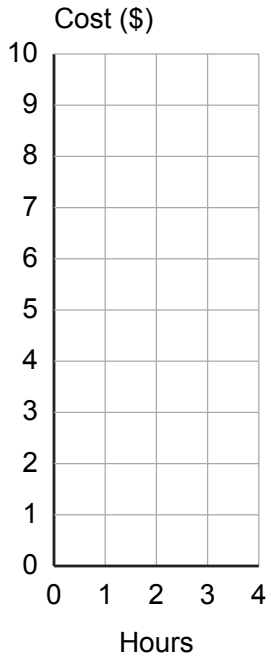
5. Apply

P is y = 2x + 1 and Q is y = -x + 7. A student claims (1,3) is their common solution because it is on P. Use both the graph and substitution to evaluate the claim.



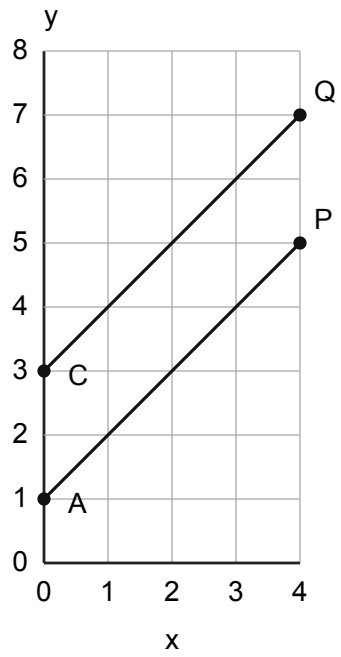
6. Apply

Two rentals charge P: y = x + 4 and Q: y = 2x + 2, with x hours and y dollars. Graph both on the grid. Read and verify when the prices match, then interpret the point.



7. Challenge

These lines are P: y = x + 1 and Q: y = x + 3. Explain why no ordered pair satisfies both, even outside the displayed window.



ANSWER KEY

Where Lines Meet

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

Task 1

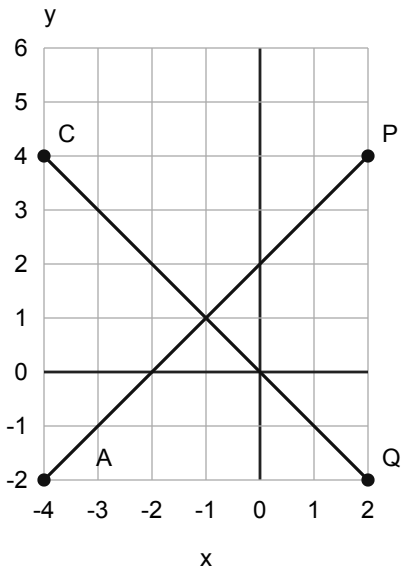
Q simplifies to y = 2x + 1, the same line as P. For example, (0,1) and (1,3) satisfy both. Every point on the line is a solution, so there are infinitely many.

Task 2

(2,4). P gives 2(2) = 4; Q gives -2 + 6 = 4.

Task 3

The lines meet at (-1,1). P gives -1 + 2 = 1; Q gives -(-1) = 1. Plot at least two points for each straight line.



Task 4

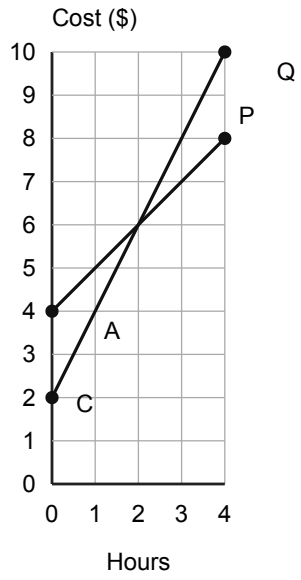
(3/2,5/2). P gives 3/2 + 1 = 5/2; Q gives -3/2 + 4 = 5/2. The intersection lies halfway between the adjacent integer grid lines.

Task 5

The claim is false: Q gives 6 at x = 1, not 3. The common point is (2,5), which satisfies 2(2) + 1 = 5 and -2 + 7 = 5.

Task 6

The prices match at 2 hours and $6. The intersection is (2,6); 2 + 4 = 6 and 2(2) + 2 = 6.



Task 7

There is no common solution. The slopes are equal and Q stays 2 units above P for every x; the parallel lines never intersect.