Solutions Make the Graph

Test ordered pairs, plot equation solutions, and explain the whole graph

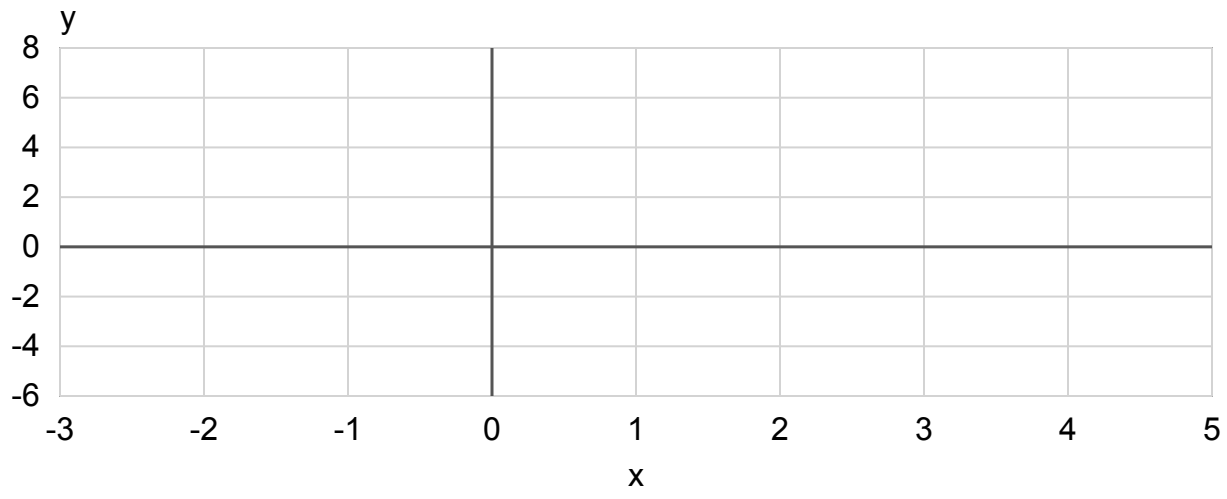
Name: _____ Date: _____

Part 1: Test and Plot

Work with a partner. Your pair has one shared coordinate plane. For each candidate point, substitute its x-value into y = 2x - 1. Write the result in column 3. Compare it with the point's y-value. Circle Yes or No, then plot only the points that are solutions on the shared graph.

Candidate point (x, y)	Substitute x	2x - 1 =	Is y equal to the result?
(-2, -5)	-2		Yes / No
(0, 1)	0		Yes / No
(1, 0)	1		Yes / No
(2, 3)	2		Yes / No
(3, 6)	3		Yes / No
(4, 7)	4		Yes / No

On the graph, label each plotted solution with its ordered pair. Do not plot the points that do not satisfy the equation.



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Part 2: What Does the Graph Mean?

Use the shared graph from Part 1. Choose one x-value from this list: 0, 1, or 3. Find the y-value that makes y = 2x - 1 true. Write and plot your new solution point on the shared graph.

My chosen x	2x - 1	My new solution point

Imagine continuing to choose x-values and calculating y = 2x - 1. Explain why the graph of the equation represents all of its solution pairs. Be sure to explain why the points your class plotted are only a sample, not the entire solution set.

Listen as your teacher asks: “Would the point (3, 5) belong on this graph? How can you tell?” Write one calculation or sentence that supports your answer.

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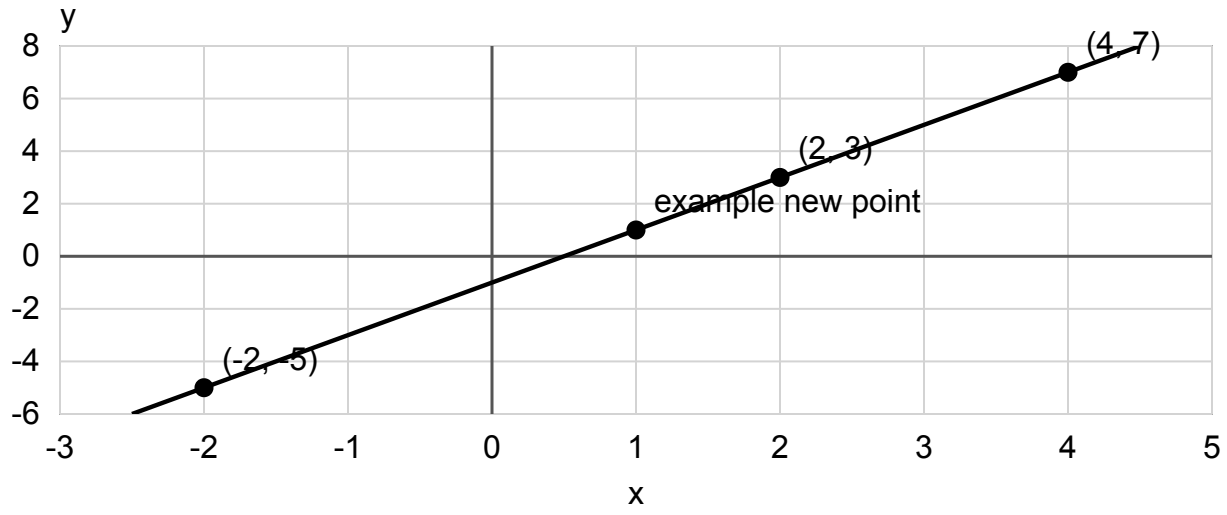
Answer Key: Solutions Make the Graph

1. Table and plot: (-2, -5): 2(-2) - 1 = -5, Yes. (0, 1): 2(0) - 1 = -1, No. (1, 0): 2(1) - 1 = 1, No. (2, 3): 2(2) - 1 = 3, Yes. (3, 6): 2(3) - 1 = 5, No. (4, 7): 2(4) - 1 = 7, Yes. Students plot and label (-2, -5), (2, 3), and (4, 7).

2. New solution: Accept one of the stated choices: x = 0 gives 2(0) - 1 = -1, so (0, -1); x = 1 gives 2(1) - 1 = 1, so (1, 1); or x = 3 gives 2(3) - 1 = 5, so (3, 5). Each point fits within the shared graph window.

3. Explanation rubric: A complete response says that an ordered pair is on the graph exactly when its coordinates make y = 2x - 1 true. It also states that there are more possible x-values than the few tested, so the plotted points are a finite sample. Sample response: “Each x-value can be substituted into the equation to get a matching y-value. Every pair that matches is a solution and belongs on the graph. We tested only a few x-values, so our points are not all the solutions. Continuing the pattern gives more solution points.”

4. Oral check: (3, 5) belongs because 2(3) - 1 = 5. It is a solution even though the candidate point (3, 6) was not.



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Teaching Companion

Materials supplied: Part 1 substitution table and one blank coordinate plane; Part 2 response table and writing lines. **Additionally needed:** pencils and, optionally, rulers. Print one copy of Part 1 for each pair so the coordinate plane is genuinely shared; give each student a Part 2 page.

Setup: Seat students in pairs. Put the Part 1 sheet between partners. Tell partners that both must agree before marking the shared table or graph. Students complete their own Part 2 page after the shared investigation.

Teaching script: Say: “A solution to an equation in two variables is an ordered pair that makes the equation true. Today, we will test points rather than guess from the picture. Substitute the x-coordinate first. Then compare your calculated result to the y-coordinate.” After the first row, say: “If the two y-values match, plot that point. If they do not match, leave it off the graph.” Before Part 2, say: “Choose 0, 1, or 3 so your new point will fit on our shared graph. We have drawn a sample of solutions. Ask yourself whether there could be more x-values to test.” Read the oral question on the student page exactly as written.

Observation method: During Part 1, check that each pair (a) substitutes the x-coordinate, (b) compares the calculated value with the given y-coordinate, and (c) plots only matching points. During Part 2, collect individual writing. Mark proficient when the student gives a valid new point from the stated choices and explains both conditions: points on the graph satisfy the equation, and the class plotted only finitely many of the infinitely many possible solution pairs. If needed, prompt: “What would happen if you chose another x?” Do not tell students that every candidate point belongs on the graph.

Source credit: Original instructional task aligned to NY Next Generation Mathematics AI-A.REI.10, “Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane.” Standard reference: https://www.nysed.gov/curriculum-instruction/mathematics-learning-standards