

Point-Slope Form

Name: _____

Date: _____

Score: _____ / 34

Q Quick Review

Point-slope form: $y - y_1 = m(x - x_1)$, where m is the slope and (x_1, y_1) is any point on the line. It's the fastest way to write a line when you know one point and the slope — just substitute the point and slope and you're done. To convert to slope-intercept form, distribute the slope and add y_1 to both sides. Be careful with the minus signs: $y - (-3)$ becomes $y + 3$, and $x - (-2)$ becomes $x + 2$. Point-slope is also handy when you have two points: compute the slope, then substitute either point into the form.

PRACTICE

Write the line in point-slope or slope-intercept form.

- A line has slope 2 and passes through (1, 5). Write point-slope form. _____
- A line has slope -3 and passes through (0, 7). Write point-slope form. _____
- slope $\frac{1}{2}$, (4, 3) _____
- A line has slope 4 and passes through $(-2, 1)$. Write point-slope form. _____
- A line has slope -1 and passes through (3, -5). Write point-slope form. _____
- Convert $y - 2 = 3(x - 1)$ _____
- Convert $y + 4 = -2(x - 3)$ _____
- Convert $y - 1 = \frac{1}{2}(x + 2)$ _____
- Through (2, 4), (5, 10) _____
- Through (0, 3), (4, 11) _____
- slope 0, (5, 7) _____
- Through $(-1, -2)$, (3, 6) _____
- A line has slope $-\frac{2}{3}$ and passes through (6, 1). Write point-slope form. _____
- Convert $y + 2 = 4(x - 1)$ to slope-intercept form. _____
- Through (1, 1) with slope -1 _____
- Convert $y - 0 = 5(x - 0)$ to slope-intercept form. _____
- Write the equation of the line through (2, -3) and (6, -3). _____
- slope $\frac{3}{4}$, $(-4, 0)$ _____
- Through (5, 8), (7, 2) _____
- Convert $y - 7 = -\frac{1}{3}(x + 6)$ _____



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◆ VISUAL PRACTICE

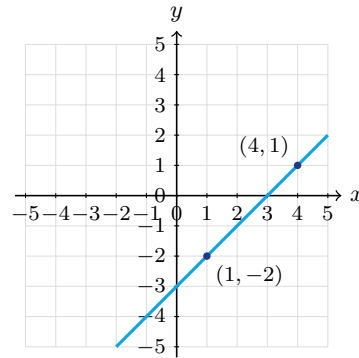
Use the graph, table, chart, or diagram to answer the question.

21. The line passes through $(-2, 1)$ and $(2, 5)$. Write a point-slope equation.



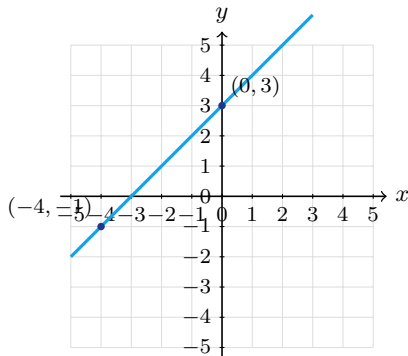
Answer: _____

22. The line passes through $(1, -2)$ and $(4, 1)$. Write a point-slope equation.



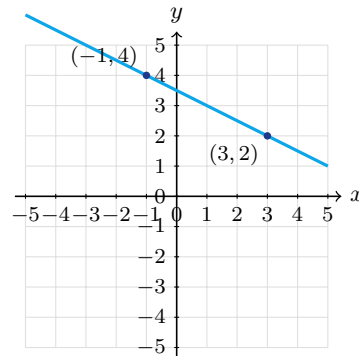
Answer: _____

23. The line passes through $(-4, -1)$ and $(0, 3)$. Write a point-slope equation using $(-4, -1)$.



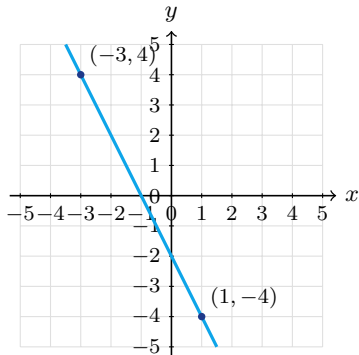
Answer: _____

24. The line passes through $(-1, 4)$ and $(3, 2)$. Write a point-slope equation using $(3, 2)$.



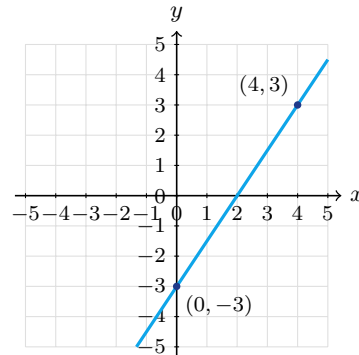
Answer: _____

25. The line passes through $(-3, 4)$ and $(1, -4)$. Write a point-slope equation using $(-3, 4)$.



Answer: _____

26. The line passes through $(0, -3)$ and $(4, 3)$. Write a point-slope equation using $(4, 3)$.



Answer: _____



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◆ Word Problems

27. A line passes through $(3, 12)$ and has slope 5. Use point-slope form to find the y -value when $x = 7$.

Model: _____

Answer: _____

28. A taxi cost is \$12 for 4 miles and \$22 for 9 miles. Write the equation for cost.

Model: _____

Answer: _____

29. A plant is 4 in tall after 2 weeks and 10 in tall after 5 weeks. Write a model.

Model: _____

Answer: _____

30. A truck rental costs \$50 for 100 miles and \$80 for 250 miles. Write the cost as a function of miles.

Model: _____

Answer: _____

31. A line passes through $(-2, 9)$ and $(4, -3)$. Find the slope and write one valid point-slope equation.

Model: _____

Answer: _____

32. A water tank has 420 gallons after 3 hours and 300 gallons after 7 hours. Write a linear model in point-slope form.

Model: _____

Answer: _____

33. A runner has gone 1.5 miles after 12 minutes and 4 miles after 32 minutes. Write a distance model.

Model: _____

Answer: _____

34. The temperature is 68°F at 2 p.m. and 56°F at 8 p.m. Let h be hours after noon, and write a linear temperature model.

Model: _____

Answer: _____



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Answer Keys

1. $y - 5 = 2(x - 1)$

2. $y - 7 = -3x$

3. $y - 3 = \frac{1}{2}(x - 4)$

4. $y - 1 = 4(x + 2)$

5. $y + 5 = -(x - 3)$

6. $y = 3x - 1$

7. $y = -2x + 2$

8. $y = \frac{1}{2}x + 2$

9. $y - 4 = 2(x - 2)$

10. $y = 2x + 3$

11. $y = 7$

12. $y - 6 = 2(x - 3)$

13. $y - 1 = -\frac{2}{3}(x - 6)$

14. $y = 4x - 6$

15. $y - 1 = -(x - 1)$

16. $y = 5x$

17. $y = -3$

18. $y = \frac{3}{4}(x + 4)$

19. $y - 8 = -3(x - 5)$

20. $y = -\frac{1}{3}x + 5$

21. $y - 1 = 1(x + 2)$

22. $y + 2 = 1(x - 1)$

23. $y + 1 = 1(x + 4)$

24. $y - 2 = -\frac{1}{2}(x - 3)$

25. $y - 4 = -2(x + 3)$

26. $y - 3 = \frac{3}{2}(x - 4)$

27. $y = 32$

28. $C = 2m + 4$

29. $h = 2w$

30. $C = \frac{1}{5}m + 30$

31. $y - 9 = -2(x + 2)$

32. $V - 420 = -30(t - 3)$

33. $d - 1.5 = \frac{1}{8}(t - 12)$

34. $T - 68 = -2(h - 2)$

Step-by-Step Tutor Notes

- Point-slope form is $y - y_1 = m(x - x_1)$. Use $m = 2$ and $(x_1, y_1) = (1, 5)$ to get $y - 5 = 2(x - 1)$.
- Use $m = -3$ and the point $(0, 7)$: $y - 7 = -3(x - 0)$. Since $x - 0 = x$, this is $y - 7 = -3x$.
- Compare the change in output to the change in input, because slope is a rate of change. Fractional slope works the same way. So the requested value is $y - 3 = \frac{1}{2}(x - 4)$.
- Point-slope form uses $x - x_1$. Because $x_1 = -2$, $x - (-2) = x + 2$, so $y - 1 = 4(x + 2)$.
- Since $y_1 = -5$, the left side is $y - (-5) = y + 5$. The slope -1 gives $y + 5 = -(x - 3)$.
- Work one inverse operation at a time and keep both sides balanced. Distribute: $y - 2 = 3x - 3$. Add 2: $y = 3x - 1$. After simplifying, the answer is $y = 3x - 1$.
- Work one inverse operation at a time and keep both sides balanced. Distribute: $y + 4 = -2x + 6$. Subtract 4: $y = -2x + 2$. After simplifying, the answer is $y = -2x + 2$.
- Work one inverse operation at a time and keep both sides balanced. Distribute: $y - 1 = \frac{1}{2}x + 1$. Add 1: $y = \frac{1}{2}x + 2$. After simplifying, the answer is $y = \frac{1}{2}x + 2$.
- Line up the two changes first; that keeps the rate from getting mixed up. Slope: $\frac{10-4}{5-2} = 2$. Use $(2, 4)$: $y - 4 = 2(x - 2)$. So the requested value is $y - 4 = 2(x - 2)$.
- Line up the two changes first; that keeps the rate from getting mixed up. Slope = 2. Through $(0, 3)$ means $b = 3$. $y = 2x + 3$. So the requested value is $y = 2x + 3$.
- Think of slope as the amount the output changes for each 1-unit change in the input. Slope 0 is horizontal: $y - 7 = 0(x - 5)$, so $y = 7$. So the requested value is $y = 7$.
- Think of slope as the amount the output changes for each 1-unit change in the input. Slope: $\frac{6-(-2)}{3-(-1)} = \frac{8}{4} = 2$. So the requested value is $y - 6 = 2(x - 3)$.
- Use the point $(6, 1)$ as (x_1, y_1) and the slope $-\frac{2}{3}$ as m : $y - 1 = -\frac{2}{3}(x - 6)$.
- Distribute first: $y + 2 = 4x - 4$. Then subtract 2 from both sides to get $y = 4x - 6$.
- This is a good place to slow down, check the notation, and simplify cleanly. $y - 1 = -1(x - 1)$, the -1 goes outside. So the answer is $y - 1 = -(x - 1)$.
- Both zeros disappear, leaving $y = 5x$. This is a line through the origin with slope 5.
- The two points have the same y -value, so the line is horizontal. Its equation is $y = -3$.
- Use the clue in the question first, then let the arithmetic finish the job. $y - 0 = \frac{3}{4}(x - (-4)) = \frac{3}{4}(x + 4)$. So the answer is $y = \frac{3}{4}(x + 4)$.
- Compare the change in output to the change in input, because slope is a rate of change. Slope: $\frac{2-8}{7-5} = -3$. So the requested value is $y - 8 = -3(x - 5)$.
- Work one inverse operation at a time and keep both sides balanced. Distribute: $y - 7 = -\frac{1}{3}x - 2$. Add 7: $y = -\frac{1}{3}x + 5$. After simplifying, the answer is $y = -\frac{1}{3}x + 5$.
- The slope is $\frac{5-1}{2-(-2)} = 1$. Use point $(-2, 1)$ in point-slope form.
- The slope is $\frac{1-(-2)}{4-1} = 1$. Using $(1, -2)$ gives $y + 2 = 1(x - 1)$.
- The slope is $\frac{3-(-1)}{0-(-4)} = 1$. Using $(-4, -1)$ gives $y + 1 = 1(x + 4)$.
- The slope is $\frac{2-4}{3-(-1)} = -\frac{1}{2}$. Using $(3, 2)$ gives $y - 2 = -\frac{1}{2}(x - 3)$.
- The slope is $\frac{-4-4}{1-(-3)} = -2$. Using $(-3, 4)$ gives $y - 4 = -2(x + 3)$.
- The slope is $\frac{3-(-3)}{4-0} = \frac{3}{2}$. Using $(4, 3)$ gives $y - 3 = \frac{3}{2}(x - 4)$.
- $y - 12 = 5(x - 3)$. At $x = 7$: $y - 12 = 5(4) = 20$, so $y = 32$.
- Slope: $\frac{22-12}{9-4} = 2$ dollars/mile. Use $(4, 12)$: $C - 12 = 2(m - 4)$, so $C = 2m + 4$. The y -intercept \$4 is the base fare.
- Slope: $\frac{10-4}{5-2} = 2$ in/week. Through $(2, 4)$: $h - 4 = 2(w - 2)$, so $h = 2w$. (At $w = 0$ height is 0.)
- Slope: $\frac{80-50}{250-100} = \frac{30}{150} = \frac{1}{5}$. Through $(100, 50)$: $C - 50 = \frac{1}{5}(m - 100)$. Simplify: $C = \frac{1}{5}m + 30$. Base fee \$30.
- The slope is $\frac{-3-9}{4-(-2)} = -\frac{12}{6} = -2$. Using $(-2, 9)$ gives $y - 9 = -2(x + 2)$.
- The rate is $\frac{300-420}{7-3} = -30$ gallons per hour. Using $(3, 420)$ gives $V - 420 = -30(t - 3)$.
- The slope is $\frac{4-1.5}{32-12} = \frac{2.5}{20} = \frac{1}{8}$ mile per minute. Use $(12, 1.5)$.
- From $h = 2$ to $h = 8$, temperature changes by -12 degrees over 6 hours, so the slope is -2 . Use the point $(2, 68)$.



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