

# 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  $y - 7 = -\frac{1}{3}(x + 6)$  \_\_\_\_\_

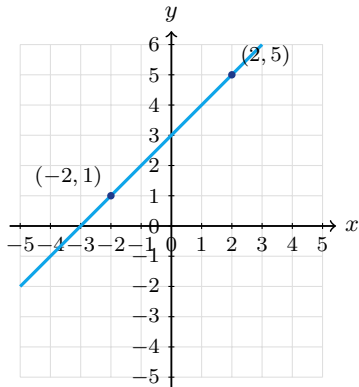


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◆ VISUAL PRACTICE

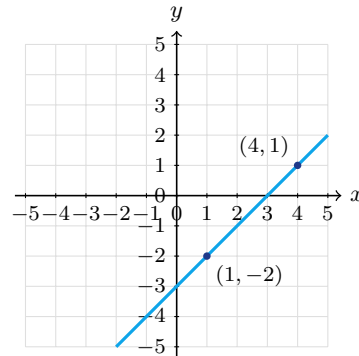
Use the graph, table, chart, or diagram to answer the question.

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



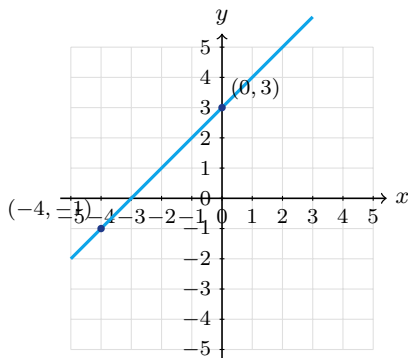
Answer: \_\_\_\_\_

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



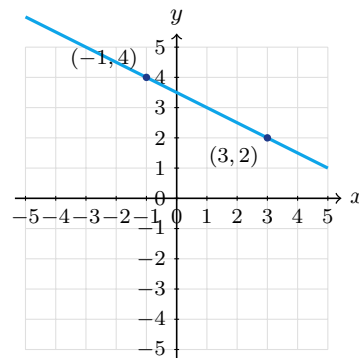
Answer: \_\_\_\_\_

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



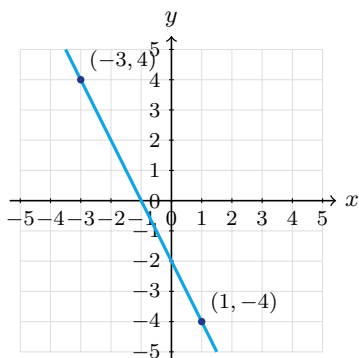
Answer: \_\_\_\_\_

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



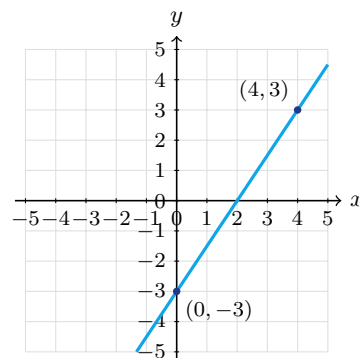
Answer: \_\_\_\_\_

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: \_\_\_\_\_



## ◆ 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  $68^{\circ}\text{F}$  at 2 p.m. and  $56^{\circ}\text{F}$  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.  $T - 68 = -2(h - 2)$

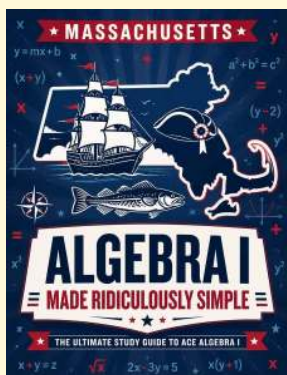
## Step-by-Step Tutor Notes

- 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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