Point-Slope Form

Name: _____	Date: _____	Score: _____ / 34

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.

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

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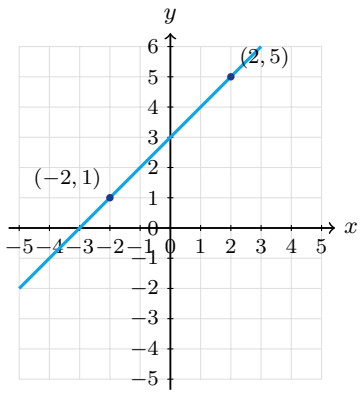
VISUAL PRACTICE

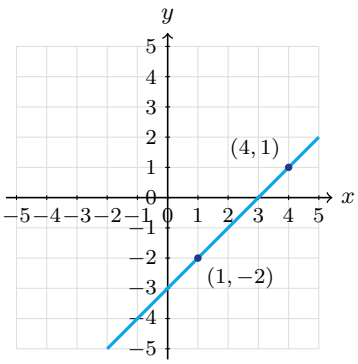
Use the graph, table, chart, or diagram to answer the question.

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



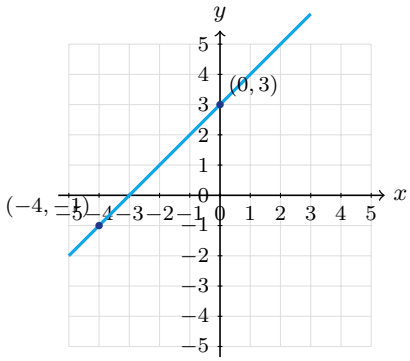
Answer: _____

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



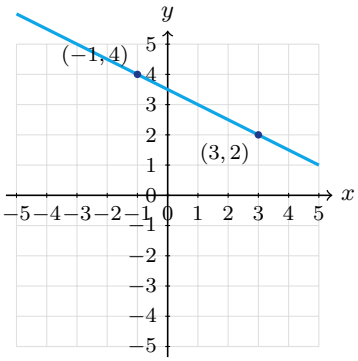
Answer: _____

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



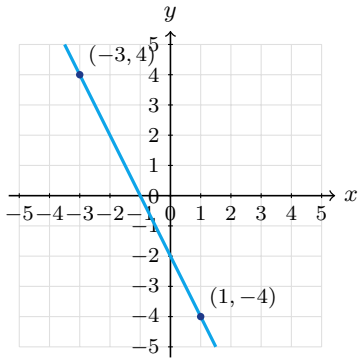
Answer: _____

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



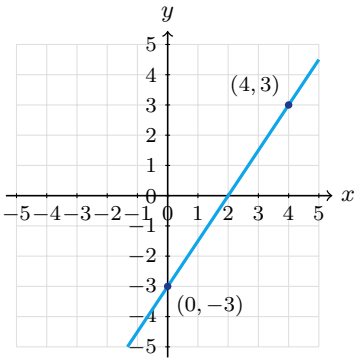
Answer: _____

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

1. Point-slope form is $y-y_1=m(x-x_1)$. Use $m=2$ and $(x_1,y_1)=(1,5)$ to get $y-5=2(x-1)$.
2. Use $m=-3$ and the point $(0,7)$: $y-7=-3(x-0)$. Since $x-0=x$, this is $y-7=-3x$.
3. 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 $y-3=\frac{1}{2}(x-4)$.
4. Point-slope form uses $x-x_1$. Because $x_1=-2$, $x-(-2)=x+2$, so $y-1=4(x+2)$.
5. Since $y_1=-5$, the left side is $y-(-5)=y+5$. The slope -1 gives $y+5=-(x-3)$.
6. 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 $y=3x-1$.
7. 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 $y=-2x+2$.
8. 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 $y=\frac{1}{2}x+2$.
9. 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 $y-4=2(x-2)$.
10. 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 $y=2x+3$.
11. 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 $y=7$.
12. 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 $y-6=2(x-3)$.
13. Use the point $(6,1)$ as (x_1,y_1) and the slope $-\frac{2}{3}$ as m: $y-1=-\frac{2}{3}(x-6)$.
14. Distribute first: $y+2=4x-4$. Then subtract 2 from both sides to get $y=4x-6$.
15. 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 $y-1=-(x-1)$.
16. Both zeros disappear, leaving $y=5x$. This is a line through the origin with slope 5.
17. The two points have the same y-value, so the line is horizontal. Its equation is $y=-3$.
18. 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 $y=\frac{3}{4}(x+4)$.
19. 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 $y-8=-3(x-5)$.
20. 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 $y=-\frac{1}{3}x+5$.
21. The slope is $\frac{5-1}{2-(-2)}=1$. Use point $(-2,1)$ in point-slope form.
22. The slope is $\frac{1-(-2)}{4-1}=1$. Using $(1,-2)$ gives $y+2=1(x-1)$.
23. The slope is $\frac{3-(-1)}{0-(-4)}=1$. Using $(-4,-1)$ gives $y+1=1(x+4)$.
24. The slope is $\frac{2-4}{3-(-1)}=-\frac{1}{2}$. Using $(3,2)$ gives $y-2=-\frac{1}{2}(x-3)$.
25. The slope is $\frac{-4-4}{1-(-3)}=-2$. Using $(-3,4)$ gives $y-4=-2(x+3)$.
26. The slope is $\frac{3-(-3)}{4-0}=\frac{3}{2}$. Using $(4,3)$ gives $y-3=\frac{3}{2}(x-4)$.
27. $y-12=5(x-3)$. At $x=7$: $y-12=5(4)=20$, so $y=32$.
28. 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.
29. 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.).
30. 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.
31. The slope is $\frac{-3-9}{4-(-2)}=\frac{-12}{6}=-2$. Using $(-2,9)$ gives $y-9=-2(x+2)$.
32. The rate is $\frac{300-420}{7-3}=-30$ gallons per hour. Using $(3,420)$ gives $V-420=-30(t-3)$.
33. The slope is $\frac{4-1.5}{32-12}=\frac{2.5}{20}=\frac{1}{8}$ mile per minute. Use $(12,1.5)$.
34. 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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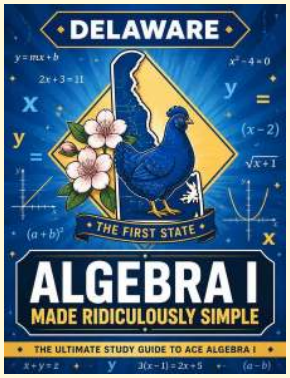

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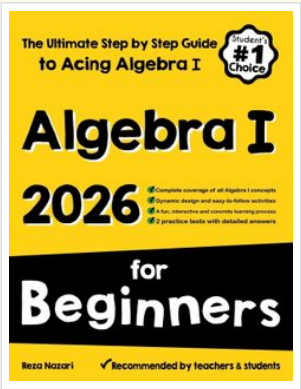

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