

# Point-Slope and Standard Form

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_ / 24

## Q Quick Review

There are several ways to write the same line. **Point-slope form** is  $y - y_1 = m(x - x_1)$  — handy when you know the slope  $m$  and one point  $(x_1, y_1)$ . **Slope-intercept form** is  $y = mx + b$ , the easiest form for graphing. **Standard form** is  $Ax + By = C$ , where  $A$ ,  $B$ , and  $C$  are integers. You can switch between forms with algebra: distribute and solve for  $y$  to reach slope-intercept, or move terms around to reach standard form. They all describe the *same* line.

◊ **Example:** Write the equation of the line through  $(3, 5)$  with slope 2 in slope-intercept form.  
 ⇒ We're given a point and a slope, so point-slope form is the natural starting place. Plug in  $m = 2$ ,  $x_1 = 3$ ,  $y_1 = 5$ :  $y - 5 = 2(x - 3)$ . Now we just need to clean it up into  $y = mx + b$  form. Distribute the 2 on the right:  $y - 5 = 2x - 6$ . Then add 5 to both sides to get  $y$  alone:  $y = 2x - 1$ . That's the same line, now in the form that's easy to graph.

**Answer:**  $y = 2x - 1$

## PRACTICE

Write each line in the requested form.

- |  |       |                                     |       |
|--|-------|-------------------------------------|-------|
| 1. Point-slope: $m = 3$ , $(1, 2)$           | _____ | 11. $y = x - 7$ to standard form    | _____ |
| 2. Point-slope: $m = -2$ , $(4, 1)$          | _____ | 12. $y = 4x$ to standard form       | _____ |
| 3. Point-slope: $m = 1$ , $(0, 5)$           | _____ | 13. $2x + y = 8$ to slope-int       | _____ |
| 4. Point-slope: $m = \frac{1}{2}$ , $(2, 3)$ | _____ | 14. $3x - y = 6$ to slope-int       | _____ |
| 5. $y - 4 = 2(x - 1)$ to slope-int           | _____ | 15. $x + 2y = 10$ to slope-int      | _____ |
| 6. $y - 1 = 3(x - 2)$ to slope-int           | _____ | 16. $4x + 2y = 12$ to slope-int     | _____ |
| 7. $y + 2 = -1(x - 3)$ to slope-int          | _____ | 17. Slope of $3x + y = 9$           | _____ |
| 8. $y - 5 = \frac{1}{2}(x - 4)$ to slope-int | _____ | 18. Slope of $2x - 4y = 8$          | _____ |
| 9. $y = 2x + 6$ to standard form             | _____ | 19. $y$ -intercept of $x + y = 5$   | _____ |
| 10. $y = -3x + 4$ to standard form           | _____ | 20. $y - 0 = 5(x - 1)$ to slope-int | _____ |

## ◆ Word Problems

21. A line passes through the point  $(2, 7)$  with slope 3. Write its equation in slope-intercept form. \_\_\_\_\_
22. A taxi's cost line passes through  $(0, 4)$  and has slope 2. Write the equation in standard form. \_\_\_\_\_
23. A line is given in standard form as  $5x + 2y = 20$ . What is its slope and  $y$ -intercept? \_\_\_\_\_
24. A line through  $(1, 1)$  has slope  $\frac{1}{2}$ . Write the equation in slope-intercept form. \_\_\_\_\_



## Answer Keys

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| <ol style="list-style-type: none"> <li>1. <math>y - 2 = 3(x - 1)</math></li> <li>2. <math>y - 1 = -2(x - 4)</math></li> <li>3. <math>y - 5 = 1(x - 0)</math></li> <li>4. <math>y - 3 = \frac{1}{2}(x - 2)</math></li> <li>5. <math>y = 2x + 2</math></li> <li>6. <math>y = 3x - 5</math></li> <li>7. <math>y = -x + 1</math></li> <li>8. <math>y = \frac{1}{2}x + 3</math></li> <li>9. <math>2x - y = -6</math></li> <li>10. <math>3x + y = 4</math></li> <li>11. <math>x - y = 7</math></li> <li>12. <math>4x - y = 0</math></li> <li>13. <math>y = -2x + 8</math></li> </ol> | <ol style="list-style-type: none"> <li>14. <math>y = 3x - 6</math></li> <li>15. <math>y = -\frac{1}{2}x + 5</math></li> <li>16. <math>y = -2x + 6</math></li> <li>17. <math>-3</math></li> <li>18. <math>\frac{1}{2}</math></li> <li>19. <math>5</math></li> <li>20. <math>y = 5x - 5</math></li> <li>21. <math>y = 3x + 1</math></li> <li>22. <math>2x - y = -4</math></li> <li>23. slope <math>-\frac{5}{2}</math>, <math>y</math>-intercept 10</li> <li>24. <math>y = \frac{1}{2}x + \frac{1}{2}</math></li> </ol> |
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### Step-by-Step Explanations

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| <ol style="list-style-type: none"> <li>1. Plug into <math>y - y_1 = m(x - x_1)</math>: <math>y - 2 = 3(x - 1)</math>.</li> <li>2. Plug into the form: <math>y - 1 = -2(x - 4)</math>.</li> <li>3. Plug in: <math>y - 5 = 1(x - 0)</math>, which is just <math>y - 5 = x</math>.</li> <li>4. Plug in: <math>y - 3 = \frac{1}{2}(x - 2)</math>.</li> <li>5. Distribute: <math>y - 4 = 2x - 2</math>, then add 4: <math>y = 2x + 2</math>.</li> <li>6. Distribute: <math>y - 1 = 3x - 6</math>, then add 1: <math>y = 3x - 5</math>.</li> <li>7. Distribute: <math>y + 2 = -x + 3</math>, then subtract 2: <math>y = -x + 1</math>.</li> <li>8. Distribute: <math>y - 5 = \frac{1}{2}x - 2</math>, then add 5: <math>y = \frac{1}{2}x + 3</math>.</li> <li>9. Move the <math>2x</math> over: <math>-2x + y = 6</math>, or equivalently <math>2x - y = -6</math>.</li> <li>10. Add <math>3x</math> to both sides: <math>3x + y = 4</math>.</li> <li>11. Subtract <math>x</math> from both sides: <math>-x + y = -7</math>, or <math>x - y = 7</math>.</li> <li>12. Move <math>4x</math> over: <math>-4x + y = 0</math>, or <math>4x - y = 0</math>.</li> <li>13. Subtract <math>2x</math> from both sides: <math>y = -2x + 8</math>.</li> <li>14. Subtract <math>3x</math>: <math>-y = -3x + 6</math>, then multiply by <math>-1</math>: <math>y = 3x - 6</math>.</li> </ol> | <ol style="list-style-type: none"> <li>15. Subtract <math>x</math>: <math>2y = -x + 10</math>, then divide by 2: <math>y = -\frac{1}{2}x + 5</math>.</li> <li>16. Subtract <math>4x</math>: <math>2y = -4x + 12</math>, divide by 2: <math>y = -2x + 6</math>.</li> <li>17. Solve for <math>y</math>: <math>y = -3x + 9</math>, so the slope is <math>-3</math>.</li> <li>18. Solve for <math>y</math>: <math>-4y = -2x + 8</math>, so <math>y = \frac{1}{2}x - 2</math>; slope <math>\frac{1}{2}</math>.</li> <li>19. Solve for <math>y</math>: <math>y = -x + 5</math>, so the <math>y</math>-intercept is 5.</li> <li>20. Distribute: <math>y = 5x - 5</math> (the <math>y - 0</math> is just <math>y</math>).</li> <li>21. Start with point-slope: <math>y - 7 = 3(x - 2)</math>. Distribute: <math>y - 7 = 3x - 6</math>, then add 7: <math>y = 3x + 1</math>.</li> <li>22. Slope-intercept is <math>y = 2x + 4</math>. Move the <math>2x</math> over: <math>-2x + y = 4</math>, or <math>2x - y = -4</math>.</li> <li>23. Solve for <math>y</math>: <math>2y = -5x + 20</math>, so <math>y = -\frac{5}{2}x + 10</math>. The slope is <math>-\frac{5}{2}</math> and the intercept is 10.</li> <li>24. Point-slope: <math>y - 1 = \frac{1}{2}(x - 1)</math>. Distribute: <math>y - 1 = \frac{1}{2}x - \frac{1}{2}</math>, then add 1: <math>y = \frac{1}{2}x + \frac{1}{2}</math>.</li> </ol> |
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