

Slope and the Equations of a Line

Name: _____ Date: _____ Score: _____ / 24

Q Quick Review

The **slope-intercept form** of a line is $y = mx + b$. Here m is the **slope** (steepness) and b is the **y -intercept** — the spot where the line crosses the y -axis. To graph it, start by plotting $(0, b)$, then use the slope as $\frac{\text{rise}}{\text{run}}$ to step to the next point. To read an equation, the number multiplied by x is m , and the lone constant is b . Any equation in this form makes a straight line.

◇ **Example:** Write the equation of the line with slope 3 that passes through $(0, -4)$.

⇒ We want the form $y = mx + b$, so we need two numbers: the slope m and the y -intercept b . The slope is handed to us — it's 3. And the point $(0, -4)$ is special because its x -value is 0, which means it sits right on the y -axis. So $b = -4$. Drop both values into the form: $y = 3x + (-4)$, which we tidy up as $y = 3x - 4$.

Answer: $y = 3x - 4$

PRACTICE

Write each line in slope-intercept form, or identify m and b .

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|---|-------|---------------------------------------|-------|
| 1. slope 2, y -intercept 5 | _____ | 11. In $y = 7 - 4x$, $b = ?$ | _____ |
| 2. slope 4, y -intercept -1 | _____ | 12. slope $-\frac{2}{3}$, y -int 4 | _____ |
| 3. slope -3 , y -intercept 6 | _____ | 13. In $y = 8$, $m = ?$ | _____ |
| 4. slope $\frac{1}{2}$, y -intercept 0 | _____ | 14. In $y = 8$, $b = ?$ | _____ |
| 5. slope 1, y -intercept -7 | _____ | 15. slope 6, through $(0, 0)$ | _____ |
| 6. In $y = 5x + 2$, $m = ?$ | _____ | 16. In $2y = 6x + 10$, $y = ?$ | _____ |
| 7. In $y = 5x + 2$, $b = ?$ | _____ | 17. In $y - 4 = 2x$, $y = ?$ | _____ |
| 8. In $y = -2x - 9$, $m = ?$ | _____ | 18. In $y + 3 = -x$, $y = ?$ | _____ |
| 9. In $y = -2x - 9$, $b = ?$ | _____ | 19. slope 0, y -intercept -2 | _____ |
| 10. In $y = 7 - 4x$, $m = ?$ | _____ | 20. In $3y = 9x - 12$, $y = ?$ | _____ |

◆ Word Problems

21. A gym charges a \$20 sign-up fee plus \$5 per visit. Write an equation for the total cost y after x visits, and find the cost of 7 visits. _____

22. A water tank starts with 50 liters and is drained at 8 liters per minute. Write an equation for the water y left after x minutes. _____

23. A phone plan costs \$30 per month with no extra fees. Write the equation for total cost y after x months and state the slope and y -intercept. _____

24. A line passes through $(0, 9)$ with slope -2 . Write its equation, then find y when $x = 4$. _____



Answer Keys

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|-----------------------------|------------------------------|
| 1. $y = 2x + 5$ | 13. $m = 0$ |
| 2. $y = 4x - 1$ | 14. $b = 8$ |
| 3. $y = -3x + 6$ | 15. $y = 6x$ |
| 4. $y = \frac{1}{2}x$ | 16. $y = 3x + 5$ |
| 5. $y = x - 7$ | 17. $y = 2x + 4$ |
| 6. $m = 5$ | 18. $y = -x - 3$ |
| 7. $b = 2$ | 19. $y = -2$ |
| 8. $m = -2$ | 20. $y = 3x - 4$ |
| 9. $b = -9$ | 21. $y = 5x + 20; \$55$ |
| 10. $m = -4$ | 22. $y = -8x + 50$ |
| 11. $b = 7$ | 23. $y = 30x; m = 30, b = 0$ |
| 12. $y = -\frac{2}{3}x + 4$ | 24. $y = -2x + 9; y = 1$ |

Step-by-Step Explanations

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|---|--|
| <p>1. Put $m = 2$ and $b = 5$ into $y = mx + b$.</p> <p>2. With $m = 4$ and $b = -1$, the line is $y = 4x - 1$.</p> <p>3. A negative slope is fine: $y = -3x + 6$.</p> <p>4. With $b = 0$ the line passes through the origin: $y = \frac{1}{2}x$.</p> <p>5. Slope 1 is just written as $x: y = x - 7$.</p> <p>6. The number multiplied by x is the slope, so $m = 5$.</p> <p>7. The lone constant is the y-intercept, so $b = 2$.</p> <p>8. The coefficient of x is -2, so $m = -2$.</p> <p>9. The constant term is -9, so $b = -9$.</p> <p>10. Reorder to $y = -4x + 7$; the slope is -4.</p> <p>11. Reordered as $y = -4x + 7$, the y-intercept is 7.</p> <p>12. Place $m = -\frac{2}{3}$ and $b = 4$ into the form.</p> <p>13. There is no x term, so the slope is 0 — a horizontal line.</p> <p>14. The line crosses the y-axis at 8, so $b = 8$.</p> | <p>15. Through the origin means $b = 0$, so $y = 6x$.</p> <p>16. Divide every term by 2: $y = 3x + 5$.</p> <p>17. Add 4 to both sides: $y = 2x + 4$.</p> <p>18. Subtract 3 from both sides: $y = -x - 3$.</p> <p>19. A slope of 0 drops the x term, leaving $y = -2$.</p> <p>20. Divide each term by 3: $y = 3x - 4$.</p> <p>21. The per-visit rate is the slope ($m = 5$) and the sign-up fee is the intercept ($b = 20$): $y = 5x + 20$. At $x = 7$: $y = 5(7) + 20 = 55$.</p> <p>22. It loses water, so the slope is -8, and it starts at 50 liters, so $b = 50$. The equation is $y = -8x + 50$.</p> <p>23. There's no start-up fee, so $b = 0$, and the monthly rate is the slope $m = 30$. So $y = 30x$.</p> <p>24. The point $(0, 9)$ gives $b = 9$, and the slope is -2, so $y = -2x + 9$. At $x = 4$: $y = -2(4) + 9 = 1$.</p> |
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