Slope and the Equations of a Line

Name: _____	Date: _____	Score: _____ / 24

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.

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

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

Step-by-Step Explanations

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

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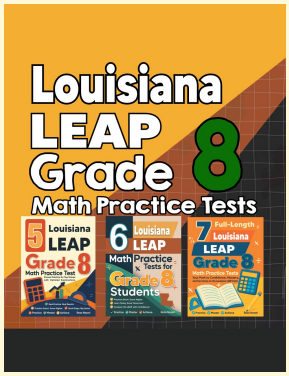

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