

Writing Functions

Name: _____ Date: _____ Score: _____ / 29

Q Quick Review

Writing a function from a real-world description means naming an input, naming the output, and writing a rule that turns one into the other.

The structure is usually *fixed amount + rate × input*. A taxi that charges \$3.50 to start plus \$2 per mile becomes $C(m) = 2m + 3.50$ — the flat fee is the y -intercept, the per-mile rate is the slope. Identify the constant piece (intercept) and the per-unit piece (slope) first; the equation writes itself.

For area / volume formulas, use the geometry directly. Rectangle with length ℓ and width $\ell - 4$: area is $A(\ell) = \ell(\ell - 4) = \ell^2 - 4\ell$. Box with square base s and height h : volume $V(s, h) = s^2h$.

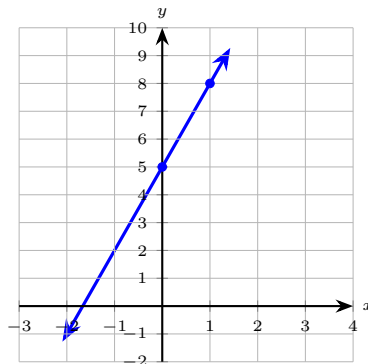
From a table, find the slope as $\frac{\Delta y}{\Delta x}$ between two points, then read the y -intercept (or solve for b using one point). Linear data has constant differences; quadratic data has constant second differences.

Two graphs of the same family share a parent. If $h(x) = x - 2$ and the dashed graph is $k(x) = 3(x - 2) + 2$, then $k(x) = 3h(x) + 2$. Spot the inner expression and pull it out. **Common slips**: multiplying the fixed fee by the input (“the \$3.50 should be flat, not per-mile”), and choosing $f(x) = mx + b$ vs $f(x) = bx + m$ by which number appeared first in the sentence.

PRACTICE

Write a function for each situation. Define your variable.

1. Taxi charges \$3.50 to start plus \$2 per mile m . Cost function? _____
2. Rectangle with length ℓ and width $\ell - 4$. Area function? _____
3. Box with square base of side s and height h . Volume? _____
4. Car A east at 40 mph, car B north at 30 mph, t hours. Distance apart? _____
5. Write the equation of the line graphed below. _____



6. Ball thrown up from a 5-foot platform at 48 ft/s. Height function? _____
7. Garden: length $x + 6$, width $x - 2$. Area function? _____
8. Phone plan: \$25 flat, \$0.10 per text over 200. Cost when over. _____
9. Parking: \$6 first hour plus \$2.50 each additional hour. _____
10. Circle of radius r . Area function? _____
11. Square of side s . Perimeter function? _____
12. Rectangle with perimeter P and length L . Width as a function of L ? _____
13. Sum of integers from 1 to n . _____



- 14. Hourly rate r , hours h . Earnings function in h ? _____
- 15. $h(x) = x - 2$ is solid. Dashed graph: $3(x - 2) + 2$. Express the dashed line as a function of h . _____
- 16. Gym: \$30 fixed plus \$5 per class. Cost function in n ? _____
- 17. Square pen with perimeter 200. Side length s ? _____
- 18. The table shows a linear function. Write its formula. _____

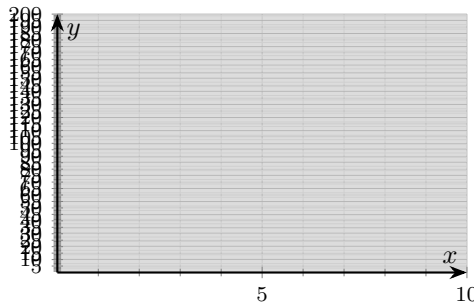
x	0	2	4	6
$f(x)$	4	10	16	22

- 19. Cone with radius r and height h . Volume function? _____
- 20. The table shows a savings balance over the first months. Write the balance as a linear function $S(m)$. _____

m	0	1	2	3
$S(m)$	200	225	250	275

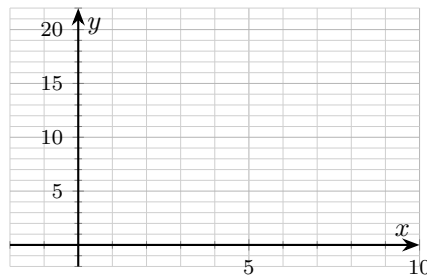
◆ Word Problems

- 21. A gym charges \$30 to join and \$15 per month after that. Write a function $C(m)$ for total cost after m months. The graph below shows the standard plane to sketch this on if you'd like. _____



Then find $C(8)$.

- 22. Two cars start at the same point. Car A heads east at 45 mph; car B heads north at 60 mph. After t hours, write a function $D(t)$ for the straight-line distance between them, then find $D(4)$. _____
- 23. A linear function passes through $(2, 7)$ and $(6, 19)$. Use the plane below to sketch the line, then write its equation. _____



- 24. A school sells \$12 adult tickets and \$5 student tickets. Write a function $R(a, s)$ for total ticket revenue when a adult and s student tickets are sold. If 40 adult and 90 student tickets sell, what is the revenue? _____



Additional Practice

25. If $f(x) = 2x - 5$, find $f(4)$. _____

26. If $g(x) = x^2 + 1$, find $g(-3)$. _____

27. For $f(x) = 3x + 2$, solve $f(x) = 14$. _____

28. Find $(f + g)(x)$ if $f = x + 1$, $g = 2x - 5$. _____

29. Find $(fg)(x)$ if $f = x - 2$, $g = x + 3$. _____



Answer Keys

1. $C(m) = 2m + 3.50$
2. $A(\ell) = \ell^2 - 4\ell$
3. $V(s, h) = s^2h$
4. $D(t) = 50t$
5. $f(x) = 3x + 5$
6. $h(t) = -16t^2 + 48t + 5$
7. $A(x) = x^2 + 4x - 12$
8. $C(t) = 25 + 0.10(t - 200)$
9. $P(h) = 6 + 2.50(h - 1)$
10. $A(r) = \pi r^2$
11. $P(s) = 4s$
12. $W(L) = \frac{P - 2L}{2}$

Additional Practice Answers

25. 3
26. 10
27. $x = 4$

13. $S(n) = \frac{n(n+1)}{2}$
14. $E(h) = rh$
15. $k(x) = 3h(x) + 2$
16. $C(n) = 5n + 30$
17. $s = 50$
18. $f(x) = 3x + 4$
19. $V(r, h) = \frac{1}{3}\pi r^2h$
20. $S(m) = 25m + 200$
21. $C(m) = 15m + 30, C(8) = \150
22. $D(t) = 75t, D(4) = 300$ miles
23. $y = 3x + 1$
24. $R(a, s) = 12a + 5s, R(40, 90) = \930

28. $3x - 4$
29. $x^2 + x - 6$

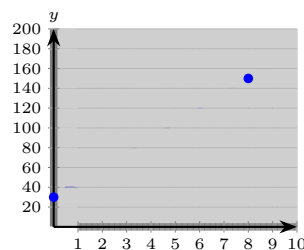
Additional Practice: Answers for all numbered items, including the added practice, are shown in the grid above.

Step-by-Step Explanations

1. Flat fee is the intercept (\$3.50); per-mile rate is the slope (\$2). So $C(m) = 2m + 3.50$. A common slip is $3.50m + 2$ — that would make the flat fee scale with miles.
2. Keep the rule visible: Area is length times width: $\ell(\ell - 4) = \ell^2 - 4\ell$. Requires $\ell > 4$ to keep width positive. That gives a quick check on the answer.
3. One steady path is: Base area is s^2 ; volume is base area times height. This is the part to check before moving on, because it keeps the answer tied to the original question.
4. After t hours, $40t$ east and $30t$ north. Pythagoras: $\sqrt{(40t)^2 + (30t)^2} = \sqrt{2500t^2} = 50t$.
5. The two marked points are $(0, 5)$ and $(1, 8)$. Slope is $\frac{8 - 5}{1 - 0} = 3$; the y -intercept is 5. So $f(x) = 3x + 5$.
6. Keep the rule visible: Use $h(t) = -16t^2 + v_0t + h_0$ with $v_0 = 48, h_0 = 5$. This is the part to check before moving on, because it keeps the answer tied to the original question.
7. One steady path is: $(x + 6)(x - 2) = x^2 + 4x - 12$. Need $x > 2$ for positive width. This is the part to check before moving on, because it keeps the answer tied to the original question.
8. For $t \leq 200$, just 25. Past 200, each extra text adds 0.10. Build the offset explicitly: $(t - 200)$.
9. After the first hour, there are $(h - 1)$ extra hours at \$2.50 each. At $h = 5$: $P(5) = 6 + 10 = 16$.
10. Keep the rule visible: The classic area formula. Defined for $r \geq 0$. This is the part to check before moving on, because it keeps the answer tied to the original question.
11. One steady path is: Four equal sides. Slope 4, intercept 0. This is the part to check before moving on, because it keeps the answer tied to the original question.
12. Start with the key idea: $P = 2L + 2W$, so $W = \frac{P - 2L}{2}$. (Here P is a fixed constant.) This is the part to check before moving on, because it keeps the answer tied to the original question.
13. A careful way to see it: The Gauss formula. At $n = 10$: $S(10) = 55$. This is the part to check before moving on, because it keeps the answer tied to the original question.
14. Direct variation: earnings scale linearly with hours. (Here r is treated as a constant.)
15. Notice $x - 2$ is exactly $h(x)$, so $3(x - 2) + 2$ becomes $3h(x) + 2$. (Same line, two equivalent descriptions.)

16. Start with the key idea: Flat fee is intercept; per-class is slope. This is the part to check before moving on, because it keeps the answer tied to the original question.
17. A careful way to see it: $4s = 200 \Rightarrow s = 50$ units. (Area = 2500 if you continue.) This is the part to check before moving on, because it keeps the answer tied to the original question.
18. Outputs rise by 6 for every $\Delta x = 2$, so the slope is $\frac{6}{2} = 3$. The intercept is $f(0) = 4$. Formula: $f(x) = 3x + 4$.
19. One steady path is: Standard cone formula. One-third of the cylinder of same base and height. That gives a quick check on the answer.
20. The balance starts at \$200 (the value when $m = 0$) and climbs \$25 each month — a constant difference. So the slope is 25 and the intercept is 200: $S(m) = 25m + 200$.
21. Initiation fee \$30 is the intercept; monthly \$15 is the slope. So $C(m) = 15m + 30$. At $m = 8$: $15(8) + 30 = 120 + 30 = 150$. A common trap is to forget the initiation fee and write $15m$ alone — but the prompt explicitly says there's an upfront \$30.

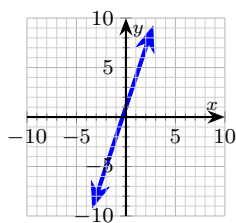
Answer graph



22. After t hours, car A is $45t$ east and car B is $60t$ north. Pythagoras: $D(t) = \sqrt{(45t)^2 + (60t)^2} = \sqrt{2025t^2 + 3600t^2} = \sqrt{5625t^2} = 75t$ (since 45-60-75 is a 3-4-5 triple). At $t = 4$: $D(4) = 300$ miles.
23. Slope: $\frac{19 - 7}{6 - 2} = \frac{12}{4} = 3$. Use point-slope with $(2, 7)$: $y - 7 = 3(x - 2)$, so $y = 3x + 1$. Check the other point: $3(6) + 1 = 19$. y -intercept is 1, x -intercept at $x = -\frac{1}{3}$.



Answer graph



24. Each adult contributes \$12; each student \$5. Add: $R(a, s) = 12a + 5s$. At $a = 40$, $s = 90$: $12(40) + 5(90) = 480 + 450 = 930$. (Both counts are whole positive integers — exactly the kind of clean ticket data this kind of problem should have.)



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