# Chapter 1 Expressions, Equations, and Functions

### *Prerequisite Skills for the chapter "Expressions, Equations, and Functions"*

**1.** In the fraction $\frac{2}{3}$, 2 is the numerator and 3 is the denominator.

**2.** Two fractions that represent the same number are called *equivalent* fractions.

**3.** The word *percent* (%) means "divided by 100."

**4.** $\frac{2}{3} + \frac{3}{5} = \frac{2}{3} \cdot \frac{5}{5} + \frac{3}{5} \cdot \frac{3}{3} = \frac{10}{15} + \frac{9}{15} = \frac{19}{15} = 1\frac{4}{15}$

**5.** $\frac{5}{6} - \frac{3}{4} = \frac{5}{6} \cdot \frac{2}{2} - \frac{3}{4} \cdot \frac{3}{3} = \frac{10}{12} - \frac{9}{12} = \frac{1}{12}$

**6.** $\frac{3}{5} \times \frac{2}{3} = \frac{6}{15} = \frac{2}{5}$

**7.** $\frac{1}{2} \div \frac{5}{8} = \frac{1}{2} \cdot \frac{8}{5} = \frac{8}{10} = \frac{4}{5}$

**8.** $4\% = 0.04$ **9.** $23\% = 0.23$

**10.** $1.5\% = 0.015$ **11.** $2.5\% = 0.025$

**12.** Perimeter $= 2\ell + 2w = 2(11) + 2\left(4\frac{1}{2}\right)$

$= 22 + 9 = 31$ in.

Area $= \ell w = 11\left(4\frac{1}{2}\right) = 49\frac{1}{2}$ in.$^2$

## Lesson 1.1 Evaluate Expressions

### *Guided Practice for the lesson "Evaluate Expressions"*

**1.** $6y = 6(2) = 12$ **2.** $\frac{8}{y} = \frac{8}{2} = 4$

**3.** $y + 4 = 2 + 4 = 6$ **4.** $11 - y = 11 - 2 = 9$

**5.** Total cost $= 2a = 2(4.75) = 9.5$

The total cost is \$9.50.

**6.** $9^5$ = nine to the fifth power $= 9 \cdot 9 \cdot 9 \cdot 9 \cdot 9$

**7.** $2^8$ = two to the eighth power

$= 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$

**8.** $n^4 = n$ to the fourth power $= n \cdot n \cdot n \cdot n$

**9.** $x^3 = 8^3 = 8 \cdot 8 \cdot 8 = 512$

**10.** $k^2 = (2.5)^2 = (2.5)(2.5) = 6.25$

**11.** $d^4 = \left(\frac{1}{3}\right)^4 = \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} = \frac{1}{81}$

**12.** $A = s^2 = 14^2 = 196$

The area of the square is 196 square inches.

### *Exercises for the lesson "Evaluate Expressions"*

### *Skill Practice*

**1.** The exponent is 12. The base is 6.

**2.** Substitute 3 for $n$. Evaluate three to the fifth power.

$n^5 = 3^5 = 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 243$

**3.** $15x = 15(4) = 60$ **4.** $0.4r = 0.4(6) = 2.4$

**5.** $w - 8 = 20 - 8 = 12$

**6.** $1.6 - g = 1.6 - 1.2 = 0.4$

**7.** $5 + m = 5 + 7 = 12$

**8.** $0.8 + h = 0.8 + 3.7 = 4.5$

**9.** $\frac{24}{f} = \frac{24}{8} = 3$ **10.** $\frac{t}{5} = \frac{4.5}{5} = 0.9$

**11.** $2.5m = 2.5(4) = 10$ **12.** $\frac{1}{2}k = \frac{1}{2} \cdot \frac{2}{3} = \frac{2}{6} = \frac{1}{3}$

**13.** $y - \frac{1}{2} = \frac{5}{6} - \frac{1}{2} = \frac{5}{6} - \frac{1}{2} \cdot \frac{3}{3} = \frac{5}{6} - \frac{3}{6} = \frac{2}{6} = \frac{1}{3}$

**14.** $h + \frac{1}{3} = 1\frac{1}{3} + \frac{1}{3} = \frac{4}{3} + \frac{1}{3} = \frac{5}{3} = 1\frac{2}{3}$

**15.** D; $2.5m = 2.5\,(10) = 25$

The correct answer is D.

**16.** $12^5$ = twelve to the fifth power $= 12 \cdot 12 \cdot 12 \cdot 12 \cdot 12$

**17.** $7^3$ = seven to the third power, or seven cubed $= 7 \cdot 7 \cdot 7$

**18.** $(3.2)^2$ = three and two tenths to the second power, or three and two tenths squared $= (3.2)(3.2)$

**19.** $(0.3)^4$ = three tenths to the fourth power

$= (0.3)(0.3)(0.3)(0.3)$

**20.** $\left(\frac{1}{2}\right)^8$ = one half to the eighth power

$= \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2}$

**21.** $n^7 = n$ to the seventh power $= n \cdot n \cdot n \cdot n \cdot n \cdot n \cdot n$

**22.** $y^6 = y$ to the sixth power $= y \cdot y \cdot y \cdot y \cdot y \cdot y$

**23.** $t^4 = t$ to the fourth power $= t \cdot t \cdot t \cdot t$

**24.** The expression states 0.4 squared, not 0.4 times 2.

$(0.4)^2 = (0.4)(0.4) = 0.16$

**25.** The expression $5^4$ means five to the fourth power, not four to the fifth power.

$5^4 = 5 \cdot 5 \cdot 5 \cdot 5 = 625$

**26.** $3^2 = 3 \cdot 3 = 9$ **27.** $10^2 = 10 \cdot 10 = 100$

**28.** $1^5 = 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 = 1$

**29.** $11^3 = 11 \cdot 11 \cdot 11 = 1331$

**30.** $5^3 = 5 \cdot 5 \cdot 5 = 125$

**31.** $3^5 = 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 243$

**32.** $2^6 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 64$

**33.** $6^4 = 6 \cdot 6 \cdot 6 \cdot 6 = 1296$

**34.** $\left(\frac{1}{4}\right)^2 = \frac{1}{4} \cdot \frac{1}{4} = \frac{1}{16}$ **35.** $\left(\frac{3}{5}\right)^3 = \frac{3}{5} \cdot \frac{3}{5} \cdot \frac{3}{5} = \frac{27}{125}$

**36.** $\left(\frac{2}{3}\right)^4 = \frac{2}{3} \cdot \frac{2}{3} \cdot \frac{2}{3} \cdot \frac{2}{3} = \frac{16}{81}$ **37.** $\left(\frac{1}{6}\right)^3 = \frac{1}{6} \cdot \frac{1}{6} \cdot \frac{1}{6} = \frac{1}{216}$

**38.** $x^2 = \left(\frac{3}{4}\right)^2 = \frac{3}{4} \cdot \frac{3}{4} = \frac{9}{16}$

**39.** $p^2 = 1.1^2 = (1.1)(1.1) = 1.21$

**40.** $x + y = 11 + 6.4 = 17.4$ **41.** $kn = 9(4.5) = 40.5$

**42.** $w - z = 9.5 - 2.8 = 6.7$ **43.** $\frac{b}{c} = \frac{24}{2.5} = 9.6$

**44.** C; $xy = 10(0.5) = 5$ $x - y = 10 - 0.5 = 9.5$

$\frac{x}{y} = \frac{10}{0.5} = 20$ $\frac{y}{x} = \frac{0.5}{10} = 0.05$

$\frac{x}{y}$ has the greatest value. So, the correct answer is C.

**45.** B; The correct answer is B.

**46.** If $y > x$, $3^y$ is greater than $3^x$ because 3 to a higher power is three multiplied by itself more times, which gives a greater result.

**47.** The expression $x^2$ is greater than $2^x$ for $x = 3$. Through trial and error you can find that 3 is the only value of $x$ where $x^2$ is greater than $2^x$ because $3^2 = 3 \cdot 3 = 9$ and $2^3 = 2 \cdot 2 \cdot 2 = 8$.

### *Problem Solving*

**48.** $4s = 4(7.5) = 30$

The perimeter is 30 meters.

**49.** distance $= 13\ell = 13(12.5) = 162.5$

The leopard frog can jump 162.5 centimeters.

**50.** **a.** $n = 2g$

$= 2(120) = 240$

Jen scored 240 points on goals.

**b.** point total $= n + a$

$= 240 + 20 = 260$

Jen's point total was 260 points.

**51.** **a.** $f = 3.5 + 5.5 + 3 = 12$

The total length of the three fish is 12 inches.

**b.** Area of water surface $= 12f = 12(12) = 144$

The fish need 144 square inches of water surface.

**52.** C; $V = s^3 = 8^3 = 512$

The volume of the cube is 512 cubic feet.

Weight $= 30V = 30(512) = 15{,}360$

The weight of the uncarved cube is 15,360 pounds.

The correct answer is C.

**53.** New England Patriots' net score $= a - b = 336 - 238$

$= 98$ points

Carolina Panthers' net score $= a - b = 325 - 304$

$= 21$ points

The New England Patriots' net score was greater.

**54.** **a.** volume Bin A $= 6^3 = 216$ in.$^3$

The volume of Bin A is 216 cubic inches.

volume Bin B $= 12^3 = 1728$ in.$^3$

The volume of Bin B is 1728 cubic inches.

volume Bin C $= 18^3 = 5832$ in.$^3$

The volume of Bin C is 5832 cubic inches.

**b.** $\frac{\text{Edge length of Bin B}}{\text{Edge length of Bin A}} = \frac{12}{6} = 2$

The edge length of Bin B is 2 times greater than the edge length of Bin A.

$\frac{\text{Volume of Bin B}}{\text{Volume of Bin A}} = \frac{1728}{216} = 8$

The volume of Bin B is 8 times greater than the volume of Bin A.

**c.** $\frac{\text{Edge length of Bin C}}{\text{Edge length of Bin A}} = \frac{18}{6} = 3$

The edge length of Bin C is 3 times greater than the edge length of Bin A.

$\frac{\text{Volume of Bin C}}{\text{Volume of Bin A}} = \frac{5832}{216} = 27$

The volume of Bin C is 27 times greater than the volume of Bin A.

**d.** Multiplying the edge length of a cube by a number $n$ makes the volume of the cube $n^3$ times larger. When the edge length of Bin A was multiplied by 2, the volume was 8 times greater, which is $2^3$. When the edge length of Bin A was multiplied by 3, the volume was 27 times greater, which is $3^3$.

**55.** You can form 3 different cubes.

One with an edge length of $\frac{1}{4}$ inch, using 8 cubes.

$V = s^3 = \left(\frac{1}{4}\right)^3 = \frac{1}{64}$ in.$^3$

One with an edge length of $\frac{3}{8}$ inch, using 27 cubes.

$V = s^3 = \left(\frac{3}{8}\right)^3 = \frac{27}{512}$ in.$^3$

One with an edge length of $\frac{1}{2}$ inch, using 64 cubes.

$V = s^3 = \left(\frac{1}{2}\right)^3 = \frac{1}{8}$ in.$^3$

Total volume $= \frac{1}{64} + \frac{27}{512} + \frac{1}{8} = \frac{99}{512}$

The total volume is $\frac{99}{512}$ cubic inches.

## Lesson 1.2 Apply Order of Operations

### *Guided Practice for the lesson "Apply Order of Operations"*

**1.** $20 - 4^2 = 20 - 16 = 4$

**2.** $2 \cdot 3^2 + 4 = 2 \cdot 9 + 4 = 18 + 4 = 22$

**3.** $32 \div 2^3 + 6 = 32 \div 8 + 6 = 4 + 6 = 10$

**4.** $15 + 6^2 - 4 = 15 + 36 - 4 = 51 - 4 = 47$

**5.** $4(3 + 9) = 4(12) = 48$

**6.** $3(8 - 2^2) = 3(8 - 4) = 3(4) = 12$

**7.** $2[(9 + 3) \div 4] = 2[12 \div 4] = 2[3] = 6$

**8.** $y^2 - 3 = 8^2 - 3 = 64 - 3 = 61$

**9.** $12 - y - 1 = 12 - 8 - 1 = 4 - 1 = 3$

**10.** $\frac{10y + 1}{y + 1} = \frac{10(8) + 1}{8 + 1} = \frac{80 + 1}{8 + 1} = \frac{81}{9} = 9$

**11.** No, the sponsor's cost does not double. The cost for juice drinks and sandwiches will double, but the cost for trash bags will not.

### Exercises for the lesson "Apply Order of Operations"

### Skill Practice

1. Evaluate power.
2. Substitute 3 for $x$. Evaluate the expression inside the parentheses by multiplying within parentheses, then adding within parentheses. Square the result of that expression. Multiply that result by 2.
3. $13 - 8 + 3 = 5 + 3 = 8$
4. $8 - 2^2 = 8 - 4 = 4$
5. $3 \cdot 6 - 4 = 18 - 4 = 14$
6. $5 \cdot 2^3 + 7 = 5 \cdot 8 + 7 = 40 + 7 = 47$
7. $48 \div 4^2 + \frac{3}{5} = 48 \div 16 + \frac{3}{5} = 3 + \frac{3}{5} = 3\frac{3}{5}$
8. $1 + 5^2 \div 50 = 1 + 25 \div 50 = 1 + \frac{1}{2} = 1\frac{1}{2}$
9. $2^4 \cdot 4 - 2 \div 8 = 16 \cdot 4 - 2 \div 8 = 64 - 2 \div 8$
$= 64 - \frac{1}{4} = 63\frac{3}{4}$
10. $4^3 \div 8 + 8 = 64 \div 8 + 8 = 8 + 8 = 16$
11. $(12 + 72) \div 4 = 84 \div 4 = 21$
12. $24 + 4(3 + 1) = 24 + 4\,(4) = 24 + 16 = 40$
13. $12(6 - 3.5)^2 - 1.5 = 12(2.5)^2 - 1.5 = 12(6.25) - 1.5$
$= 75 - 1.5 = 73.5$
14. $24 \div (8 + 4^2) = 24 \div (8 + 16) = 24 \div 24 = 1$
15. $\frac{1}{2}(21 + 2^2) = \frac{1}{2}(21 + 4) = \frac{1}{2}(25) = 12\frac{1}{2}$
16. $\frac{1}{6}(6 + 18) - 2^2 = \frac{1}{6}(24) - 2^2 = \frac{1}{6}(24) - 4$
$= 4 - 4 = 0$
17. $\frac{3}{4}[13 - (2 + 3)]^2 = \frac{3}{4}[13 - 5]^2 = \frac{3}{4}[8]^2 = \frac{3}{4}[64] = 48$
18. $8[20 - (9 - 5)^2] = 8[20 - 4^2] = 8[20 - 16]$
$= 8[4] = 32$
19. A; $3[20 - (7 - 5)^2] = 3[20 - 2^2] = 3[20 - 4]$
$= 3[16] = 48$

    The correct answer is A.
20. The order of operations states that division must be done before addition. $14 \div 7$ should have been evaluated first.
$(1 + 13) \div 7 + 7 = 14 \div 7 + 7 = 2 + 7 = 9$
21. The order of operations states that evaluating powers must be done before multiplication. $6^2$ should have been evaluated first.
$20 - \frac{1}{2} \cdot 6^2 = 20 - \frac{1}{2} \cdot 36 = 20 - 18 = 2$
22. $4n - 12 = 4(7) - 12 = 28 - 12 = 16$
23. $2 + 3x^2 = 2 + 3(3^2) = 2 + 3(9) = 2 + 27 = 29$
24. $6t^2 - 13 = 6(2^2) - 13 = 6(4) - 13 = 24 - 13 = 11$
25. $11 + r^3 - 2r = 11 + 5^3 - 2(5) = 11 + 125 - 2(5)$
$= 11 + 125 - 10 = 136 - 10 = 126$
26. $5(w - 4) = 5(7 - 4) = 5(3) = 15$
27. $3(m^2 - 2) = 3(1.5^2 - 2) = 3(2.25 - 2)$
$= 3(0.25) = 0.75$
28. $\frac{9x + 4}{3x + 1} = \frac{9 \cdot 7 + 4}{3 \cdot 7 + 1} = \frac{63 + 4}{3 \cdot 7 + 1} = \frac{63 + 4}{21 + 1}$
$= \frac{67}{21 + 1} = \frac{67}{22} = 3\frac{1}{22}$
29. $\frac{k^2 - 1}{k + 3} = \frac{5^2 - 1}{5 + 3} = \frac{25 - 1}{5 + 3} = \frac{24}{5 + 3} = \frac{24}{8} = 3$
30. $\frac{b^3 - 21}{5b + 9} = \frac{3^3 - 21}{5 \cdot 3 + 9} = \frac{27 - 21}{5 \cdot 3 + 9} = \frac{27 - 21}{15 + 9} = \frac{6}{24} = \frac{1}{4}$
31. B; $\frac{x^2}{25} + 3x = \frac{10^2}{25} + 3(10) = \frac{100}{25} + 3(10) = 4 + 3(10)$
$= 4 + 30 = 34$

    The correct answer is B.
32. $(9 + 39 + 22) \div (11 - 9 + 3) = 14$
33. *Sample answer:* $2 \times 2 + [3^2 - (4 + 3)] \times 5 = 14$

### Problem Solving

34. $\frac{5.95 + 6.15}{2} = \frac{12.1}{2} = 6.05$

    The average cost of a T-shirt is \$6.05.
35. **a.** $3 \cdot 0.99 + 2 \cdot 9.95 = 2.97 + 2 \cdot 9.95$
$= 2.97 + 19.9 = 22.87$

    The total cost is \$22.87.

    **b.** $25 - 22.87 = 2.13$

    You will have \$2.13 left.
36. **a.** $25 + 1.17h = 25 + 1.17(34) = 25 + 39.78 = 64.78$

    A girl who was 34 inches tall at age 2 would be about 65 inches tall as an adult.

    **b.** $22.7 + 1.37h = 22.7 + 1.37(33)$
$= 22.7 + 45.21 = 67.91$

    A boy who was 33 inches tall at age 2 would be about 68 inches tall as an adult.
37. *Sample answer:* $(2 \times 3) + (16 \div 4) = 2 \times 3 + 16 \div 4$
38. regular shipping $= 0.5w + 4.49 = 0.5(26.5) + 4.49$
$= 13.25 + 4.49 = 17.74$

    rush delivery $= 0.99w + 6.49 = 0.99(26.5) + 6.49$
$= 26.235 + 6.49 = 32.725 \approx 32.73$

    $32.73 - 17.74 = 14.99$

    By using regular shipping, you save \$14.99.
39. **a.** income $= 10s = 10(38) = 380$

    Your income is \$380.

    expenses $= 4.50m + 12.99 = 4.50(50) + 12.99$
$= 225 + 12.99 = 237.99$

    Your expenses are \$237.99.

    profit $= 380 - 237.99 = 142.01$

    Your profit is \$142.01.

    **b.** You could use a single expression to determine profit by subtracting the expression for expenses from the expression for income.

**40. a.** The point total is a combination of all of the points earned from first, second, and third place votes. The number of first place votes must be multiplied by 3 because each first place vote is worth three points. The number of second place votes must be multiplied by 2 because each is worth 2 points. The number of third place votes does not need to be multiplied by anything because each third place vote is worth only 1 point.

**b.** Jason White's points $= 3(319) + 2(204) + 116$
$= 957 + 408 + 116$
$= 1481$

Larry Fitzgerald's points $= 3(253) + 2(233) + 128$
$= 759 + 466 + 128$
$= 1353$

$1481 - 1353 = 128$

Jason White got 128 more points than Larry Fitzgerald.

**c.** *Sample answer:* Yes. Change each of the first place votes to third place votes, change each of the second place votes to first place votes, and change each of the third place votes to second place votes.

### *Graphing Calculator Activity for the lesson "Apply Order of Operations"*

**1.** 5 **2.** 14 **3.** 0.429

**4.** 0.789 **5.** 0.188 **6.** 165.667

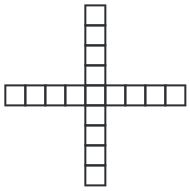
**7.** $1.07m - \frac{148\ m^2}{10{,}000\ h^2} = 1.07(54) - \frac{148(54^2)}{10{,}000(1.6^2)} \approx 40.9$

The lean body mass of a woman who is 1.6 meters tall and has a mass of 54 kilograms is about 40.9 BMI units.

## Lesson 1.3 Write Expressions

### *Investigating Algebra Activity for the lesson "Write Expressions"*

**1.** The figure number is the same as the number of times 4 is added in the numerical expression. The fourth figure will have 17 squares.



**2.** Calculate the number of squares in the $n$th figure by adding 1 to 4 times the number $n$.

**3.** $1 + 4n$ **4.** $2n$

### *Guided Practice for the lesson "Write Expressions"*

**1.** $\frac{10 + x}{2}$ **2.** $\frac{8}{p}$

**3.** $6d$, where $d$ represents the amount (in dollars) contributed by each worker.

**4.** unit rate $= \frac{8.80}{40} = \$.22$ per minute

Let $m$ be the number of extra minutes.

$35 + 0.22m = 35 + 0.22(35) = 35 + 7.7 = 42.7$

The total bill is \$42.70.

### *Exercises for the lesson "Write Expressions"*

### *Skill Practice*

**1.** A *rate* is a fraction that compares two quantities measured in different units.

**2.** Divide both the numerator, 20 miles, and the denominator, 4 hours, by 4; $\frac{20 \text{ miles} \div 4}{4 \text{ hours} \div 4} = \frac{5 \text{ mi}}{1 \text{ h}}$ or 5 mi/h.

**3.** $x + 8$ **4.** $6y$ **5.** $\frac{1}{2}m$

**6.** $\frac{50}{h}$ **7.** $7 - n$ **8.** $15 + x$

**9.** $\frac{2t}{12}$ **10.** $p^2 - 3$ **11.** $2k - 7$

**12.** $3w + 5$ **13.** C **14.** C

**15.** $4v$ **16.** $5 - p$ **17.** $\frac{16}{p}$

**18.** $20 + j$ **19.** $7 - d$ **20.** $\frac{m}{60}$

**21.** $12y$

**22.** $\frac{32 \text{ students}}{4 \text{ groups}} = \frac{32 \text{ students} \div 4}{4 \text{ groups} \div 4} = \frac{8 \text{ students}}{1 \text{ group}}$

The unit rate is 8 students per group.

**23.** $\frac{4.5 \text{ pints}}{3 \text{ servings}} = \frac{4.5 \text{ pints} \div 3}{3 \text{ servings} \div 3} = \frac{1.5 \text{ pints}}{1 \text{ serving}}$

The unit rate is 1.5 pints per serving.

**24.** $\frac{12 \text{ runs}}{5 \text{ innings}} = \frac{12 \text{ runs} \div 5}{5 \text{ innings} \div 5} = \frac{2.4 \text{ runs}}{1 \text{ inning}}$

The unit rate is 2.4 runs per inning.

**25.** $\frac{\$136}{20 \text{ shares}} = \frac{\$136 \div 20}{20 \text{ shares} \div 20} = \frac{\$6.80}{1 \text{ share}}$

The unit rate is \$6.80 per share.

**26.** The \$2 and the 24 feet should be in the numerator. The error occurred by putting the unit from 24 feet in the denominator and ending up with dollars per square feet as the units for the answer.

$\frac{\$2}{\cancel{\text{foot}}} \cdot 24\ \cancel{\text{feet}} = \$48$

**27.** The units in the answer should be dollars, not dollars per foot.

$9\ \cancel{\text{yards}} \cdot \frac{3\ \cancel{\text{feet}}}{1\ \cancel{\text{yard}}} \cdot \frac{\$2}{\cancel{\text{foot}}} = \$54$

**28.** $2 \text{ min} + 4 \text{ sec} = 2(60) + 4 = 124 \text{ sec}$

$\frac{1\frac{1}{4} \text{ mi}}{124 \text{ sec}} = \frac{1\frac{1}{4} \text{ mi} \div 124}{124 \text{ sec} \div 124} = \frac{\frac{5}{496} \text{ mi}}{1 \text{ sec}} = \frac{5}{496} \text{ mi/sec}$

1 min + 55 sec = 1(60) + 55 = 115 sec

$$\frac{1\frac{3}{16}\text{ mi}}{115\text{ sec}} = \frac{1\frac{3}{16}\text{ mi} \div 115}{115\text{ sec} \div 115} = \frac{\frac{19}{1840}\text{ mi}}{1\text{ sec}} = \frac{19}{1840}\text{ mi/sec}$$

Because $\frac{19}{1840} > \frac{5}{496}$, $1\frac{3}{16}$ miles in 1 minute and 55 seconds is a greater rate.

**29.** $\frac{\$1.60}{5\text{ min}} = \frac{\$1.60 \div 5}{5\text{ min} \div 5} = \frac{\$.32}{1\text{ min}} = \$.32$ per min

$\frac{\$19.50}{1\text{ h}} = \frac{\$19.50}{60\text{ min}} = \frac{\$19.50 \div 60}{60\text{ min} \div 60} = \frac{\$.33}{1\text{ min}} \approx \$.33$ per min

Because \$.33 > \$.32, \$19.50 for 1 hour is the greater rate.

**30.** $\frac{n(n+1)}{2} = \frac{50(50+1)}{2} = \frac{50(51)}{2} = \frac{2550}{2} = 1275$

The sum of the whole numbers from 1 to 50 is 1275.

### *Problem Solving*

**31.** Let $t$ = number of tickets.

$19.95t + 3 = 19.95(5) + 3 = 99.75 + 3 = 102.75$

The total cost of ordering 5 tickets is \$102.75.

**32.** $98g = 98(20) = 1960$

It would take 1960 tons of organic material to fill a 20-gallon gas tank.

**33. a.** $\frac{\$2.64}{48\text{ oz}} = \frac{\$2.64 \div 48}{48\text{ oz} \div 48} = \$.055/\text{oz}$

The juice in the 48-ounce container costs \$0.055 per ounce.

$\frac{\$3.84}{64\text{ oz}} = \frac{\$3.84 \div 64}{64\text{ oz} \div 64} = \$.06/\text{oz}$

The juice in the 64-ounce container costs \$.06 per ounce.

**b.** The 48-ounce container costs less per ounce.

**c.** 192 oz • \$.055/oz = \$10.56

192 oz • \$.06/oz = \$11.52

\$11.52 − \$10.56 = \$.96

You save \$.96 by buying the 48-ounce containers.

**34.** *Sample answer:* You earn 30 dollars for shoveling driveways in a certain amount of time. If $x = 4$ hours, the unit rate is

$\frac{\$30}{4\text{ hours}} = \frac{\$30 \div 4}{4\text{ hours} \div 4} = \frac{\$7.50}{1\text{ hour}} = \$7.50/\text{h}.$

**35.** $\frac{\$125}{5\text{ birds}} = \frac{\$125 \div 5}{5\text{ birds} \div 5} = \frac{\$25}{1\text{ bird}}$

$25(7) + 325 = 175 + 325 = 500$

The total cost if 7 birds are exhibited is \$500.

**36.** Let $s$ = number of small photos and let $\ell$ = number of large photos.

$36s + 60\ell = 36(12) + 60(5) = 432 + 300 = 732$

It would take 732 seconds, or 12 minutes 12 seconds, to print 12 small photos and 5 large photos.

**37. a.** Let $g$ = girth (in feet), $h$ = height (in feet), and $c$ = crown spread in feet.

$12g + h + \frac{1}{4}c$

**b.** $12(12) + 97 + \frac{1}{4}(24) = 144 + 97 + 6 = 247$

The narrow leaf cottonwood's score is 247.

$12(21.5) + 95 + \frac{1}{4}(95) = 258 + 95 + 23.75 = 376.75$

The green ash's score is 376.75.

$12(14.5) + 51 + \frac{1}{4}(68) = 174 + 51 + 17 = 242$

The green buttonwood's score is 242.

**c.** An increase of $n$ feet in girth would have the greatest effect on a tree's score because the girth in feet must be multiplied by 12 to change it to inches. The height is not multiplied by anything, and the crown spread is only multiplied by $\frac{1}{4}$, so the girth being multiplied by 12 causes greater change.

### *Quiz for the lessons "Evaluate Expressions", "Apply Order of Operations", and "Write Expressions"*

**1.** When $y = 43$; $y + 10 = 43 + 10 = 53$

**2.** When $b = 9$; $15 - b = 15 - 9 = 6$

**3.** When $t = 20$; $t^2 = 20^2 = 400$

**4.** When $n = 8$; $3n - 5 = 3(8) - 5 = 24 - 5 = 19$

**5.** When $y = 5$; $2y^2 - 1 = 2(5^2) - 1 = 2(25) - 1$
$= 50 - 1 = 49$

**6.** When $x = 8$; $\frac{3x-6}{8} = \frac{3(8)-6}{8} = \frac{24-6}{8} = \frac{18}{8} = 2\frac{1}{4}$

**7.** $y - 7$ **8.** $t + 5$ **9.** $2k$

**10.** Let $p$ = number of people.

Total cost = $25 + 2p$
$= 25 + 2(5) = 25 + 10 = 35$

The total cost for 5 people is \$35.

## Lesson 1.4 Write Equations and Inequalities

### *Guided Practice for the lesson "Write Equations and Inequalities"*

**1.** $\frac{p}{12} \geq 30$

**2.** $9 - x = 4$
$9 - 5 \stackrel{?}{=} 4$
$4 = 4$
5 is a solution.

**3.** $b + 5 < 15$
$7 + 5 \stackrel{?}{<} 15$
$12 < 15$
7 is a solution.

**4.** $2n + 3 \geq 21$

$2(9) + 3 \stackrel{?}{\geq} 21$

$18 + 3 \stackrel{?}{\geq} 21$

$21 \geq 21$

9 is a solution.

| | *Equation* | *Think* | *Solution* | *Check* |
|---|---|---|---|---|
| **5.** | $m + 6 = 11$ | What number plus 6 equals 11? | 5 | $5 + 6 = 11$ ✓ |
| **6.** | $5x = 40$ | 5 times what number equals 40? | 8 | $5(8) = 40$ ✓ |
| **7.** | $\frac{r}{4} = 10$ | What number divided by 4 equals 10? | 40 | $\frac{40}{4} = 10$ ✓ |

**8.** Let $p$ be the regular price of 4 tickets.

$\frac{1}{2}p = 15$

*Think:* one half of what number equals 15?

Because $\frac{1}{2}(30) = 15$, the solution is 30.

The regular price for the tickets is \$30.

Cost per person: $\frac{\$30}{4 \text{ people}} = \$7.50$ per person

Each person pays \$7.50.

**9.** Let $p =$ average number of points per game.

$16p > 351$

$16 \cdot 22 \stackrel{?}{>} 351$

$352 > 351$

An average of 22 points per game will be enough to beat last year's total.

### *Exercises for the lesson "Write Equations and Inequalities"*

### *Skill Practice*

**1.** *Sample answer:* $5n > 17$

**2.** An equation is formed when an equal sign is placed between two expressions. An expression has no equal sign.

**3.** $42 + n = 51$

**4.** $z - 11 = 35$

**5.** $9 - \frac{t}{6} = 5$

**6.** $12 + 8k = 48$

**7.** $9(t + 5) < 6$

**8.** $4w \leq 51$

**9.** $8 < b + 3 < 12$

**10.** $4 < 8k \leq 16$

**11.** $10 < t - 7 < 20$

**12.** $p \leq \$10$

**13.** $p \geq \$12.99$

**14.** The phrase "no more than 13" indicates that $n + 4$ could be less than or equal to 13, not just less than 13. The verbal sentence should be $n + 4 \leq 13$.

**15.** The phrase "at most 15" indicates that $\frac{t}{4.2}$ must be less than or equal to 15, not greater than 15. The verbal sentence should be $\frac{t}{4.2} \leq 15$.

**16.** D

**17.** $x + 9 = 17$

$8 + 9 \stackrel{0}{} 17$

$17 = 17$

8 is a solution.

**18.** $9 + 4y = 17$

$9 + 4(1) \stackrel{0}{} 17$

$9 + 4 \stackrel{0}{} 17$

$13 \neq 17$

1 is not a solution.

**19.** $6f - 7 = 29$

$6(5) - 7 \stackrel{0}{} 29$

$30 - 7 \stackrel{0}{} 29$

$23 \neq 29$

5 is not a solution.

**20.** $\frac{k}{5} + 9 = 11$

$\frac{10}{5} + 9 \stackrel{0}{} 11$

$2 + 9 \stackrel{0}{} 11$

$11 = 11$

10 is a solution.

**21.** $\frac{r}{3} - 4 = 4$

$\frac{12}{3} - 4 \stackrel{0}{} 4$

$4 - 4 \stackrel{0}{} 4$

$0 \neq 4$

12 is not a solution.

**22.** $\frac{x - 5}{3} \geq 2.8$

$\frac{11 - 5}{3} \stackrel{?}{\geq} 2.8$

$\frac{6}{3} \stackrel{?}{\geq} 2.8$

$2 \not\geq 2.8$

11 is not a solution.

**23.** $15 - 4y > 6$

$15 - 4(2) \stackrel{?}{>} 6$

$15 - 8 \stackrel{?}{>} 6$

$7 > 6$

2 is a solution.

**24.** $y - 3.5 < 6$

$9 - 3.5 \stackrel{?}{<} 6$

$5.5 < 6$

9 is a solution.

**25.** $2 + 3x \leq 8$

$2 + 3(2) \stackrel{?}{\leq} 8$

$2 + 6 \stackrel{?}{\leq} 8$

$8 \leq 8$

2 is a solution.

**26.** $2p - 1 \geq 7$

$2(3) - 1 \stackrel{?}{\geq} 7$

$6 - 1 \stackrel{?}{\geq} 7$

$5 \not\geq 7$

3 is not a solution.

**27.** $4z - 5 < 3$

$4(2) - 5 \stackrel{?}{<} 3$

$8 - 5 \stackrel{?}{<} 3$

$3 \not< 3$

2 is a not solution.

**28.** $3z + 7 > 20$

$3(4) + 7 \stackrel{?}{>} 2$

$12 + 7 \stackrel{?}{>} 20$

$19 \not> 20$

4 is not a solution.

| | *Equation* | *Think* | *Solution* | *Check* |
|---|---|---|---|---|
| **29.** | $x + 8 = 13$ | What number plus 8 equals 13? | 5 | $5 + 8 = 13$ ✓ |

| | | | | |
|---|---|---|---|---|
| **30.** | $y + 16 = 25$ | What number plus 16 equals 25? | 9 | $9 + 16 = 25$ ✓ |
| **31.** | $z - 11 = 1$ | What number minus 11 equals 1? | 12 | $12 - 11 = 1$ ✓ |
| **32.** | $5w = 20$ | 5 times what number equals 20? | 4 | $5(4) = 20$ ✓ |
| **33.** | $8b = 72$ | 8 times what number equals 72? | 9 | $8(9) = 72$ ✓ |
| **34.** | $\frac{f}{6} = 4$ | What number divided by 6 equals 4? | 24 | $\frac{24}{6} = 4$ ✓ |

**35.** $3x - 2 = x + 5$

$3\left(3\frac{1}{2}\right) - 2 \stackrel{?}{=} 3\frac{1}{2} + 5$

$10\frac{1}{2} - 2 \stackrel{?}{=} 8\frac{1}{2}$

$8\frac{1}{2} = 8\frac{1}{2}$

$3\frac{1}{2}$ is a solution.

**36.** $2k + 4 \le k + 11$

$2\left(3\frac{1}{2}\right) + 4 \stackrel{?}{\le} 3\frac{1}{2} + 11$

$7 + 4 \stackrel{?}{\le} 14\frac{1}{2}$

$11 \le 14\frac{1}{2}$

$3\frac{1}{2}$ is a solution.

**37.** C; $z - 9 = 3$ $\quad z + 15 = 27$

$z = 12$ $\quad z = 12$

The correct answer is C.

**38.** Ask yourself, what number added to 4 gives you 19? The answer is 15. Then ask yourself, what number times 3 gives you 15? The answer is 5, so $x = 5$.

### *Problem Solving*

**39.** Let $m =$ miles you still need to walk.

$12.5 + m = 20$

$m = 7.5$

You still need to walk 7.5 miles.

**40.** Let $x =$ how many more CDs you can buy.

$27 + x \le 40$

$x \le 13$

If you buy 15 CDs, they will not all fit.

**41.** Let $t =$ New Zealand's time in hours.

$t + 6 = 173$

$t = 167$

The winning team's time was 167 hours.

**42.** $8(2.5) \stackrel{?}{\le} 18$

$20 \not\le 18$

You cannot bake 8 batches because 8 batches would take 20 cups of flour, and you only have 18 cups.

**43.** Let $d =$ the amount the neighbor paid in dollars.

$\frac{d}{4} = 25$

$d = 100$

The neighbor paid \$100.

**44.** *Sample answer:* You want to buy \$5 gift certificates to a music store for your friends. If you have \$50, how many certificates can you buy? $5(10) = 50$; 10 certificates; you can buy 10 \$5 gift certificates for \$50.

**45. a.** $6r + 5(10 - r) \ge 55$

**b.** If you spend 10 total hours and the same amount of time is spent at each job, you spend 5 hours at each job.

$6(5) + 5(10 - 5) \stackrel{?}{\ge} 55$

$30 + 5(5) \stackrel{?}{\ge} 55$

$30 + 25 \stackrel{?}{\ge} 55$

$55 \ge 55$

If you spend the same amount of time at each job, you will meet your goal.

**c.** If you spent the 10 hours running errands for \$6 per hour, you would earn \$60 because $10 \text{ hours} \cdot \frac{\$6}{1 \text{ hour}} = \$60$. Yes, you will meet your goal.

If you spend the 10 hours walking dogs for \$5 per hour, you would earn \$50 because $10 \text{ hours} \cdot \frac{\$5}{1 \text{ hour}} =$ \$50. You will not meet your goal if you work all 10 hours walking dogs.

**46. a.** Let $t =$ number of tickets.

$10t \ge 600$

$t \ge 60$

They must sell at least 60 tickets to cover expenses.

**b.** $10t \ge 600 + 1000$

$10t \ge 1600$

$t \ge 160$

They must sell at least 160 tickets to cover their expenses and meet their goal.

**c.** Yes, they can exceed their goal because they would only have to sell 160 tickets to meet their goal. They can only exceed their goal by the amount earned from 40 tickets because they cannot sell over 200 tickets, and they need to sell 160 to meet the goal.

$40 \text{ tickets} \cdot \frac{\$10}{1 \text{ ticket}} = \$400$

The most they can exceed their goal by is \$400.

**47.** Let $n =$ number of books your friend has read.

$3n = n + 4$

$n = 2$

Your friend has read 2 books and you have read 6 books.

**48.** length $= x$, width $= x - 1$

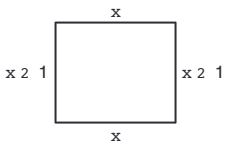
$x + x + x - 1 + x - 1 = 22$

$x = 6, x - 1 = 5$

$6 + 6 + 5 + 5 = 22$

The length is 6 inches.

The width is 5 inches.




### *Mixed Review of Problem Solving for the lessons "Evaluate Expressions", "Apply Order of Operations", "Write Expressions", and "Write Equations and Inequalities"*

**1. a.** $2 \cdot \frac{5}{8} + 5\frac{3}{4} = 1\frac{1}{4} + 5\frac{3}{4} = 7$

Each fabric square should have a side length of 7 inches.

**b.** Area $= s^2$

$48(s^2) = 48(7^2) = 48(49) = 2352$

You need 2352 square inches.

**c.** $36 \div 7 \approx 5$, so 5 squares fit across the width of the fabric. You need 10 squares to fit along the length. So you need a piece of fabric that is 70 inches long.

**d.** $A = 36(70) = 2520$ in.$^2$

$2520 - 2352 = 168$

There will be 168 square inches left over.

**2. a.** $\frac{1}{3}h + 5$

**b.** $\frac{1}{3}(66) + 5 = 22 + 5 = 27$ oz

$\frac{1}{3}(69) + 5 = 23 + 5 = 28$ oz

28 oz $-$ 27 oz $= 1$ oz

The player's new bat should be 1 ounce heavier.

**3. a.** $\frac{x}{20}$; Because 20 cars fit on each shelf, the number of cars you have divided by 20 will tell you how many shelves you need.

**b.** $\frac{120}{20} = 6$

You need 6 shelves to display 120 cars.

**4.** *Sample answer:* A basketball player scores less than 15 points in a game. What is the most 3-point field goals the player could have scored? The solution $x < 5$ means the player scored less than 5 3-point field goals.

**5.** No; If it costs \$7.50 for 3 quarts, then the unit rate is found by dividing \$7.50 by 3.

$\frac{\$7.50}{3 \text{ quarts}} = \frac{\$7.50 \div 3}{3 \text{ quarts} \div 3} = \$2.50$ per quart

You will need $\$2.50 \times 2 = \$5.00$ for 2 quarts.

**6. a.** $9f + 4p + 4c$

**b.** $9(14) + 4(11) + 4(1) = 126 + 44 + 4 = 174$

There are 174 calories in a serving of cheddar cheese.

**c.** If there are 11 grams of protein in 1 serving, in order to get 45 grams of protein, the teenager would have to eat about 4.1 servings, because $\frac{45}{11} \approx 4.1$. If there are 174 calories in 1 serving, the teenager would consume $147(4.1) = 713$ calories.

**7.** First model: $V = s^3 = 14^3 = 2744$ in.$^3$

Second Model: $V = s^3 = 16^3 = 4096$ in.$^3$

$4096 - 2744 = 1352$

The larger model has 1352 cubic inches more storage space than the smaller model.

## Lesson 1.5 Use a Problem Solving Plan

### *Guided Practice for the lesson "Use a Problem Solving Plan"*

**1.** $0.1s + 0.15 \cdot 4 = 3$

$0.1s + 0.6 = 3$

Guess a number easily multiplied by 0.1, like 30.

$0.1(30) + 0.6 \stackrel{?}{=} 3$

$3.6 \neq 3$; 30 does not check. Try 24.

$0.1(24) + 0.6 = 3$

$3 = 3$; 24 checks.

You should run 24 short blocks.

**2.** D; $A = \ell w$

$A = 12(5) = 60$

The area is 60 square feet, so the total cost is $\$2.40(60) = \$144$. The correct answer is D.

### *Exercises for the lesson "Use a Problem Solving Plan"*

#### *Skill Practice*

**1.** *Sample answer:* $d = rt$

**2.** Use the formula for volume of a cube, $V = s^3$. Substitute 1.5 for $s$ and solve for $V$. Multiply the volume in cubic feet by \$4 per cubic foot to find the cost.

**3.** You know:

The number of collars made.

The amount spent on materials.

The amount of profit you want to make.

You need to find out:

The amount you have to charge for each collar so that after subtracting \$85 in expenses, you still have \$90 profit left.

**4.** You know:

The rate the runner runs each day and how much time the runner spends running at that rate.

You need to know:

The distance run the first day at 0.15 mile per minute for 40 minutes and the distance run the next day at 0.16 mile per minute for 50 minutes.

The total distance run when those results are added together.

**5.** You know:

The temperature in Rome in degrees Celsius.

The temperature in Dallas in degrees Fahrenheit.

You need to know:

The formula for converting Fahrenheit to Celsius,

$C = \frac{5}{9}(F - 32)$.

What is 83°F equivalent to in degrees Celsius? Which temperature was higher?

**6.** The perimeter of a rectangle is not just length plus width, it is 2 times length plus 2 times width.

$P = 2\ell + 2w = 2(200) + 2(150) = 400 + 300 = 700$

$\$10(700) = \$7000$

**7.** The fence goes around the field, so the length of the fence is perimeter, not area. The formula for perimeter should be used: $P = 2\ell + 2w$.

**8.** $C = \frac{5}{9}(F - 32)$ **9.** $P = I - E$

**10.** $A = \frac{1}{2}b \cdot h$

**11.** C; $I = Prt = 1200(0.05)(2) = \$120$

The correct answer is C.

**12.** D; $d = rt = 55(2.5) = 137.5$

The correct answer is D.

**13.** Use the formula $P = 2\ell + 2w$, 2 times the length equals $P - 2w$.

So, $\ell = \frac{P - 2w}{2}$.

$\ell = \frac{(P - 2w)}{2} = \frac{P}{2} - w$

### *Problem Solving*

**14.** $\frac{127}{22} \approx 5.77$; So you need 6 storage racks to hold all of the DVDs.

$6(21) = 126$

It would cost \$126.

**15.** Area of the print: $A = s^2 = 8^2 = 64$ in.$^2$

Area of frame and print: $A = s^2 = \left(8 + 2 \cdot 1\frac{1}{4}\right)^2$

$= 10.5^2 = 110.25$ in$^2$

The area of frame and print minus the area of the print gives you the area of the frame.

$110.25 - 64 = 46.25$ in.$^2$

The area of the frame is 46.25 square inches.

**16.** Let $w$ = number of weeks.

$\$250 - \$70 = \$180$

You still need to save \$180.

$10w = 180$

$w = 18$

It will take 18 weeks to save for the mountain board.

**17.** $15 - 13\frac{3}{8} = 1\frac{5}{8}$

You can still carry $1\frac{5}{8}$ pounds.

$1\frac{5}{8} \div \frac{3}{4} = \frac{13}{8} \cdot \frac{4}{3} = \frac{52}{24} = 2\frac{1}{6}$

You can carry 2 extra water bottles.

**18.** Area of large pan $= \ell w = 16(14) = 224$ in.$^2$

Area of small pan $= \ell w = 15.5(10) = 155$ in.$^2$

$0.15(224) = 33.6$ oz

$0.15(155) = 23.25$ oz

$33.6 - 23.25 = 10.35$ oz

You need 10.35 ounces more dough to make a thick crust pizza in the large pan.

**19. a.** $d = rt = 4800(0.2) = 960$

The wave traveled 960 feet.

**b.** $\frac{960}{2} = 480$

The diving partner was 480 feet away.

**20. a.** $A = \frac{1}{2}bh = \frac{1}{2}(150)(200) = 15{,}000$ ft$^2$

$\frac{15{,}000}{3750} = 4$; 4 bags are needed.

$4(\$27.50) = 110$

The total cost is \$110.

**b.** $P = 150 + 200 + 250 = 600$ ft

$\frac{600}{50} = 12$

12 rolls of fencing are needed.

$12(23.19) = 278.28$

It costs \$278.28 to buy fencing to enclose the area.

**c.** The length of the perimeter is 600 feet.

$\frac{600}{5} = 120$

120 posts are needed.

$120(3.19) = 382.80$

It will cost \$382.80 to put fence posts every 5 feet around the perimeter.

**21. a.**

| Side length (ft) | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Remaining area ($ft^2$) | 431 | 428 | 423 | 416 | 407 | 396 |

**b.** Area of the room $= \ell w = 24(18) = 432$

$432 - s^2 \geq 400$

The greatest possible side length of the closet floor is 5 feet.

**22.** $A = \ell w$

$80 = 16w$

$w = 5$

$P = 2\ell + 2w = 2(16) + 2(5) = 32 + 10 = 42$

Because $42 > 40$, 40 feet of fencing will not be enough to fence in the pen.

**23. a.** $d_1 + d_2 = d_{\text{Total}}$

$4t + 11t = 12$

$t = 0.8$ h $= 48$ min

You will meet in 48 minutes.

$4(0.8) = 3.2$; $11(0.8) = 8.8$

You will be 3.2 miles from home and your friend will be 8.8 miles from home.

**b.** $4t + 12t = 12$; $t = 0.75$ h $= 45$ min

$48 - 45 = 3$

$4(0.75) = 3$; $12(0.75) = 9$

You will meet 3 minutes sooner. You will be 3 miles from home and your friend will be 9 miles from home.

### *Quiz for the lessons "Write Equations and Inequalities" and "Use a Problem Solving Plan"*

**1.** $2n + 4 = 25$

**2.** $\frac{x}{2} \leq 9$

**3.** $13 - 2x = 5$

$13 - 2(4) \stackrel{?}{=} 5$

$13 - 8 \stackrel{?}{=} 5$

$5 = 5$

4 is a solution.

**4.** $5d - 4 \geq 16$

$5(4) - 4 \stackrel{?}{\geq} 16$

$20 - 4 \stackrel{?}{\geq} 16$

$16 \geq 16$

4 is a solution.

**5.** $4y + 3 \geq 15$

$4(3) + 3 \stackrel{?}{\geq} 15$

$12 + 3 \stackrel{?}{\geq} 15$

$15 \geq 15$

3 is a solution.

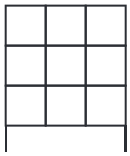
**6.** $\frac{978 \text{ mi}}{28.5 \text{ mi/gal}} \approx 34.32$ gal

$2(34.32) = 68.64$

The gas for the trip will cost about \$68.64.

### *Problem Solving Workshop for the lesson "Use a Problem Solving Plan"*

**1.** Area of a possible largest square with the pan $= 9^2 = 81$ in.$^2$



Area of a piece of cake $= 3^2 = 9$ in.$^2$

$81 \div 9 = 9$ pieces

You can cut 9 square pieces.

A diagram is useful so you can actually see how the square pieces fit into the large rectangle.

**2.** Diagram:


Equation:

$x =$ distance between floats

$3x + 6 = 12$

$3(2) + 6 = 12$

$x = 2$

The floats are 2 feet apart.

**3.** Though there are 4 floats, there are only 3 spaces between floats, so the equation should be $3x + 6 = 12$.

$3(2) + 6 = 12$

$x = 2$

**4.** **Method 1:** $P = 2\ell + 2w$

$72 = 2(2w) + 2w$

$72 = 4w + 2w$

$12 = w$

$\ell = 2w = 2(12) = 24$; The length is 24 inches.

**Method 2:**


Adding the lengths of all sides equals 72 inches.

$6w = 72$

## Lesson 1.6 Precision and Significant Digits

### *Guided Practice for the lesson "Precision and Significant Digits"*

**1.** 21.13 oz; the units are the same. Because hundredths are smaller than tenths, 21.13 ounces is more precise than 21.4 ounces.

**2.** $2\frac{5}{8}$ in.; the units are the same. Because eighths are smaller than halves, $2\frac{5}{8}$ inches is more precise than $14\frac{1}{2}$ inches.

**3.** 14 mm; the units are different. Because a millimeter is a smaller unit of measure than a centimeter, 14 millimeters is a more precise measurement.

**4.** 90 min; the units are different. Because a minute is a smaller unit of measure than an hour, 90 minutes is a more precise measurement.

**5.** The digits 8 and 2 are nonzero digits, so they are significant digits. The two zeros between the nonzero digits are significant digits. The zero to the right of the last nonzero digit is also to the right of the decimal point, so it is a significant digit. There are 5 significant digits: **800.20.**

6. The digit 5 is a nonzero digit, so it is a significant digit. The zeros are not between two significant digits nor are they to the right of the last nonzero digit and the decimal point, so they are not significant. There is 1 significant digit: 0.00**5**.

7. The digits 3, 6, and 9 are nonzero digits, so they are significant digits. The zeros at the end of a whole number are not significant. There are 3 significant digits: **36,9**00.

8. 27.23 m − 12.7 m = 14.53 m
The least precise measurement is 12.7 meters. Its last significant digit is in the tenths place. Round the difference to the nearest tenth. The correct answer is 14.5 meters.

9. 45.16 $yd^2$ ÷ 4.25 yd ≈ 10.626 yd
The least precise measurement is 4.25 yards. It has 3 significant digits. Round the quotient to 3 significant digits. The correct answer is 10.6 yards.

### *Exercises for the lesson "Precision and Significant Digits"*

#### *Skill Practice*

1. The level of detail that an instrument can measure is known as its *precision*.

2. 0.023; the number 0.023 has two significant digits, while the number 301 has three significant digits.

3. 14.2 gal; the units are the same. Because tenths are smaller units than ones, 14.2 gallons is more precise than 7 gallons.

4. 0.02 mm; the units are the same. Because hundredths are smaller units than tenths, 0.02 millimeter is more precise than 0.1 millimeter.

5. 71 in.; the units are different. Because inches are a smaller unit of measure than feet, 71 inches is a more precise measurement.

6. 57.65 lb; the units are the same. Because hundredths are smaller units than tenths, 57.65 pounds is more precise than 34.9 pounds.

7. 29.3 cm; the units are different. Because a centimeter is a smaller unit of measure than a meter, 29.3 centimeters is a more precise measurement.

8. 17.2 yd; the units are the same. Because tenths are smaller than ones, 17.2 yards is more precise than 36 yards.

9. Minutes are a smaller unit of measure than hours, therefore 85 minutes is more precise than 1.5 hours.

10. Inches are a smaller unit of measure than feet, therefore 47 inches is more precise than 4 feet.

11. The digits 3, 1, 2, and 5 are nonzero digits, so they are significant digits. There are 4 significant digits.

12. The digit 1 is a nonzero digit, so it is significant. The zeros at the end of a whole number are not significant. There is 1 significant digit.

13. The digit 3 is a nonzero digit, so it is significant. The two zeros to the left of 3 are not between two significant digits nor are they to the right of the decimal place and the last nonzero digit, so they are not significant. The zero to the right of 3 is to the right of the decimal place and to the right of the last nonzero digit, so it is significant. There are 2 significant digits.

14. The digits 1, 6, and 7 are nonzero digits, so they are significant digits. The two zeros are between significant digits, so they are significant digits. There are 5 significant digits.

15. The digits 1 and 2 are nonzero digits, so they are significant digits. The first zero is between two significant digits, so it is a significant digit. The second zero is at the end of a whole number, so it is not significant. There are 3 significant digits.

16. The digits 2 and 5 are nonzero digits, so they are significant digits. The zeros are not between two significant digits nor are they to the right of the decimal place and to the right of the last nonzero digit, so they are not significant. There are 2 significant digits.

17. The 3 and 8 are nonzero digits, so they are significant digits. The zero is to the right of the decimal place and to the right of the last nonzero digit, so it is a significant digit. There are 3 significant digits.

18. The digits 8, 3, 7, and 5 are nonzero digits, so they are significant digits. There are 4 significant digits.

19. The digits 2, 5, 7, 1, and 4 are nonzero digits, so they are significant digits. The first zero is between significant digits, so it is a significant digit. The second zero is to the right of the decimal place and to the right of the last nonzero digit, so it is a significant digit. There are 7 significant digits.

20. The digit 7 is a nonzero digit, so it is a significant digit. The zeros are not between two significant digits nor are they to the right of the last nonzero digit and to the right of the decimal point, so they are not significant. There is 1 significant digit. The answer is A.

21. 97.2 m − 16.04 m = 81.16 m
The least precise measurement is 97.2 meters. Its last significant digit is in the tenths place. Round the difference to the nearest tenth. The correct answer is 81.2 meters.

22. 8 ft × 11.2 ft = 89.6 $ft^2$
The least precise measurement is 8 feet. It has 1 significant digit. Round the product to 1 significant digit. The correct answer is 90 $ft^2$.

23. 257.64 oz ÷ 2.4 oz = 107.35
The least precise measurement is 2.4 ounces. It has 2 significant digits. Round the quotient to 2 significant digits. The correct answer is 110.

24. 0.043 yd + 0.22 yd = 0.263 yd
The least precise measurement is 0.22 yard. Its last significant digit is in the hundredths place. Round the sum to the nearest hundredth. The correct answer is 0.26 yard.

25. 6.42 mm × 7.51 mm = 48.2142 $mm^2$
Each measurement has 3 significant digits. Round the product to 3 significant digits. The correct answer is 48.2 square millimeters.

**26.** 2.8 mi + 3.56 mi = 6.36 mi
The least precise measurement is 2.8 miles. Its last significant digit is in the tenths place. Round the sum to the nearest tenth. The correct answer is 6.4 miles.

**27.** 245 kg – 18.32 kg = 226.68 kg
The least precise measurement is 245 kilograms. Its last significant digit is in the ones place. Round the difference to the nearest whole number. The correct answer is 227 kilograms.

**28.** 9.05 $cm^2$ ÷ 18 cm ≈ 0.5028 cm
The least precise measurement is 18 centimeters. It has 2 significant digits. Round the quotient to 2 significant digits. The correct answer is 0.50 centimeter.

**29.** The area must have the same number of significant digits as the least precise measurement. The value 20 is less precise than 8.2, having one significant digit. Therefore the area of the rectangle should be given with just one significant digit.

**30.** The least precise measurement is 5.5 hours. It has 2 significant digits. Round the quotient to 2 significant digits. The answer is C.

**31.** 0.40 ft × 2.25 ft = 0.9 $ft^2$
The least precise measurement is 0.40 feet. It has 2 significant digits. The product must be written using 2 significant digits. The correct answer is 0.90 square foot.

**32.** 23.175 $km^2$ ÷ 10.30 km = 2.25 km
The least precise measurement is 10.30 kilometers. It has 4 significant digits. The quotient must be written using 4 significant digits. The correct answer is 2.250 kilometers.

### *Problem Solving*

**33.** Because hundredths are smaller than tenths, 8.05 grams is more precise than 8.2 grams. So, Justine's measurement is more precise.

**34.** A millimeter is a smaller unit of measure than a centimeter, so 154 millimeters is a more precise measurement than either 15.35 centimeters or 14.9 centimeters. Luis made the most precise measurement.

**35.** A centimeter is a larger unit of measure and thus less precise than a millimeter. Because tenths are larger than hundredths, 14.9 centimeters is less precise than 15.35 centimeters. Chandra made the least precise measurement.

**36.** Alex's measurement is 0.15 centimeter greater than the actual length, while Chandra's measurement is 0.3 centimeter smaller and Luis's measurement is 0.2 centimeter greater than the actual length. So Alex's answer is closest.

**37.** No. *Sample answer*: Both 426 miles and 19.3 gallons are measurements with 3 significant digits, so Brian's answer should have 3 significant digits. He should say that his car gets 22.1 miles per gallon.

**38. a.** Both the length and width of the pool are given to the nearest foot, so the perimeter should be given to the nearest foot also: 2029 + 2029 + 167 + 167 = 4392 feet.

**b.** Because 167 has 3 significant digits, the area should be given to 3 significant digits also: 2029 × 167 = 338,843 $ft^2$, so the area is 339,000 square feet.

**39.** 118.5 lb; because tenths are smaller units than ones, 118.5 pounds is more precise than 119 pounds.

**40.** Perimeter: 6.4 + 6.4 + 2 + 2 = 16.8 m; because 2 is the least precise measurement, the sum should be rounded to the nearest whole number: 17 meters;
Area: 6.4 × 2 = 12.8 $m^2$; because 2 is the least precise measurement, the product should be rounded to 1 significant digit: 10 square meters.

**41.** 7.2 + 6.03 = 13.23 mi; because 7.2 is the least precise measurement, the sum should be rounded to the nearest tenth and they should report their cumulative miles to their sponsors as 13.2 miles.

**42–46.** Sample answers are given.

**42.** 36,500 mi

**43.** 22,000 cm

**44.** 0.1472 mm

**45.** 4020 $m^2$

**46.** 7.4032 lb

**47.** 852 $in.^2$ ÷ 36 in. ≈ 23.7 in.; because 36 is the least precise measurement, the quotient should be rounded to 2 significant digits: 24 inches.

**48.** Edmond; because milliliters are smaller units of measure than liters, his is the more precise measurement.

**49.** 52.5 ft × 35 ft = 1837.5 $ft^2$; because 35 is the least precise measurement, the product should be rounded to 2 significant digits and she should report the area of the house as 1800 square feet.

**50.** $(3.5 \text{ cm})^3$ = 42.875 $cm^3$; because 3.5 has 2 significant digits, the product should be rounded to 2 significant digits and the student should report the volume of the cube as 43 cubic centimeters.

**51.** 24(13.6 g + 453.59 g) = 11,212.56 g; because 24 is the least precise measurement, the result should be rounded to 2 significant digits: 11,000 grams.

## Lesson 1.7 Represent Functions as Rules and Tables

### *Guided Practice for the lesson "Represent Functions as Rules and Tables"*

**1.** The domain is the set of inputs: 0, 1, 2, and 4.

The range is the set of outputs: 5, 2, and 1.

**2.** The pairing is a function because each input is paired with exactly one output.

**3.** The pairing is not a function because the input 2 is paired with both 0 and 1.

**4.**

| x | 10 | 12 | 15 |
|---|---|---|---|
| y 5 x 2 **5** | 10 − 5 = 5 | 12 − 5 = 7 | 15 − 5 = 10 |

| x | 18 | 29 |
|---|---|---|
| y 5 x 2 **5** | 18 − 5 = 13 | 29 − 5 = 24 |

The range of the function is 5, 7, 10, 13, and 24.

**5.** Let $x$ be the input, or independent variable, and let $y$ be the output, or dependent variable. Notice that each output is 8 times the input. So, a rule for the function is $y = 8x$.

The domain of the function is 1, 2, 3, and 4. The range of the function is 8, 16, 24, and 32.

### *Exercises for the lesson "Represent Functions as Rules and Tables"*

### *Skill Practice*

**1.** An *input* is a number in the domain of a function.

An *output* is a number in the range of a function.

**2.** The independent variable is $a$ and the dependent variable is $b$, because the value of $b$ depends on the value of $a$.

**3.** domain: 0, 1, 2, 3
range: 5, 7, 15, 44

**4.** domain: 3, 5, 7, 8
range: 7, 5, 3, 2

**5.** domain: 6, 12, 21, 42
range: 5, 7, 10, 17

**6.** The pairing is a function because each input is paired with exactly one output.

**7.** The pairing is not a function because the input $\frac{3}{4}$ is paired with both 3 and 5.

**8.** The pairing is a function because each input is paired with only one output.

**9.** The pairing is a function because each input is paired with exactly one output. A pairing can be a function if one output is paired with two inputs.

**10.** The pairing is a function, but the domain, not the range, is 1, 2, 3, 4, and 5.

**11.** Answers will vary.

**12.** B; $y = 5(1) - 1$; $y = 4$
$y = 5(3) - 1$; $y = 14$
$y = 5(4) - 1$; $y = 19$
$y = 5(5) - 1$; $y = 24$
$y = 5(6) - 1$; $y = 29$
The correct answer is B.

**13.** A

**14.**

| x | 12 | 15 |
|---|---|---|
| y 5 x 2 **3** | 12 − 3 = 9 | 15 − 3 = 12 |

| x | 22 | 30 |
|---|---|---|
| y 5 x 2 **3** | 22 − 3 = 19 | 30 − 3 = 27 |

range: 9, 12, 19, 27

**15.**

| x | 4 | 5 |
|---|---|---|
| y 5 x 1 **3.5** | 4 + 3.5 = 7.5 | 5 + 3.5 = 8.5 |

| x | 7 | 8 |
|---|---|---|
| y 5 x 1 **3.5** | 7 + 3.5 = 10.5 | 8 + 3.5 = 11.5 |

| x | 12 |
|---|---|
| y 5 x 1 **3.5** | 12 + 3.5 = 15.5 |

range: 7.5, 8.5, 10.5, 11.5, 15.5

**16.**

| x | 0 | 5 |
|---|---|---|
| y 5 **3**x 1 **4** | 3(0) + 4 = 4 | 3(5) + 4 = 19 |

| x | 7 | 10 |
|---|---|---|
| y 5 **3**x 1 **4** | 3(7) + 4 = 25 | 3(10) + 4 = 34 |

range: 4, 19, 25, 34

**17.**

| x | 4 | 6 |
|---|---|---|
| y 5 $\frac{\mathbf{1}}{\mathbf{2}}$x 1 **3** | $\frac{1}{2}(4) + 3 = 5$ | $\frac{1}{2}(6) + 3 = 6$ |

| x | 9 | 11 |
|---|---|---|
| y 5 $\frac{\mathbf{1}}{\mathbf{2}}$x 1 **3** | $\frac{1}{2}(9) + 3 = 7.5$ | $\frac{1}{2}(11) + 3 = 8.5$ |

range: 5, 6, 7.5, 8.5

**18.**

| x | 4 | 6 |
|---|---|---|
| y 5 $\frac{\mathbf{2}}{\mathbf{3}}$x 1 $\frac{\mathbf{1}}{\mathbf{3}}$ | $\frac{2}{3}(4) + \frac{1}{3} = 3$ | $\frac{2}{3}(6) + \frac{1}{3} = 4\frac{1}{3}$ |

| x | 8 | 12 |
|---|---|---|
| y 5 $\frac{\mathbf{2}}{\mathbf{3}}$x 1 $\frac{\mathbf{1}}{\mathbf{3}}$ | $\frac{2}{3}(8) + \frac{1}{3} = 5\frac{2}{3}$ | $\frac{2}{3}(12) + \frac{1}{3} = 8\frac{1}{3}$ |

range: $3, 4\frac{1}{3}, 5\frac{2}{3}, 8\frac{1}{3}$

**19.**

| x | 0 | 2 |
|---|---|---|
| y 5 $\frac{\mathbf{0.5}\mathbf{x}\ \mathbf{1}\ \mathbf{1}}{\mathbf{2}}$ | $\frac{0.5(0) + 1}{2} = \frac{1}{2}$ | $\frac{0.5(2) + 1}{2} = 1$ |

| x | 4 | 6 |
|---|---|---|
| y 5 $\frac{\mathbf{0.5}\mathbf{x}\ \mathbf{1}\ \mathbf{1}}{\mathbf{2}}$ | $\frac{0.5(4) + 1}{2} = \frac{3}{2}$ | $\frac{0.5(6) + 1}{2} = 2$ |

range: $\frac{1}{2}, 1, \frac{3}{2}, 2$

**20.** Notice that each output is 2.2 more than the corresponding input. So, a rule for the function is $y = x + 2.2$.

**21.** Notice that each output is 8 less than the corresponding input. So, a rule for the function is $y = x - 8$.

**22.** *Sample anwer:*

| t | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| v | 4 | 2 | 1 | 4 |

**23. a.** Each time you put 1 quarter in the meter, you have 1 less quarter, so *number of quarters you have left* is a function of *number of quarters you put in the meter*.

**b.** $y = 10 - x$; domain: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

**c.**

| x | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| y 5 **10** 2 x | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

range: 10, 9, 8, 7, 6, 5, 4, 3, 2, 1, 0

**24. a.** For each book you buy, you spend \$.75, so money spent is a function of number of books purchased.

**b.** $y = 0.75$; 0, 1, 2, 3, 4, 5

**c.**

| x | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| y 5 **0.75**x | 0 | 0.75 | 1.5 | 2.25 | 3 | 3.75 |

range: 0, 0.75, 1.5, 2.25, 3, 3.75

**25.** $y = 20x + 100$

$x$ is the independent variable.

$y$ is the dependent variable.

domain: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, …

range: 100, 120, 140, 160, 180, 200, 220, 240, 260, 280, 300, 320, 340, …

$y = 20(12) + 100 = 340$

You will have saved \$340 in 12 months.

**26.** Answers will vary.

**27. a.**

| 2 | 2 | 2 | 3 | 3 | 3 | 4 | 4 | 4 | 5 | 5 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| a | b | c | d | e | f | g | h | i | j | k | l | m |

| 6 | 6 | 7 | 7 | 7 | 7 | 8 | 8 | 8 | 9 | 9 | 9 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| n | o | p | q | r | s | t | u | v | w | x | y | z |

The pairing is not a function because several inputs are paired with more than one output.

**b.**

| a | b | c | d | e | f | g | h | i | j | k | l | m |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 2 | 2 | 3 | 3 | 3 | 4 | 4 | 4 | 5 | 5 | 5 | 6 |

| n | o | p | q | r | s | t | u | v | w | x | y | z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 6 | 7 | 7 | 7 | 7 | 8 | 8 | 8 | 9 | 9 | 9 | 9 |

The pairing is a function because each input is paired with exactly one output.

**28. a.** Notice that each output is 8 more than the input. So, a rule for the function is $h = c + 8$.

**b.** $h = c + 8 = 30 + 8 = 38$

A compact car with a city fuel efficiency of 30 miles per gallon will have a highway fuel efficiency of 38 miles per gallon.

**c.** $\frac{11{,}550}{c} + \frac{9450}{h} = \frac{11{,}550}{30} + \frac{9450}{38} \approx 385 + 248.68$
$\approx \$633.68$

The car's annual fuel cost is about \$633.68.

**29. a.** Let $t$ = time spent swimming in hours.

$y = 300t + 440(5 - t)$

**b.** $300(2.5) + 440(5 - 2.5) = 750 + 1100 = 1850$

You burn 1850 calories.

### *Graphing Calculator Activity for the lesson "Represent Functions as Rules and Tables"*

**1.** 50°F; Enter the function $y = \frac{5}{9}(x - 32)$ into a graphing caculator. Go to the TABLE SETUP screen. Use a starting value of 32 and an increment of 1. Display the table. Scroll down to see pairs of inputs and outputs. Stop when you see 10 as an output. You will see that the input paired with the output of 10 is 50.

**2.** 212°F

**3.**

| X | Y1 |
|---|---|
| 0 | 5 |
| 1 | 5.75 |
| 2 | 6.5 |
| 3 | 7.25 |
| 4 | 8 |
| 5 | 8.75 |

X=0

**4.**

| X | Y1 |
|---|---|
| 0 | 2 |
| .5 | 4 |
| 1 | 6 |
| 1.5 | 8 |
| 2 | 10 |
| 2.5 | 12 |

X=0

**5.**

| X | Y1 |
|---|---|
| 1 | 7 |
| 2 | 14.5 |
| 3 | 22 |
| 4 | 29.5 |
| 5 | 37 |
| 6 | 44.5 |

X=1

**6.**

| X | Y1 |
|---|---|
| 3 | 7.5 |
| 6 | 9 |
| 9 | 10.5 |
| 12 | 12 |
| 15 | 13.5 |
| 18 | 15 |

X=3

## Lesson 1.8 Represent Functions as Graphs

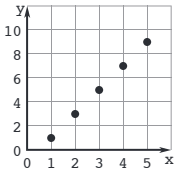
### *Investigating Algebra Activity for the lesson "Represent Functions as Graphs"*

**1–3.** Answers will vary.

### *Guided Practice for the lesson "Represent Functions as Graphs"*

**1.** $y = 2x - 1$

| x | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| y | 1 | 3 | 5 | 7 | 9 |




**2.** The graph would be very tall. The data points would only lie in the upper 20 increments of the coordinate plane. The first 500 increments would not have any data points.

**3.** Make a table for the graph.

| x | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| y | 5 | 4 | 3 | 2 | 1 |

Find a relationship between the inputs and the outputs. Notice from the table that each output value is 5 more than −1 times the corresponding input.

Write a function rule that describes the relationship: $y = -x + 5$.

A rule for the function is $y = -x + 5$. The domain of the function is 0, 1, 2, 3, and 4. The range of the function is 5, 4, 3, 2, and 1.

**4.** Make a table for the graph.

| x | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| y | 10 | 15 | 20 | 25 |

Find a relationship between the inputs and the outputs. Notice from the table that each output value is 5 more than 5 times the corresponding input.

Write a function rule that describes the relationship: $y = 5x + 5$.

A rule for the function is $y = 5x + 5$. The domain of the function is 1, 2, 3, and 4. The range of the function is 10, 15, 20, and 25.

**5.** The graph shows that sales were increasing. A prediction of \$1.4 million in sales for 2006 is reasonable because \$1.4 million is more than the sales for 2005.

### *Exercises for the lesson "Represent Functions as Graphs"*

#### *Skill Practice*

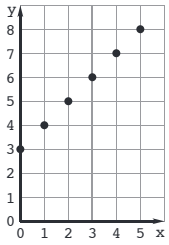
**1.** Each point on the graph of a function corresponds to an ordered pair $(x, y)$ where $x$ is in the *domain* of the function and $y$ is in the *range* of the function.

**2.** First, make a table for the graph. Then find a relationship between the inputs and outputs. Finally, write a function rule that describes the relationship.

**3.** Make an input-output table for the graph.

| x | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| y | 3 | 4 | 5 | 6 | 7 | 8 |

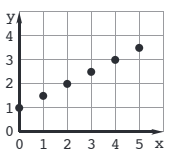
Plot a point for each ordered pair $(x, y)$.




**4.** Make an input-output table.

| x | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| y | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 |

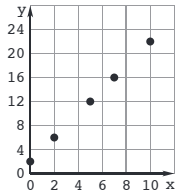
Plot a point for each ordered pair $(x, y)$.




**5.** Make an input-output table.

| x | 0 | 2 | 5 | 7 | 10 |
|---|---|---|---|---|---|
| y | 2 | 6 | 12 | 16 | 22 |

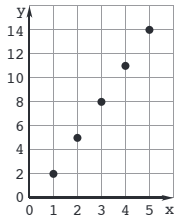
Plot a point for each ordered pair $(x, y)$.




**6.** Make an input-output table.

| x | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| y | 2 | 5 | 8 | 11 | 14 |

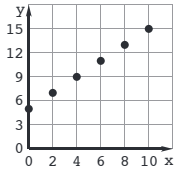
Plot a point for each ordered pair $(x, y)$.




**7.** Make an input-output table.

| x | 0 | 2 | 4 | 6 | 8 | 10 |
|---|---|---|---|---|---|---|
| y | 5 | 7 | 9 | 11 | 13 | 15 |

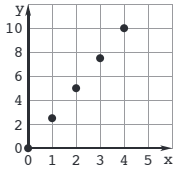
Plot a point for each ordered pair $(x, y)$.




**8.** Make an input-output table.

| x | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| y | 0 | 2.5 | 5 | 7.5 | 10 |

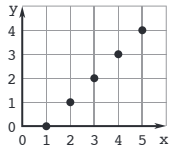
Plot a point for each ordered pair $(x, y)$.




**9.** The domain was plotted as the range. The input-output table for $y = x - 1$ is:

| x | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| y | 0 | 1 | 2 | 3 | 4 |

The correct graph is:




**10.** Make a table for the graph.

| x | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| y | 0 | 1 | 2 | 3 | 4 | 5 | 6 |

Find a relationship between the inputs and the outputs. Notice from the table that each output value is equal to the corresponding input value.

Write a function rule that describes the relationship: $y = x$.

A rule for the function is $y = x$. The domain of the function is 0, 1, 2, 3, 4, 5, and 6. The range is 0, 1, 2, 3, 4, 5, and 6.

**11.** Make a table for the graph.

| x | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| y | 0 | 2 | 4 | 6 |

Find a relationship between the inputs and the outputs. Notice from the table that each output value is 2 less than twice the corresponding input value.

Write a function rule that describes the relationship: $y = 2x - 2$.

A rule for the function is $y = 2x - 2$. The domain of the function is 1, 2, 3, and 4. The range is 0, 2, 4, and 6.

**12.** Make a table for the graph.

| x | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| y | 1 | 1.5 | 2 | 2.5 |

Find a relationship between the inputs and the outputs. Notice from the table that each output value is 1 more than half the corresponding input value.

Write a function rule that describes the relationship: $y = \frac{1}{2}x + 1$.

A rule for the function is $y = \frac{1}{2}x + 1$. The domain of the function is 0, 1, 2, and 3. The range is 1, 1.5, 2, and 2.5.

**13.** C; Make a table for the graph.

| x | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| y | 0.5 | 2 | 3.5 | 5 | 6.5 |

Find a relationship between the inputs and the outputs. Notice from the table that each output value is one half more than three halves times the corresponding input value.

Write a function rule that describes the relationship:

$y = \frac{3}{2}x + \frac{1}{2}$.

So, the correct answer is C.

**14. a.** Make a table for the graph.

| x | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| y | 0 | 0.5 | 2 | 4.5 |

Find a relationship between the inputs and the outputs. Notice from the table that each output value is one half times the correspoinding input value squared.

Write a function rule that describes the relationship:

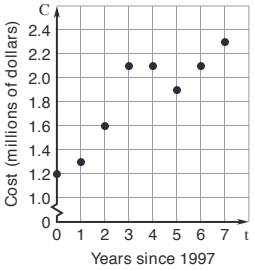
$y = \frac{1}{2}x^2$. A rule for the function is $y = \frac{1}{2}x^2$.

**b.** $y = \frac{1}{2}x^2 = \frac{1}{2}(1.5)^2 = 1.125$

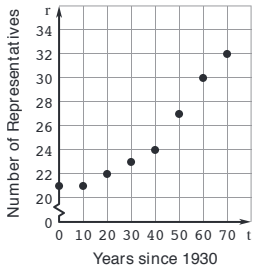
The ordered pair (1.5, 1.125) is on the graph of the function.

### *Problem Solving*

**15.**

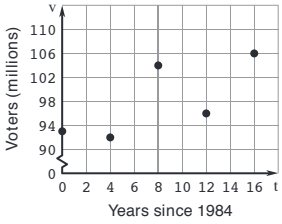



**16.**




**17.**

| Years since 1984 | Voters | Voters (millions) |
|---|---|---|
| 0 | 92,652,680 | 93 |
| 4 | 91,594,693 | 92 |
| 8 | 104,405,155 | 104 |
| 12 | 96,456,345 | 96 |
| 16 | 105,586,274 | 106 |




**18.** The independent variable is the month of the year. The dependent variable is the daylight hours. The number of daylight hours gradually increases from January through April. The most hours of daylight occur in May. Then the number of daylight hours gradually decreases from June to December.

**19. a.** As the lengths of the eggs increase, the masses of the eggs also increase.

**b.** Yes. An egg that is almost 38 mm long has a mass of just over 25 grams, so it is reasonable to say that an egg slightly longer than that would have a slightly greater mass of 27.5 grams.

20. **a.** Find the vertical distance between the blue point for men and the red point for women at any given year.

**b.** *Sample answer:* The men's times remain roughly the same since 1972. The women's times decreased greatly in the first 10 years since 1972 and then remained relatively steady.

### *Quiz for the lessons "Precision and Significant Digits", "Represent Functions as Rules and Tables" and "Represent Functions as Graphs"*

1. The units are different. Because an inch is a smaller unit than a foot, 18 in. is a more precise measurement even though 18 in. is equal to 1.5 ft.
2. The units are different. Because a millimeter is a smaller unit than a meter, 25 mm is a more precise measurement.
3. The units are the same. Because hundredths are smaller than tenths, 2.45 cm is a more precise measurement.
4. **a.** The digits 1, 6, and 2 are nonzero digits, so they are significant digits. The zeros are between significant digits, so they are also significant digits. There are 5 significant digits.

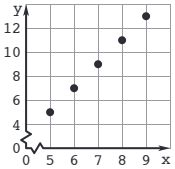
   **b.** The digits 1 and 5 are nonzero digits, so they are significant digits. The zeros are between significant digits, so they are also significant digits. There are 4 significant digits.
5.

| x | 0 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| y | 12 | 8 | 6 | 4 | 2 |

   Range: 12, 8, 6, 4, 2
6. The pairing is a function because each input is paired with exactly one output.
7. The pairing is a function because each input is paired with exactly one output.
8. Make an input-output table.

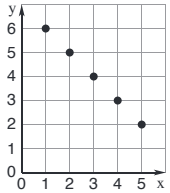
| x | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|
| y | 5 | 7 | 9 | 11 | 13 |

   Plot a point for each ordered pair $(x, y)$.




9. Make an input-output table.

| x | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| y | 6 | 5 | 4 | 3 | 2 |




### *Extension for the lesson "Represent Functions as Graphs"*

1. The relation is a function because every input is paired with exactly one output.
2. The input 4 has two different outputs, 8 and 9. So, the relation is not a function.
3. The input 7.5 has two different outputs, 8.7 and 9.7. So, the relation is not a function.
4. No vertical line can be drawn through more than one point. The graph represents a function.
5. No vertical line can be drawn through more than one point. The graph represents a function.
6. You can draw a vertical line through the points (2, 2) and (2, 4) and through the points (4, 1) and (4, 5). The graph does not represent a function.
7. This is not necessarily a function because two students could have the same number of letters in their first names and a different number of letters in their last names, which would pair an input with more than one output.
8. This is not necessarily a function because your height could stay the same while your weight changes, which would pair one input with more than one output.
9. This is a function because on each birthday, you have only one height which means that each input is paired with only one output.

### *Mixed Review of Problem Solving for the lessons "Use a Problem Solving Plan", "Represent Functions as Rules and Tables", and "Represent Functions as Graphs"*

Total Cost = Cost for each topping • Number of toppings + Cost for a large cheese pizza

1. **a.** $C = 0.95n + 7$

   **b.**

| n | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| C 5 **0.95**n 1 **7** | 7 | 7.95 | 8.90 | 9.85 | 10.80 | 11.75 |

| n | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|
| C 5 **0.95**n 1 **7** | 12.70 | 13.65 | 14.60 | 15.55 | 16.50 |

   The table represents a function because each number of toppings (input) is paired with only one price (output).

   domain: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

   range: 7, 7.95, 8.90, 9.85, 10.80, 11.75, 12.70, 13.65, 14.60, 15.55, 16.50

   **c.** You can afford a pizaa with 8 toppings.

**2. a.** profit = (number of cars) • (price per car) − cost of materials;

$P = I - E = 120(5) - 75 = 525$

Your profit is \$525.

**b.** Doubling the number of cars you wash does not double your profit because, no matter how many cars you wash, your expenses would still be the same.

**3. a.** Area of windows $= 2(3.5)(4) = 28 \text{ ft}^2$

Area of doors $= 2(3.5)(7) = 49 \text{ ft}^2$

$49 + 28 = 77$

The combined area of windows and doors is 77 square feet.

**b.** $A = 4(9)(25) = 900 \text{ ft}^2$; $900 - 77 = 823$

The combined area of all four walls, excluding the windows and doors, is 823 square feet.

**c.** $\frac{823}{400} \approx 2.06$; you will need 3 one-gallon cans of paint in order to give the room one coat of paint.

**d.** $24.95(3) = 74.85$

It will cost \$74.85 for one coat of paint.

**4.** $C = \frac{5}{9}(F - 32)$

$C = \frac{5}{9}(68 - 32)$

$C = 20°\text{C}$

You should raise the temperature 2°C.

**5.** Using the formulas $d = rt$, you find that: $250 = 55t$, so the trip takes about 4.55 hours. You will not reach Jacksonville by 5:00 p.m. because that would allow for only 4 hours of travel time.

**6.** $I = Prt = 1200(0.03)(2) = 72$

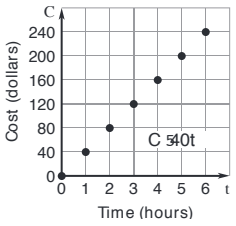
After 2 years, \$1272 will be in the account.

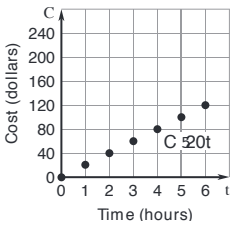
**7.** Answers will vary.

**8. a.** Cost of lessons: $\ell = 40t$

Cost of rentals: $r = 20t$

**b.**




**c.** $C = 40t + 20t = 60t$

The graph would go diagonally up and to the right, just like the other graphs in part (b), but this graph would have a steeper slope.

### *Chapter Review for the chapter "Expressions, Equations, and Functions"*

**1.** In the power $7^{12}$, 7 is the base and 12 is the exponent.

**2.** An *equation* is an open sentence that contains an equal sign.

**3.** An *algebraic expression* consists of numbers, variables, and operations.

**4.** The input variable is along the horizontal axis and the output variable is along the vertical axis.

**5.** When $x = 13$; $3 + x = 3 + 13 = 16$

**6.** When $y = 18$; $y - 2 = 18 - 2 = 16$

**7.** When $k = 2$; $\frac{20}{k} = \frac{20}{2} = 10$

**8.** When $w = 0.5$; $40w = 40(0.5) = 20$

**9.** When $z = 20$; $z^2 = 20^2 = 400$

**10.** When $w = 0.1$; $w^3 = 0.1^3 = 0.001$

**11.** $A = s^2 = 5^2 = 25$; The area is 25 square inches.

**12.** $V = s^3 = 3^3 = 27$; The volume is 27 cubic inches.

**13.** $12 - 6 \div 2 = 12 - 3 = 9$

**14.** $1 + 2 \cdot 9^2 = 1 + 2 \cdot 81 = 1 - 162 = 163$

**15.** $3 + 2^3 - 6 \div 2 = 3 + 8 - 6 \div 2 = 3 + 8 - 3 = 8$

**16.** $15 - (4 + 3^2) = 15 - (4 + 9) = 15 - 13 = 2$

**17.** $\frac{20 - 12}{5^2 - 1} = \frac{20 - 12}{25 - 1} = \frac{8}{24} = \frac{1}{3}$

**18.** $50 - [7 + (3^2 \div 2)] = 50 - [7 + (9 \div 2)]$
$= 50 - [7 + 4.5]$
$= 50 - 11.5$
$= 38.5$

**19.** When $x = 4$; $15x - 8 = 15(4) - 8 = 60 - 8 = 52$

**20.** When $x = 4$;
$3x^2 + 4 = 3(4^2) + 4 = 3(16) + 4 = 48 + 4 = 52$

**21.** When $x = 4$; $2(x - 1)^2 = 2(4 - 1)^2 = 2(3^2) = 2(9) = 18$

**22.** $k + 7$ **23.** $z - 5$ **24.** $\frac{k}{12}$ **25.** $3x^2$

**26.** $x$ = number of axles; $3x$

**27.** $n$ = number of notebooks purchased; $2.95n + 2.19$

**28.** $12z = 60$

**29.** $13 + t \geq 24$

**30.** $3x - 4 = 10$
$3(5) - 4 \stackrel{?}{=} 10$
$15 - 4 \stackrel{?}{=} 10$
$11 \neq 10$
5 is not a solution.

**31.** $4y - 2 \geq 2$
$4(3) - 2 \stackrel{?}{\geq} 2$
$12 - 2 \stackrel{?}{\geq} 2$
$10 \geq 2$
3 is a solution.

**32.** $2d + 4 < 9d - 7$
$2(3) + 4 \stackrel{?}{<} 9(3) - 7$
$6 + 4 \stackrel{?}{<} 27 - 7$
$10 < 20$
3 is a solution.

**33.** Area of original flag $= 30(42) = 1260 \text{ ft}^2$
Area of flag now $= 30(34) = 1020 \text{ ft}^2$
$1260 - 1020 = 240$; 240 square feet have been lost.

**34.** Let $x$ = number of cans on bottom of shelf.
$x + (x - 2) + (x - 4) = 30$
$3x - 6 = 30$
$x = 12$

There are 12 cans on the bottom row, 10 cans on the middle row, and 8 cans on the top row.

**35.** The digits 1, 5, and 2 are nonzero digits, so they are significant digits. The zero is between significant digits, so it is also a significant digit. There are 4 significant digits.

**36.** The digits 1, 3, and 2 are nonzero digits, so they are significant digits. The zeros are between significant digits, so they are also significant digits. There are 5 significant digits.

**37.** The digit 2 is a nonzero digit, so it is a significant. The zero to the right of the last nonzero digit is also to the right of the decimal point, so it is a significant digit. There are 2 significant digits.

**38.** Lorraine's measurement has a different unit than Arnie's measurement. Because a millimeter is a smaller unit than a centimeter, Lorraine's measurement is a more precise measurement.

**39.**

| x | 10 | 12 | 15 |
|---|---|---|---|
| y 5 x − **5** | 10 − 5 = 5 | 12 − 5 = 7 | 15 − 5 = 10 |

| x | 20 | 21 |
|---|---|---|
| y 5 x − **5** | 20 − 5 = 15 | 21 − 5 = 16 |

range: 5, 7, 10, 15, 16

**40.**

| x | 0 | 2 | 3 |
|---|---|---|---|
| y 5 **3**x 1 **1** | 3(0) + 1 = 1 | 3(2) + 1 = 7 | 3(3) + 1 = 10 |

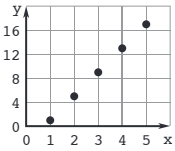
| x | 5 | 10 |
|---|---|---|
| y 5 **3**x 1 **1** | 3(5) + 1 = 16 | 3(10) + 1 = 31 |

range: 1, 7, 10, 16, 31

**41.** Notice that each output is 4 more than the corresponding input. So, a rule for the function is $y = x + 4$.

**42.** Notice that each output is 5 times the corresponding input. So, a rule for the function is $y = 5x$.

**43.**




**44.** Make a table for the graph.

| x | 1 | 3 | 5 | 7 |
|---|---|---|---|---|
| y | 1 | 2 | 3 | 4 |

Find a relationship between the inputs and the outputs. Notice from the table that each output value is one half more than one half times the corresponding input value. Write a function rule that describes the relationship:

$y = \frac{1}{2}x + \frac{1}{2}$.

A rule for the function is $y = \frac{1}{2}x + \frac{1}{2}$. The domain of the function is 1, 3, 5, and 7. The range is 1, 2, 3, and 4.

### *Chapter Test for the chapter "Expressions, Equations, and Functions"*

**1.** $7 + 3^2 \cdot 2 = 7 + 9 \cdot 2 = 7 + 18 = 25$

**2.** $(5^2 + 17) \div 7 = (25 + 17) \div 7 = 42 \div 7 = 6$

**3.** $(24-11) - (3 + 2) \div 4 = 13 - 5 \div 4$
$= 13 - 1.25 = 11.75$

**4.** When $x = 30$; $\frac{x}{5} = \frac{30}{5} = 6$

**5.** When $n = 20$; $n^3 = 20^3 = 8000$

**6.** When $t = 11$; $15 - t = 15 - 11 = 4$

**7.** When $x = 1\frac{1}{2}$; $12 + 4\left(1\frac{1}{2}\right) = 12 + 6 = 18$

**8.** When $z = 6$; $3z^2 - 7 = 3(6^2) - 7$
$= 3(36) - 7 = 108 - 7 = 101$

**9.** When $n = 2$; $2(4n + 5) = 2(4 \cdot 2 + 5)$
$= 2(8 + 5) = 2(13) = 26$

**10.** $19 + x^3$

**11.** $3y \leq 21$

**12.** $2(z - 12) = 10$

**13.** $2 + 3x = 10$
$2 + 3(2) \stackrel{?}{=} 10$
$2 + 6 \stackrel{?}{=} 10$
$8 \neq 10$
2 is not a solution.

**14.** $8 + 3b > 15$
$8 + 3(2) \stackrel{?}{>} 15$
$8 + 6 \stackrel{?}{>} 15$
$14 \not> 15$
2 is not a solution.

**15.** $11y - 5 \leq 30$
$11(3) - 5 \stackrel{?}{\leq} 30$
$33 - 5 \stackrel{?}{\leq} 30$
$28 \leq 30$
3 is a solution.

**16.**
$$\begin{array}{r} 15.2 \\ \times\ 2.4 \\ \hline 36.48 \end{array}$$
Because 2.4 has only 2 significant digits, the product must also have 2 significant digits. So, 15.2 feet × 2.4 feet is 36 $ft^2$.

**17.** **a.** The graph is a function because no vertical line can be drawn through more than one point.

**b.** domain: 1, 2, 3, 4, 5, 6

range: 3, 4, 5, 6, 7, 8

**c.** Notice that each output value is 2 more than the corresponding input value. So, a rule for the function is $y = x + 2$.

**18.** Let $t$ = pounds of tomatoes and let $p$ = pounds of peppers.

$1.29t + 3.99p$

$1.29(5) + 3.99(2) = 14.43$

The total cost is $14.43.

**19.** First trip:

$d = rt = 50(6.5)$

$= 325$ mi

Cost of first trip:

$325(0.3) = 97.5$

Second trip:

$d = rt = 55(6)$

$= 330$ mi

Cost of second trip:

$330(0.3) = 99$

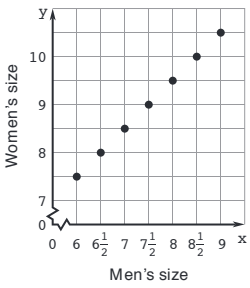
The second trip cost \$1.50 more.

**20. a.** Notice that each output value is $1\frac{1}{2}$ more than the corresponding input value. So, a rule for the function is $y = x + 1\frac{1}{2}$.

domain: $6, 6\frac{1}{2}, 7, 7\frac{1}{2}, 8, 8\frac{1}{2}, 9$

range: $7\frac{1}{2}, 8, 8\frac{1}{2}, 9, 9\frac{1}{2}, 10, 10\frac{1}{2}$

**b.**




### Standardized Test Preparation for the chapter "Expressions, Equations, and Functions"

**1.** Partial credit; the calculation $4000 \div 200$ is the correct one to use, but the solution does not explain why the calculation $4000 \div 200$ produces the correct answer.

**2.** No credit; the answer is incorrect and the student's reasoning is incorrect. The equation $d = 1000t$ is a valid equation but it cannot be used to answer the question.

**3.** Full credit solution. the function rules are correct. The variables are defined. The table and explanation show how the problem was correctly solved.

### Standardized Test Practice for the chapter "Expressions, Equations, and Functions"

**1.** You would expect there to be between 120 and 140 calories in one cup of punch.

$\frac{2}{5}(140 \text{ cal}) + \frac{3}{5}(120 \text{ cal}) = 56 + 72 = 128$ cal

There are exactly 128 calories in one cup of the punch. If the punch takes 2 parts pineapple juice and 3 parts apple juice, that makes 5 parts total. Multiplying the amount of calories in pineapple juice by $\frac{2}{5}$ gives you the amount of calories from pineapple juice in the punch: $\frac{2}{5}(140) = 56$. Multiplying the calories in apple juice by $\frac{3}{5}$ gives you the amount of calories from apple juice in the punch: $\frac{3}{5}(120) = 72$. Adding these 2 results together gives the total calories in the punch: $56 + 72 = 128$.

**2.** If Ming wants to purchase 100 songs at \$.99 per song, the total cost for songs is: $100(0.99) = \$99$. If Ming has \$340 to spend, the amount left after purchasing songs is: $340 - 99 = \$241$. So she should consider Model A or B because she has enough money for either of those players and 100 songs.

**3. a.** Let $x =$ the selling price of each calendar. The income is the number of calendars sold times the selling price. The expenses are the product of the number of calendars sold and the \$3 it costs to make each calendar.

Using the formula $P = I - E$, you find that: $P = 200x - 200(3)$.

The shelter wants to make \$1800 profit.

$1800 = 200x - 200(3)$

$1800 = 200x - 600$

$2400 = 200x$

$12 = x$

They should sell each calendar for \$12.

**b.** You can use the same method as in part (a), but substituting \$2000 for $P$ instead of \$1800.

$2000 = 200x - 600$

$2600 = 200x$

$13 = x$

They should sell each calendar for \$13.

**4.** He would earn the most money if 2 of his 5 working days were Saturday and Sunday. So 3 days he'll make \$8.50 per hour and 2 days he'll make $1.5(8.5) = \$12.75$ per hour. Because there are 8 hours in a shift, Mark will work 24 hours during the week and 16 hours on the weekend.

Earnings $= 24(8.50) + 16(12.75) = 408$

The most Mark could make in one week is \$408.

**5.** If the current allownace is greater than \$6 per week, Option 1 is preferable because half of \$6 is \$3, and half of anything greater than \$6 would give more than an additional \$3 per week.

For example, $\$6.50 + \frac{1}{2}(\$6.50) = \$9.75$ per week, but $\$6.50 + \$3 = \$9.50$.

If the current allowance is less than \$6 per week, Option 2 is preferable because adding half of the current allowance would be less than adding \$3 per week.

For example, $\$5 + \$3 = \$8$, but $\$5 + \frac{1}{2}(\$5) = \$7.50$.

**6. a.**

| number of pizzas | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| cost | \$11 | \$22 | \$33 | \$33 |

**b.** The cost of the pizzas is a function of the number of pizzas purchased because each number of pizzas is paired with exactly one output.

**c.** The number of pizzas purchased is not a function of the cost because the cost of \$33 is paired with both 3 and 4.

**7.** 5 feet = 60 inches

Perimeter of placemat = 60 inches − 6 inches

= 54 in.

$P = 2\ell + 2w$

$54 = 2(16) + 2x$

$54 = 32 + 2x$

$x = 11$

The width of the placemat is 11 inches.

**8.** To find time, use the formula $d = rt$. The time it takes on the express bus is found by $10 = 40t$, so $t = \frac{1}{4}$ h, or 15 minutes. The driving time on the local bus is found by $10 = 30t$, so $t = \frac{1}{3}$ h, or 20 min. The total time on the local bus is found by adding 20 minutes driving time to the 5 two-minute stops.

$20 + 5(2) = 30$ min

The amount of time saved by taking the express bus is $30 - 15 = 15$ min.

**9.** A; $y = x - 3$ **10.** D; $3c - 5$ **11.** B; 12

**12.** $202 - 2(2 + 3)^2 = 202 - 2(5^2)$

$= 202 - 2(25)$

$= 202 - 50$

$= 152$

**13.** When $x = 3$; $x^2 - 2x + 7 = 3^2 - 2(3) + 7$

$= 9 - 2(3) + 7$

$= 9 - 6 + 7$

$= 10$

**14.** $54 = 9x$

$6 = x$

**15.** $V = s^3 = 9^3 = 729$ in.$^3$

**16.** $d = rt = 12\left(\frac{7.5}{60}\right) = 12(0.125) = 1.5$ mi

The perimeter of the field is 1.5 miles.

$P = 2\ell + 2w$

$1.5 = 2(2w) + 2w$

$1.5 = 4w + 2w$

$1.5 = 6w$

$0.25 \text{ mi} = w$

$\ell = 2w = 0.25 \cdot 2 = 0.5$ mi

The length is 0.5 mi.

**17.** The rule is $y = x - 7$, so the missing value is 1.

**18. a.**

$I = Prt$

Mario's account: $I = 140(0.05)t$

Andy's account: $I = 150(0.03)t$

**b.** Mario's account

| t | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| I | 7 | 14 | 21 | 28 | 35 |

Andy's account

| t | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| I | 4.50 | 9 | 13.50 | 18 | 22.50 |

**c.** $140 + 140(.05)t = 150 + 150(.03)t$

$140 + 7t = 150 + 4.5t$

$2.5t = 10$

$t = 4$

They will have the same amount after 4 years, and \$168 will be in each account.

\$140 + \$28 = \$168 in Mario's account.

\$150 + \$18 = \$168 in Andy's account.

**19. a.** The area of the rectangle and the square must be the same.

Area of a square $= s^2$

Area of a rectangle $= \ell w$

So, $s^2 = \ell w$, and $w = s - 10$, $\ell = s + 15$

$\ell - w = (s + 15) - (s - 10) = s + 15 - s + 10 = 25$

The length of the rectangle is 25 feet greater than the width, because the width is 10 feet less than the side of the square and the length is 15 more than the side of a square.

**b.** $P = 2\ell + 2w$

$130 = 2(w + 25) + 2w$

$130 = 2w + 50 + 2w$

$80 = 4w$

$20 = w$

Using the rule $P = 2\ell + 2w$, you find that the width is 20 feet, so the length is 25 feet more than that, $20 + 25 = 45$ ft.

**c.** $A = \ell w = 45(20) = 900$ ft$^2$

Because each tile is 1 square foot, it will take $\frac{900}{1}$, or 900 tiles.

## Extra Practice for the chapter "Expressions, Equations, and Functions"

**1.** When $k = 7$:

$k + 9 = 7 + 9 = 16$

**2.** When $x = 3$:

$21 - x = 21 - 3 = 18$

**3.** When $t = 0.9$:

$3.5 + t = 3.5 + 0.9$

$= 4.4$

**4.** When $y = \frac{7}{12}$:

$y - \frac{3}{8} = \frac{7}{12} - \frac{3}{8} = \frac{14}{24} - \frac{9}{24} = \frac{5}{24}$

**5.** When $m = 9.6$:

$\frac{m}{4} = \frac{9.6}{4} = 2.4$

**6.** When $t = 2.3$

$1.5t = 1.5(2.3) = 3.45$

**7.** When $z = \frac{2}{3}$:

**8.** When $p = 0.2$:

$z^3 = \left(\frac{2}{3}\right)^3 = \frac{2^3}{3^3} = \frac{8}{27}$ $p^4 = (0.2)^4 = 0.0016$

**9.** $25 - 7 + 8 = 18 + 8 = 26$

**10.** $67 - 3 \cdot 4 = 67 - 12 = 55$

**11.** $8^2 \div 4 + 12 = 64 \div 4 + 12 = 16 + 12 = 28$

**12.** $9 + 6 \div 3 = 9 + 2 = 11$

**13.** $\frac{3^3 - 7}{2} = \frac{27 - 7}{2} = \frac{20}{2} = 10$

**14.** $\frac{1}{3}(7 - 5.5)^2 = \frac{1}{3}(1.5)^2 = \frac{1}{3}(2.25) = 0.75$

**15.** $3 + 4(3 + 24) = 3 + 4(27) = 3 + 108 = 111$

**16.** $\frac{3}{5}[27 - (2 + 5)]^2 = \frac{3}{5}(27 - 7)^2 = \frac{3}{5}(20)^2$

$= \frac{3}{5}(400) = 240$

**17.** $\frac{3}{4}m$ **18.** $\frac{x}{7}$ **19.** $y - 3$

**20.** $3n + 6$

**21.** The expression $45 - m$ represents the number of minutes left in the class.

**22.** There is 100 centimeters in one meter, so the number of meters in $c$ centimeters is $\frac{c}{100}$.

**23.** $12 \cdot (r - 4) = 72$ **24.** $10 < q - 18 < 15$

**25.** $d - 13 = 25$

What number minus 13 is 25? The solution is 38.

**26.** $12z = 96$

12 times what number equals 96? The solution is 8.

**27.** $23 - m = 7$

23 minus what number equals 7? The answer is 16.

**28.** $\frac{k}{6} = 12$

What number divided by 6 equals 12? The solution is 72.

**29.** You know the temperatures of Quito and Miami. You need to find out which temperature is higher.

**30.** You know the rate Katherine walked each day and the total time she walked each day. You need to know the total distance Kathrine walked.

**31.** The domain is 3, 4, 5, and 6. The range is 9, 11, 13, and 15.

**32.**

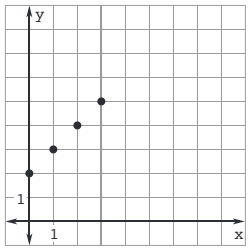
| x | 2 | 4 |
|---|---|---|
| y | 1.25(2) + 5 = 7.5 | 1.25(4) + 5 = 10 |

| x | 6 | 8 |
|---|---|---|
| y | 1.25(6) + 5 = 12.5 | 1.25(8) + 5 = 15 |

The range is 7.5, 10, 12.5, and 15.

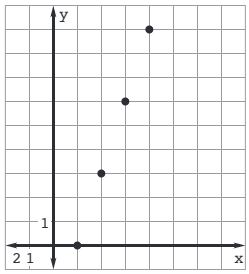
**33.** $y = x + 2$

| x | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| y | 2 | 3 | 4 | 5 |



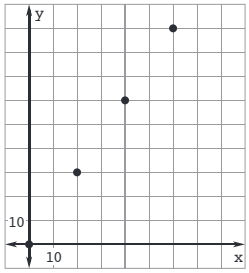

**34.** $y = 3x - 3$

| x | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| y | 0 | 3 | 6 | 9 |




**35.** $y = 1.5x$

| x | 0 | 20 | 40 | 60 |
|---|---|---|---|---|
| y | 0 | 30 | 60 | 90 |




**36.** $y = \frac{1}{4}x + 2$

| x | 0 | 4 | 8 | 12 |
|---|---|---|---|---|
| y | 2 | 3 | 4 | 5 |