

2-8 Solve Two-Step Equations

Name _____ Date _____

To solve a *two-step equation*, use two properties of equality to isolate the variable.

Solve: $2x + 17 = 29$

$$2x + 17 - 17 = 29 - 17 \leftarrow \text{Use the Subtraction Property of Equality.}$$

$$2x = 12 \leftarrow \text{Simplify.}$$

$$\frac{1}{2} 2x = \frac{12}{2} \leftarrow \text{Use the Division Property of Equality.}$$

$$x = 6 \leftarrow \text{Simplify.}$$

Check: $2x + 17 = 29$

$$2(\mathbf{6}) + 17 \stackrel{?}{=} 29$$

$$12 + 17 \stackrel{?}{=} 29$$

$$29 = 29 \text{ True}$$

So 6 is the solution of the equation $2x + 17 = 29$.

Solve and check.

1. $2b - 8 = 80$

$$2b - 8 + 8 = 80 + 8$$

$$2b = 88; \frac{2b}{2} = \frac{88}{2}; b = 44$$

Check: $2(44) - 8 = 80$

$$88 - 8 = 80; 80 = 80$$

2. $3h - 10 = 35$

3. $2r + 14 = 34$

4. $-24 = 3r - (-15)$

5. $-27 = -4r - (-17)$

6. $-6z + 16 = 52$

7. $-7e + 8 = -13$

8. $2 = \frac{b}{9} + 5$

9. $0 = \frac{d}{8} + 6$

10. $8 = \frac{a}{5} + (-3)$

11. $13 = \frac{g}{5} + (-7)$

12. $\frac{d}{12} - 3 = 2$

13. $\frac{v}{9} - 7 = 97$

14. $\frac{21}{x} = -3$

15. $\frac{-225}{b} = 15$

2-9 Formulas

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The interior dimensions of a restaurant refrigerator are 8 feet high, 6 feet wide, and 3 feet deep. How many cubic feet of space are in the refrigerator?

To solve, use the formula for the volume of a rectangular prism.

$$V = \ell wh$$

$$V = 8 \cdot 6 \cdot 3 \quad \leftarrow \text{Substitute the known values.}$$

$$V = 144 \quad \leftarrow \text{Simplify.}$$

There are 144 cubic feet of space inside the refrigerator.

Remember: *Volume* is measured in cubic units (units³).
Area is measured in square units (units²).
Perimeter is measured in units.

Use the volume formula for a rectangular prism, $V = \ell wh$, to solve.

1. Find V when $\ell = 4$, $w = 6$, and $h = 2$.

$$V = 4 \cdot 6 \cdot 2$$
$$V = 48 \text{ units}^3$$

2. Find V when $\ell = 50$, $w = 30$, and $h = 15$.

3. Find h when $V = 54$, $\ell = 6$, and $w = 3$.

4. Find h when $V = 512$, $\ell = 8$, and $w = 8$.

5. Find w when $V = 360$, $\ell = 9$, and $h = 5$.

6. Find w when $V = 48$, $\ell = 2$, and $h = 6$.

7. Find ℓ when $V = 108$, $w = 6$, and $h = 2$.

8. Find ℓ when $V = 1000$, $h = 10$, and $w = 10$.

Use the area formula for a rectangle, $A = \ell w$, to solve.

9. Find A when $\ell = 24$ and $w = 3$.

$$A = 24 \cdot 3$$
$$A = 72 \text{ units}^2$$

10. Find A when $\ell = 9$ and $w = 11$.

11. Find w when $A = 225$ and $\ell = 25$.

12. Find w when $A = 64$ and $\ell = 8$.

13. Find ℓ when $w = 4$ and $A = 104$.

14. Find ℓ when $w = 13$ and $A = 65$.

Practice Chapter 2 Test

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Evaluate each expression when $a = -9$ and $b = 16$.

1. $36 - b$

2. $\frac{a}{3}$

3. $b - a$

4. $2a + b$

Write each word phrase as an algebraic expression or equation.

5. fourteen less than a number

6. Ten times a number is four less than the number.

7. a number divided by nine

8. Twice a number plus ten is 50.

9. six times a number added to four

10. Triple a number minus eight is -12 .

Solve and check.

11. $21 + a = 33$

12. $-14 = j + 2$

13. $z - 7 = 12$

14. $-25 = y - 19$

15. $10x = -120$

16. $4 = -4b$

17. $6 = \frac{d}{8}$

18. $\frac{a}{4} = -36$

19. $m + |-10| = 70$

20. $26 = n - |-4|$

21. $4 + 3m = -2$

22. $-17 = -3 - 2n$

23. $54 = 17n - (-3)$

24. $7x - (-2) = 30$

25. $\frac{m}{-2} + (-6) = 13$

26. $34 = 9 - \frac{w}{-2}$

27. $-10 = 2d - 2^3$

28. $2n - 3^2 = 53$

4-5 Add and Subtract Decimals

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To add or subtract decimals with *unlike signs*, line up the decimal points and subtract the absolute values of the addends.

Add: $2.2 + (-5.8)$

$$\begin{array}{r} 5.8 \quad \leftarrow |-5.8| = 5.8 \\ - 2.2 \quad \leftarrow |2.2| = 2.2 \\ \hline -3.6 \quad \leftarrow |-5.8| > |2.2|, \text{ so the sum is negative} \end{array}$$

$$- 2.2 \quad \leftarrow |2.2| = 2.2$$

$$-3.6 \quad \leftarrow |-5.8| > |2.2|, \text{ so the sum is negative}$$

Check: Compare with an estimate: $2 + (-6) = -4$
 -3.6 is close to -4 . The sum is reasonable.

To add or subtract decimals with *like signs*, line up the decimal points and add or subtract the same way as with integers.

Subtract: $-3.08 - 6.81$

Think

Subtract by adding the opposite.

$$-3.08 - 6.81 = -3.08 + (-6.81)$$

$$-3.08 \quad \leftarrow |-3.08| = 3.08$$

$$+ -6.81 \quad \leftarrow |-6.81| = 6.81$$

$$-9.89 \quad \leftarrow \text{Use the sign of the addends.}$$

Add.

1. $20.95 + 13.87$

2. $14.57 + 39.26$

3. $0.89 + 1.970$

4. $15.01 + 3.592$

34.82

5. $-12.38 + (-1.74)$

6. $-17.23 + (-2.58)$

7. $-4.7 + (-2.68)$

8. $-52.43 + (-34)$

9. $8.01 + (-3.46)$

10. $-7.119 + 4.02$

11. $19.61 + (-26.52)$

12. $-119.14 + 89.480$

Subtract.

13. $6.1 - 3.5$

14. $7.000 - 0.359$

15. $2.4 - 1.06$

16. $3.407 - 2.0098$

$$\begin{array}{r} 6.1 + (-3.5) \\ \hline 2.6 \end{array}$$

17. $28.14 - (-19.31)$

18. $15.72 - (-13.18)$

19. $-3.24 - (-9)$

20. $-16.35 - (-17.9)$

21. $-4.8 - 2.6$

22. $-36.17 - 23.46$

23. $-14.3 - 16.41$

24. $-101.3 - 37.83$

25. $-9.3 - (-4.5)$

26. $-38.2 - (-13.9)$

27. $-20.1 - (-5.121)$

28. $-271.36 - (-131.74)$

4-10 Scientific Notation

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Numbers written in scientific notation are expressed as the product of two factors:

(a number x , such that $x \geq 1$ and $x < 10$) \times (a power of 10)

$$285000 = 2.85 \times 10^5$$

5 decimal places \rightarrow

Numbers greater than 1 have *positive* exponents.

$$0.0004062 = 4.062 \times 10^{-4}$$

4 decimal places \rightarrow

Numbers less than 1 and greater than 0 have *negative* exponents.

To express numbers written in scientific notation in *standard form*,

move the decimal point

or

multiply the two factors in standard form.

$$8.064 \times 10^7 = 8.0640000 = 80,640,000$$

Move the decimal point 7 places to the *right*.

$$5.27 \times 10^{(-4)} = 0.000527 = 0.000527$$

Move the decimal point 4 places to the *left*.

$$8.064 \times 10^7 = 8.064 \times 10,000,000 = 80,640,000$$

$$5.27 \times 10^{(-4)} = 5.27 \times 0.0001 = 0.000527$$

Remember:

$$10^1 = 10, 10^0 = 1, 10^{-1} = 0.1$$

Write the power of 10 in standard form. Then multiply the factors.

1. 6.4×10^3

6.4×1000
 6400

2. 8.36×10^7

3. 2.5×10^{-3}

4. 1.09×10^{-5}

5. 7.83×10^0

Write in scientific notation.

6. 531,000

5.31×10^5

7. 6,100,000

8. 0.0426

9. 0.0075

10. -48,060

11. -54,200,000

12. -0.00000062

13. -0.0000909

Write in standard form.

14. 7×10^7

$70,000,000$

15. 9×10^{10}

16. 3.7×10^4

17. 2.925×10^{-2}

18. 7.374×10^{-2}

19. 4.04×10^{-9}

20. -1.065×10^9

21. -5.15×10^{-5}

22. 4.36×10^5

23. 7.1×10^{-4}

24. 9×10^{-6}

25. 6×10^7

4-14 Solve Two-Step Equations with Decimals

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To solve a two-step equation, apply the order of operations and the Properties of Equality to isolate the variable, the unknown value.

Remember: Properties of Equality

If $a = b$, $a + c = b + c$.

If $a = b$, $a - c = b - c$.

If $a = b$, $ac = bc$.

If $a = b$, $\frac{a}{c} = \frac{b}{c}$, when $c \neq 0$.

Solve: $50 + 9.85a = 79.55$

$$50 - 50 + 9.85a = 79.55 - 50$$

$$9.85a = 29.55$$

$$\frac{9.85a}{9.85} = \frac{29.55}{9.85}$$

$$a = 3$$

Check: Use substitution.

$$50 + (9.85 \cdot 3) = 79.55$$

$$50 + (29.55) = 79.55$$

$$79.55 = 79.55 \text{ True}$$

Solve. Check to justify your answer.

1. $36.3 = 8.3 + 4s$

$$36.3 - 8.3 = 8.3 - 8.3 + 4s$$

$$28 = 4s$$

$$\frac{28}{4} = \frac{4s}{4}; 7 = s$$

Check: $36.3 = 8.3 + 4(7)$

$$36.3 = 36.3 \text{ True}$$

2. $8.5p + 6 = 40$

3. $19.5 = 0.5t + 14$

4. $186.8 = 43k + 32$

5. $0.6w + 6 = 23.4$

6. $88.7a - 15 = 19.593$

7. $16.6 = 0.8x - 17$

8. $46.0365 = 7.3g + 46$

9. $-2.46j - 15 = -12.54$

10. $(r \div 1.2) + 7.5 = 45$

11. $26 = \frac{n}{6.4} + 4.3$

12. $(b \div 2.8) + 83 = 39$

13. $\frac{y}{0.25} + 12 = 77$

14. $0.89 = \frac{w}{7.9} - (-0.14)$

15. $\frac{z}{3.6} - 0.65 = -0.15$

5-2 Greatest Common Factor

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Here are two ways to find the GCF of 54 and 90:

- List all the factors of each number, then choose the greatest common factor.
 Factors of 54: **1, 2, 3, 6, 9, 18, 27, 54**
 Factors of 90: **1, 2, 3, 5, 6, 9, 10, 15, 18, 30, 45, 90**
 Common factors: 1, 2, 3, 6, 9, 18. The GCF is 18.

- Find the prime factorization of each number, then multiply the common factors.

$$54 = 2 \cdot 3 \cdot 3 \cdot 3$$

$$90 = 2 \cdot 3 \cdot 3 \cdot 5$$

Multiply the common factors: $2 \cdot 3 \cdot 3 = 18$.
 So the GCF is 18.

Remember: Every number has 1 as a factor. A prime number has exactly two factors, itself and 1.

A fraction is in simplest form when its numerator and denominator have a GCF of 1.

Here are two ways to write $\frac{54}{90}$ in simplest form:

Divide the numerator and denominator by the GCF.

$$\frac{54 \div 18}{90 \div 18} = \frac{3}{5}$$

Use prime factorization.

$$\frac{54}{90} = \frac{\overset{1}{2} \cdot \overset{1}{3} \cdot \overset{1}{3} \cdot 3}{\underset{1}{2} \cdot \underset{1}{3} \cdot \underset{1}{3} \cdot 5} = \frac{3}{5}$$

To write equivalent fractions for $\frac{54}{90}$, multiply or divide both numerator and denominator by the same nonzero number.

Multiply. $\frac{54 \cdot 2}{90 \cdot 2} = \frac{108}{180}$

Divide. $\frac{54 \div 9}{90 \div 9} = \frac{6}{10}$

List the factors of each number. Then find the GCF for each pair of numbers.

1. 24 1, 2, 3, 4, 6, 8, 12, 24
 18 1, 2, 3, 6, 9, 18
 GCF: 6

2. 36 _____
 20 _____
 GCF: _____

3. 42 _____
 14 _____
 GCF: _____

4. 96 _____
 36 _____
 GCF: _____

Find the GCF. Use prime factorization.

5. 30 and 54

$$30 = 2 \cdot 3 \cdot 5$$

$$54 = 2 \cdot 3 \cdot 3 \cdot 3$$

$$\text{GCF: } 2 \cdot 3 = 6$$

6. 27 and 90

7. 14 and 28

8. 35 and 28

9. 17 and 19

10. 43 and 13

11. 25 and 50

12. 50 and 75

13. 8 and 20
