

Dear future Algebra I student,

This packet is to help you get an idea of the skills you should need to have when you enter Algebra I. These skills will be reviewed in the first 2-3 weeks of class and you will be tested on them.

If you find that you have difficulty on any of these skills, please do more than the problems provided. You can find more problems on a variety of websites or Algebra I workbooks that can be purchased in bookstores or online.

Please take the time to do this packet before the school year begins so you can start the year well prepared.

If you have any questions regarding this packet, please email [sremphrey@ucfsd.net](mailto:sremphrey@ucfsd.net)

Thank you and we look forward to meeting you next year!

Sincerely,

Charles F. Patton Middle School Algebra I Teachers

### Concepts students should know before entering Algebra I

Many of these problems were taken from our textbook: Algebra I: Expressions, Equations, and Applications by Paul Foerster.

### **Students should be advanced at these concepts:**

Operations involving fractions

*Simplify. Do not use a calculator.*

1.  $\frac{3}{8} + \frac{1}{4}$

2.  $6\frac{1}{2} + 3\frac{1}{9}$

3.  $5\frac{1}{3} - 2\frac{1}{4}$

4.  $6 + 3\frac{3}{8}$

5.  $2\frac{1}{6} + 2\frac{7}{8}$

6.  $7\frac{1}{8} - 2\frac{3}{4}$

7.  $20 - 8\frac{3}{4}$

8.  $\frac{5}{9} \div \frac{1}{3}$

9.  $\frac{11}{12} \cdot 3$

10.  $\frac{5}{16} \cdot \frac{4}{5}$

11.  $5\frac{1}{2} \cdot 4\frac{3}{4}$

12.  $3 \cdot 5\frac{2}{3}$

13.  $5 \div \frac{2}{5}$

14.  $9\frac{1}{4} \div 2\frac{1}{4}$

## Operations involving decimals

*Simplify. Do not use a calculator.*

1.  $5.038 + 2.96$

2.  $16 + 1.6 + 0.517$

3.  $27 - 10.4$

4.  $9.006 - 4.44$

5.  $4.8 \cdot 6.9$

6.  $0.05 \cdot 0.7$

7.  $17.03 \div 9$

8.  $4.82 \div 45$

9.  $3.25 \div 0.5$

10.  $23.24 \div 2.8$

## Order of Operations

*Simplify. Do not use a calculator.*

1.  $[36 \div (3 \cdot 4)] + 2$

2.  $60 - 7(5 + 6 \div 2) + 2^4$

3.  $4 + 6(5 - 2)$

4.  $2 + 8 \cdot 3^2$

5.  $24 - 6 \cdot 2$

6.  $4 \cdot 9 + 7 \cdot 8$

7.  $102 - 2^4(3^4 - 51)$

8.  $14 + 8 \div 2 - 1$

9.  $\frac{63 - 8}{3 + 8} - 2$

10.  $5 \cdot \frac{19 - 7}{5 + 1}$

## Writing expressions and equations from sentences

*Write the expression described*

1. Subtract 2 from  $x$ , then add  $y$
2. Multiply  $x$  by the sum of 7 and  $y$
3. One-eighth of  $z$
4. Add  $x$  and  $y$ , then square the result
5. Divide  $y$  by the sum of 7 and  $z$
6. Subtract the product of 5 and  $x$  from 7
7. Subtract the cube of  $z$  from 15
8. 13 less than the quotient of 5 divided by  $p$
9. 4 times the sum of 10 and  $x$
10. 5 more than the product of 3 and  $c$

## Evaluating a number raised to a power

*Simplify. Do not use a calculator.*

1.  $3^3$
2.  $2^7$
3.  $(-2)^4$
4.  $-2^4$

*Write in expanded form.*

5.  $x^6$
6.  $5^4$

*Write in exponential form.*

5.  $x \cdot x \cdot x \cdot x \cdot x \cdot x$
6.  $3 \cdot 3 \cdot 5 \cdot 5 \cdot 5 \cdot 5$

## Operations with negative numbers

*Simplify. Do not use a calculator.*

1.  $-6 + -3$

2.  $9 - 15$

3.  $12 - (-6)$

4.  $-9 + 5$

5.  $18 \cdot -3$

6.  $-8 \cdot -10$

7.  $\frac{-35}{-5}$

8.  $\frac{27}{-3}$

## Solving 1-step equations

*Solve. Do not use a calculator.*

1.  $x - 8 = 15$

2.  $x + 15 = 6$

3.  $5x = 6$

4.  $\frac{x}{8} = -6$

5.  $x - 8 = -12$

6.  $6 + x = -5$

7.  $-1.3x = 2.6$

8.  $\frac{x}{-9} = -12$

9.  $\frac{2}{3}x = 18$

10.  $-\frac{5}{6}x = 10$

Finding the absolute value of a number or numerical expression

*Simplify.*

1.  $|\ 8 |$

2.  $|-78|$

3.  $|\ 8 - 17 |$

4.  $|\ 5 + -7 |$

5.  $|\ 6 \cdot 4 |$

6.  $|-24 \div 3|$

Solving 2-step equations

*Solve for x. (No calculator.)*

1.  $2x + 3 = 19$

2.  $5x - 3 = 12$

3.  $4x - 2 = -1$

4.  $-2 + 3x = 8$

5.  $\frac{1}{5}x + 3 = 7$

6.  $4.6 + 5x = -9$

7.  $13 = 9 - \frac{1}{3}x$

8.  $5 - 3c = 17$

9.  $-\frac{4}{3} - x = -\frac{1}{3}$

10.  $71 = 4 - x$

## Writing expressions and equations from sentences

*Write the expression described*

1. Make 5 dollars per hour for  $x$  hours, plus \$7.50
2. Go 40 miles per hour for  $x$  hours, then go 70 miles further
3. Start with 50 grapes and eat 3 grapes per minute for 6 minutes
4. Start 20 miles from home. Walk 4 miles per hour toward home for  $x$  hours.

## Solving word problems using equations.

*Write an equation to describe the problem then solve.*

1. Suzy is selling cookies for 25 cents plus 5 cents for the box. Let  $x$  be the number of cookies you buy.
  - a) Write an expression for the number of cents you pay for  $x$  cookies.
  - b) How much will you pay for 5 cookies? 10 cookies?
  - c) If you paid \$4.30 (430 cents), how many cookies did you buy? (Write an equation first.)
2. A gas tank holds 20 gallons of gas and uses  $\frac{1}{10}$  of a gallon every mile.
  - a) Let  $x$  be the number of miles driven. Write an expression for the number of gallons left after  $x$  miles.
  - b) How many gallons are left after 10 miles? 120 miles?
  - c) At the end of a trip you find that you have 11.5 gallons left. How far did you travel?
3. Hillary is traveling to her friend's house. Her friend's house is 40 miles away. If Hillary travels at a constant rate of 30 miles per hour:
  - a) how close will she be after 30 minutes?
  - b) how long has she been traveling if she is only 5 miles away?

### Distributive property

*Simplify.*

1.  $3(x + 7)$

2.  $-2(11 - y)$

3.  $\frac{1}{3}(12x - 15y)$

4.  $\frac{7x + 63 - 14d}{7}$

### Combining like terms

*Simplify.*

1.  $7x + 6x + 8$

2.  $9x - 5 + 7x + 4$

3.  $7x^2 + 7x$

4.  $3x^2 - 5x + 6 - 8x^2$

5.  $3(4x + 7) - 2$

6.  $13 - 2(3x + 4)$

7.  $8(x + 4) - (x - 5)$

8.  $\frac{1}{4}(12x + 20) - \frac{1}{5}(30 - 15x)$

9.  $5x + 3(x - 2)$

10.  $6x - x(4x + 1)$



## Percentages

*Solve.*

1. What is 45% of 70?
2. 30 is what percent of 60?
3. 16 is 15% of what number?
4. Andy received an 85% on his test. If the test had 25 questions, how many did Andy get right?
5. Tyler made 80 ounces of a juice drink. If he used 20 ounces of apple juice, what percent of the drink is apple juice?

## Proportions

*Solve for x.*

1.  $\frac{x}{5} = \frac{24}{15}$

2.  $\frac{8}{x} = \frac{20}{17.5}$

3. In one basketball league, there are 96 players on 8 teams. In another basketball league, there are 12 teams. All of the teams in both leagues have the same number of players. How many players are in the 12-team league?
4. A car is able to get 25 miles per gallon of gasoline. The car has a 16 gallon gas tank. How many miles can the car travel if you start the trip with a full tank?
5. A flower delivery person is able to make 5 deliveries in 30 minutes. He has 3 more hours left to work today. With his remaining time on the job, how many more deliveries can he make?

**Students should be proficient at these concepts:**

Factoring out a GCF from an expression

*Factor out the common factors.*

1.  $3x + 3y$

2.  $3a - 6$

3.  $4ax + 12bx$

4.  $x^2 - 4x$

5.  $3x + 3y - 6z$

6.  $6x + 8y$

Solving equations with like terms

*Solve for x.*

1.  $2x + 6x = 56$

2.  $3x + 4x + 8 = 22$

3.  $8x - 4 - 2x = -10$

4.  $7x + 3 + 3x = 63$

Solving equations with the distributive property

*Solve for x.*

1.  $5(x + 3) - 2x = -21$

2.  $5x + 3(x + 4) = 28$

3.  $7x - 4(2 - 3x) = -27$

4.  $4x - (3x + 11) = -11$

5.  $2(x + 3) - 5(x - 1) = 32$

6.  $66 = 4(2x - 3) + 2(x + 4)$

## Solving equations with variables on both sides

*Solve for x.*

1.  $5x + 27 = 2x$

2.  $7z = -16 - 9z$

3.  $5x + 8 = 7x + 8$

4.  $4(x + 3) = 6x$

5.  $7(2 - r) = 3(r + 8)$

6.  $4x - 2(1 - x) = 2(3x - 2)$

7.  $6(x + 4) - (x + 3) = x - 1$

## Solving equations that involve decimals

*Solve.*

1.  $0.3c - 8.5 = 1 + 1.7c$

2.  $1.4x + 0.5 = 0.6x + 0.7 + 0.8x$

3.  $3(2.4x + 5) = x + 2.7$

4.  $5.9 - 1.7t = 3(4.1 - t)$

## Transforming formulas (ex: $d=rt$ , solve for $r$ )

*Solve for x.*

1.  $5x + 3c = 17$

2.  $4 - 2x = g$

3.  $x - 7f = f$

4.  $\frac{ax}{6} = 2b$

## Concepts students should know before entering Algebra I

Many of these problems were taken from our textbook: Algebra I: Expressions, Equations, and Applications by Paul Foerster.

### **Students should be advanced at these concepts:**

Operations involving fractions

*Simplify. Do not use a calculator.*

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

$$2. 6\frac{1}{2} + 3\frac{1}{9} = 6\frac{1}{2} \cdot \frac{9}{9} + 3\frac{1}{9} \cdot \frac{2}{2} = 6\frac{9}{18} + 3\frac{2}{18} = 9\frac{11}{18}$$

$$3. 5\frac{1}{3} \cdot \frac{4}{4} - 2\frac{1}{4} \cdot \frac{3}{3} = 5\frac{4}{12} - 2\frac{3}{12} = 3\frac{1}{12}$$

$$4. 6 + 3\frac{3}{8} = 9\frac{3}{8}$$

$$5. 2\frac{1}{6} + 2\frac{7}{8} = 2\frac{1}{6} \cdot \frac{4}{4} + 2\frac{7}{8} \cdot \frac{3}{3} = 2\frac{4}{24} + 2\frac{21}{24} = 4\frac{25}{24} = 5\frac{1}{24}$$

$$6. 7\frac{1}{8} - 2\frac{3}{4} = 7\frac{1}{8} - 2\frac{3}{4} \cdot \frac{2}{2} = 7\frac{1}{8} - 2\frac{6}{8} = 6\frac{9}{8} - 2\frac{6}{8} = 4\frac{3}{8}$$

$$7. 20 - 8\frac{3}{4} = 19\frac{4}{4} - 8\frac{3}{4} = 11\frac{1}{4}$$

$$8. \frac{5}{9} \div \frac{1}{3} = \frac{5}{9} \cdot \frac{3}{1} = \frac{15}{9} = \frac{5}{3} = 1\frac{2}{3}$$

$$9. \frac{11}{12} \cdot 3 = \frac{11}{12} \cdot \frac{3}{1} = \frac{33}{12} = 2\frac{9}{12} = 2\frac{3}{4}$$

$$10. \frac{5}{16} \cdot \frac{4}{5} = \frac{20}{80} = \frac{1}{4}$$

$$11. 5\frac{1}{2} \cdot 4\frac{3}{4} = \frac{11}{2} \cdot \frac{19}{4} = \frac{209}{8} = 26\frac{1}{8}$$

$$12. 3 \cdot 5\frac{2}{3} = \frac{3}{1} \cdot \frac{17}{3} = 17$$

$$13. 5 \div \frac{2}{5} = \frac{5}{1} \cdot \frac{5}{2} = \frac{25}{2} = 12\frac{1}{2}$$

$$14. 9\frac{1}{4} \div 2\frac{1}{4} = \frac{37}{4} \div \frac{9}{4} = \frac{37}{4} \cdot \frac{4}{9} = \frac{37}{9} = 4\frac{1}{9}$$

## Operations involving decimals

*Simplify. Do not use a calculator.*

1.  $5.038 + 2.96 = 7.998$

2.  $16 + 1.6 + 0.517 = 18.117$

3.  $27 - 10.4 = 16.6$

4.  $9.006 - 4.44 = 4.566$

5.  $4.8 \cdot 6.9 = 33.12$

6.  $0.05 \cdot 0.7 = 0.035$

7.  $17.03 \div 9 = 1.89\bar{2}$

8.  $4.82 \div 45 = 0.107\bar{1}$

9.  $3.25 \div 0.5 = 6.5$

10.  $23.24 \div 2.8 = 8.3$

## Order of Operations

*Simplify. Do not use a calculator.*

1.  $[36 \div (3 \cdot 4)] + 2 = [36 \div 12] + 2 = 3 + 2 = 5$

2.  $60 - 7(5 + 6 \div 2) + 2^4 = 60 - 7(5 + 6 \div 2) + 16 = 60 - 7(5 + 3) + 16 = 60 - 7(8) + 16$   
 $= 60 - 56 + 16 = 20$

3.  $4 + 6(5 - 2) = 4 + 6(3) = 4 + 18 = 22$

4.  $2 + 8 \cdot 3^2 = 2 + 8 \cdot 9 = 2 + 72 = 74$

5.  $24 - 6 \cdot 2 = 24 - 12 = 12$

6.  $4 \cdot 9 + 7 \cdot 8 = 36 + 56 = 92$

7.  $102 - 2^4(3^4 - 51) = 102 - 2^4(81 - 51) = 102 - 16(81 - 51) = 102 - 16(30) = 102 - 480 = -378$

8.  $14 + 8 \div 2 - 1 = 14 + 4 - 1 = 17$

9.  $\frac{63-8}{3+8} - 2 = \frac{55}{11} - 2 = 5 - 2 = 3$

10.  $5 \cdot \frac{19-7}{5+1} = 5 \cdot \frac{12}{6} = 5 \cdot 2 = 10$

## Writing expressions and equations from sentences

*Write the expression described*

1. Subtract 2 from x, then add y

$$x - 2 + y$$

3. One-eighth of z

$$\frac{1}{8}z$$

5. Divide y by the sum of 7 and z

$$\frac{y}{7+z}$$

7. Subtract the cube of z from 15

$$15 - z^3$$

9. 4 times the sum of 10 and x

$$4 \cdot (10 + x)$$

2. Multiply x by the sum of 7 and y

$$x \cdot (7 + y)$$

4. Add x and y, then square the result

$$(x + y)^2$$

6. Subtract the product of 5 and x from 7

$$7 - 5x$$

8. 13 less than the quotient of 5 divided by p

$$\frac{5}{p} - 13$$

10. 5 more than the product of 3 and c

$$5 + 3c$$

## Evaluating a number raised to a power

*Simplify. Do not use a calculator.*

1.  $3^3 = 3 \cdot 3 \cdot 3 = 27$

2.  $2^7 = 128$

3.  $(-2)^4 = (-2)(-2)(-2)(-2) = 16$

4.  $-2^4 = -2 \cdot 2 \cdot 2 \cdot 2 = -16$

*Write in expanded form.*

5.  $x^6 = x \cdot x \cdot x \cdot x \cdot x \cdot x$

6.  $5^4 = 5 \cdot 5 \cdot 5 \cdot 5$

*Write in exponential form.*

5.  $x \cdot x \cdot x \cdot x \cdot x \cdot x = x^6$

6.  $3 \cdot 3 \cdot 5 \cdot 5 \cdot 5 \cdot 5 = 3^2 \cdot 5^4$

## Operations with negative numbers

*Simplify. Do not use a calculator.*

1.  $-6 + -3 = -9$

2.  $9 - 15 = -6$

3.  $12 - (-6) = 18$

4.  $-9 + 5 = -4$

5.  $18 \cdot -3 = -54$

6.  $-8 \cdot -10 = 80$

7.  $\frac{-35}{-5} = 7$

8.  $\frac{27}{-3} = -9$

## Solving 1-step equations

*Solve. Do not use a calculator.*

$$x - 8 = 15$$

1.  $x - 8 + 8 = 15 + 8$   
 $x = 23$

$$x + 15 = 6$$

2.  $x + 15 - 15 = 6 - 15$   
 $x = -9$

$$5x = 6$$

3.  $\frac{5x}{5} = \frac{6}{5}$   
 $x = 1\frac{1}{5}$

$$\frac{x}{8} = -6$$

4.  $\frac{x}{8} \cdot 8 = -6 \cdot 8$   
 $x = -48$

$$x - 8 = -12$$

5.  $x - 8 + 8 = -12 + 8$   
 $x = -4$

$$6 + x = -5$$

6.  $6 + x - 6 = -5 - 6$   
 $x = -11$

$$-1.3x = 2.6$$

7.  $\frac{-1.3x}{-1.3} = \frac{2.6}{-1.3}$   
 $x = -2$

$$\frac{x}{-9} = -12$$

8.  $\frac{x}{-9} \cdot -9 = -12 \cdot -9$   
 $x = 108$

$$\frac{2}{3}x = 18$$

$$9. \quad \frac{2}{3}x \cdot \frac{3}{2} = 18 \cdot \frac{3}{2}$$
$$x = 27$$

$$-\frac{5}{6}x = 10$$

$$10. \quad -\frac{5}{6}x \cdot -\frac{6}{5} = 10 \cdot -\frac{6}{5}$$
$$x = -12$$

Finding the absolute value of a number or numerical expression

*Simplify.*

1.  $|\beta| = 8$

2.  $|-78| = 78$

3.  $|\beta - 17| = |-9| = 9$

4.  $|5 + -7| = |\beta| = 8$

5.  $|\beta \cdot 4| = |24| = 24$

6.  $|-24 \div 3| = |-8| = 8$

Solving 2-step equations

*Solve for x. (No calculator.)*

$$2x + 3 = 19$$

$$2x + 3 - 3 = 19 - 3$$

1.  $2x = 16$

$$2x \div 2 = 16 \div 2$$

$$x = 8$$

$$5x - 3 = 12$$

$$5x - 3 + 3 = 12 + 3$$

2.  $5x = 15$

$$5x \div 5 = 15 \div 5$$

$$x = 3$$

$$4x - 2 = -1$$

$$4x - 2 + 2 = -1 + 2$$

3.  $4x = 1$

$$4x \div 4 = 1 \div 4$$

$$x = \frac{1}{4}$$

$$-2 + 3x = 8$$

$$-2 + 3x + 2 = 8 + 2$$

4.  $3x = 10$

$$3x \div 3 = 10 \div 3$$

$$x = 3\frac{1}{3}$$



$$\frac{1}{5}x + 3 = 7$$

$$5. \quad \frac{1}{5}x + 3 - 3 = 7 - 3$$

$$\frac{1}{5}x \cdot \frac{5}{1} = 4 \cdot \frac{5}{1}$$

$$x = 20$$

$$4.6 + 5x = -9$$

$$4.6 + 5x - 4.6 = -9 - 4.6$$

$$6. \quad 5x = -13.6$$

$$5x \div 5 = -13.6 \div 5$$

$$x = -2.72$$

$$13 = 9 - \frac{1}{3}x$$

$$13 - 9 = 9 - \frac{1}{3}x - 9$$

$$7. \quad 4 = -\frac{1}{3}x$$

$$4 \cdot -\frac{3}{1} = -\frac{1}{3}x \cdot -\frac{3}{1}$$

$$-12 = x$$

$$5 - 3c = 17$$

$$5 - 3c - 5 = 17 - 5$$

$$8. \quad -3c = 12$$

$$-3c \div -3 = 12 \div -3$$

$$c = -4$$

$$-\frac{4}{3} - x = -\frac{1}{3}$$

$$-\frac{4}{3} - x + \frac{4}{3} = -\frac{1}{3} + \frac{4}{3}$$

$$9. \quad -x = 1$$

$$-x \div -1 = 1 \div -1$$

$$x = -1$$

$$71 = 4 - x$$

$$71 - 4 = 4 - x - 4$$

$$10. \quad 67 = -x$$

$$67 \div -1 = -x \div -1$$

$$-67 = x$$

## Writing expressions and equations from sentences

*Write the expression described*

1. Make 5 dollars per hour for x hours, plus \$7.50

$$5x + 7.50$$

2. Go 40 miles per hour for x hours, then go 70 miles further

$$40x + 70$$

3. Start with 50 grapes and eat 3 grapes per minute for 6 minutes

$$50 - 3(6)$$

4. Start 20 miles from home. Walk 4 miles per hour toward home for  $x$  hours.

$$20 - 4x$$

Solving word problems using equations.

*Write an equation to describe the problem then solve.*

1. Suzy is selling cookies for 25 cents plus 5 cents for the box. Let  $x$  be the number of cookies you buy.

a) Write an expression for the number of cents you pay for  $x$  cookies.

$$25x + 5 \text{ or } 0.25x + 0.05$$

b) How much will you pay for 5 cookies? 10 cookies?

$$25(5) + 5$$

$$125 + 5$$

$$130 \text{cents} = \$1.30$$

$$25(10) + 5$$

$$250 + 5$$

$$255 \text{cents} = \$2.55$$

c) If you paid \$4.30 (430 cents), how many cookies did you buy? (Write an equation first.)

$$25x + 5 = 430$$

$$25x + 5 - 5 = 430 - 5$$

$$25x = 425$$

$$x = 17 \text{cookies}$$

2. A gas tank holds 20 gallons of gas and uses  $\frac{1}{10}$  of a gallon every mile.

a) Let  $x$  be the number of miles driven. Write an expression for the number of gallons left after  $x$  miles.

$$20 - \frac{1}{10}x$$

b) How many gallons are left after 10 miles? 120 miles?

$$20 - \frac{1}{10}(10)$$

$$20 - 1 = 19 \text{gallons}$$

$$20 - \frac{1}{10}(120)$$

$$20 - 12$$

$$8 \text{gallons}$$

c) At the end of a trip you find that you have 11.5 gallons left. How far did you travel?

$$20 - \frac{1}{10}x = 11.5$$

$$20 - \frac{1}{10}x - 20 = 11.5 - 20$$

$$-\frac{1}{10}x = -8.5$$

$$-\frac{1}{10}x \cdot \frac{10}{1} = -8.5 \cdot \frac{10}{1}$$

$$x = 85 \text{ miles}$$

3. Hillary is traveling to her friend's house. Her friend's house is 40 miles away. If Hillary travels at a constant rate of 30 miles per hour:

a) how close will she be after 30 minutes?

$$30 \text{ minutes} = 0.5 \text{ hours}$$

$$40 - 30(0.5) = 40 - 15 = 25 \text{ miles}$$

b) how long has she been traveling if she is only 5 miles away?

$$40 - 30x = 5$$

$$40 - 30x - 40 = 5 - 40$$

$$-30x = -35$$

$$-30x \div -30 = -35 \div -30$$

$$x = 1.17 \text{ hours}$$

Distributive property

*Simplify.*

$$1. \quad 3(x + 7) = 3 \cdot x + 3 \cdot 7 = 3x + 21$$

$$2. \quad -2(11 - y) = -2 \cdot 11 - (-2)y = -22 + 2y$$

$$3. \quad \frac{1}{3}(12x - 15y) = \frac{1}{3}(12x) - \frac{1}{3}(15y) = 4x - 5y$$

$$4. \quad \frac{7x + 63 - 14d}{7} = x + 9 - 2d$$

## Combining like terms

*Simplify.*

1.  $7x + 6x + 8 = 13x + 8$

2.  $9x - 5 + 7x + 4 = 16x - 1$

3.  $7x^2 + 7x = \text{cannot\_be\_simplified}$

4.  $3x^2 - 5x + 6 - 8x^2 = -5x^2 - 5x + 6$

5.  $3(4x + 7) - 2 = 3(4x) + 3(7) - 2 = 12x + 21 - 2 = 12x + 19$

6.  $13 - 2(3x + 4) = 13 + -2(3x + 4) = 13 + -6x + -8 = 5 + -6x$

7.  $8(x + 4) - (x - 5) = 8x + 32 - x + 5 = 7x + 37$

8.  $\frac{1}{4}(12x + 20) - \frac{1}{5}(30 - 15x) = 3x + 5 - 6 + 3x = 6x - 1$

9.  $5x + 3(x - 2) = 5x + 3x - 6 = 8x - 6$

10.  $6x - x(4x + 1) = 6x - 4x^2 - x = -4x^2 + 5x$

## Percentages

*Solve.*

1. What is 45% of 70?

$$x = .45(70) = 31.5$$

2. 30 is what percent of 60?

$$30 = 60x$$

$$0.5 = x = 50\%$$

3. 16 is 15% of what number?

$$16 = .15x$$

$$106.\bar{6} = x$$

4. Andy received an 85% on his test. If the test had 25 questions, how many did Andy get right?

$$x = .85(25)$$

$$x = 21.25 \text{ questions}$$

5. Tyler made 80 ounces of a juice drink. If he used 20 ounces of apple juice, what percent of the drink is apple juice?

$$20 = 80x$$

$$0.25 = x = 25\%$$

## Proportions

Solve for  $x$ .

$$1. \frac{x}{5} = \frac{24}{15} \Rightarrow 15x = 120 \Rightarrow x = 8$$

$$2. \frac{8}{x} = \frac{20}{17.5} \Rightarrow 20x = 140 \Rightarrow x = 7$$

3. In one basketball league, there are 96 players on 8 teams. In another basketball league, there are 12 teams. All of the teams in both leagues have the same number of players. How many players are in the 12-team league?

$$\frac{96}{8} = \frac{x}{12} \Rightarrow 1152 = 8x \Rightarrow x = 144$$

4. A car is able to get 25 miles per gallon of gasoline. The car has a 16 gallon gas tank. How many miles can the car travel if you start the trip with a full tank?

$$\frac{25 \text{ miles}}{1 \text{ gallon}} = \frac{x}{16 \text{ gallons}} \Rightarrow x = 400 \text{ miles}$$

5. A flower delivery person is able to make 5 deliveries in 30 minutes. He has 3 more hours left to work today. With his remaining time on the job, how many more deliveries can he make?

$$\frac{5 \text{ deliveries}}{30 \text{ minutes}} = \frac{x}{3 \cdot 60 \text{ minutes}} \Rightarrow 30x = 900 \Rightarrow x = 30 \text{ deliveries}$$

**Students should be proficient at these concepts:**

Factoring out a GCF from an expression

*Factor out the common factors.*

1.  $3x + 3y = 3(x + y)$

2.  $3a - 6 = 3(a - 2)$

3.  $4ax + 12bx = 4x(a + 3b)$

4.  $x^2 - 4x = x(x - 4)$

5.  $3x + 3y - 6z = 3(x + y - 2z)$

6.  $6x + 8y = 2(3x + 4y)$

Solving equations with like terms

*Solve for x.*

1.  $2x + 6x = 56$   
 $8x = 56$   
 $x = 7$

2.  $3x + 4x + 8 = 22$   
 $7x + 8 = 22$   
 $7x = 14$   
 $x = 2$

3.  $8x - 4 - 2x = -10$   
 $6x - 4 = -10$   
 $6x = -6$   
 $x = -1$

4.  $7x + 3 + 3x = 63$   
 $10x + 3 = 63$   
 $10x = 60$   
 $x = 6$

Solving equations with the distributive property

*Solve for x.*

1.  $5(x + 3) - 2x = -21$   
 $5x + 15 - 2x = -21$   
 $3x + 15 = -21$   
 $3x = -36$   
 $x = -12$

2.  $5x + 3(x + 4) = 28$   
 $5x + 3x + 12 = 28$   
 $8x + 12 = 28$   
 $8x = 16$   
 $x = 2$

$$7x - 4(2 - 3x) = -27$$

$$7x - 8 + 12x = -27$$

3.  $19x - 8 = -27$

$$19x = -19$$

$$x = -1$$

$$4x - (3x + 11) = -11$$

4.  $4x - 3x - 11 = -11$

$$x - 11 = -11$$

$$x = 0$$

$$2(x + 3) - 5(x - 1) = 32$$

$$2x + 6 - 5x + 5 = 32$$

5.  $-3x + 11 = 32$

$$-3x = 21$$

$$x = -7$$

$$66 = 4(2x - 3) + 2(x + 4)$$

$$66 = 8x - 12 + 2x + 8$$

6.  $66 = 10x - 4$

$$70 = 10x$$

$$7 = x$$

### Solving equations with variables on both sides

Solve for  $x$ .

$$5x + 27 = 2x$$

1.  $3x + 27 = 0$

$$3x = -27$$

$$x = -9$$

$$7z = -16 - 9z$$

2.  $16z = -16$

$$z = -1$$

$$5x + 8 = 7x + 8$$

3.  $-2x = 0$

$$x = 0$$

$$4(x + 3) = 6x$$

4.  $4x + 12 = 6x$

$$12 = 2x$$

$$6 = x$$

$$7(2 - r) = 3(r + 8)$$

5.  $14 - 7r = 3r + 24$

$$-10 = 10r$$

$$-1 = r$$

$$4x - 2(1 - x) = 2(3x - 2)$$

$$4x - 2 + 2x = 6x - 4$$

6.  $6x - 2 = 6x - 4$

$$-2 = -4$$

*no\_solution*

$$6(x + 4) - (x + 3) = x - 1$$

$$6x + 24 - x - 3 = x - 1$$

7.  $5x + 21 = x - 1$

$$4x = -22$$

$$x = -5.5$$

## Solving equations that involve decimals

Solve.

$$0.3c - 8.5 = 1 + 1.7c$$

1.  $-1.4x = 9.5$   
 $x \approx -6.79$

$$1.4x + 0.5 = 0.6x + 0.7 + 0.8x$$

2.  $1.4x + 0.5 = 1.4x + 0.7$   
 $0.5 = 0.7$   
*no\_solution*

$$3(2.4x + 5) = x + 2.7$$

3.  $7.2x + 15 = x + 2.7$   
 $6.2x = -12.3$   
 $x \approx -1.98$

$$5.9 - 1.7t = 3(4.1 - t)$$

4.  $5.9 - 1.7t = 12.3 - 3t$   
 $1.3t = 6.4$   
 $x \approx 4.92$

## Transforming formulas (ex: $d=rt$ , solve for $r$ )

Solve for  $x$ .

$$5x + 3c = 17$$

1.  $5x = 17 - 3c$   
 $x = \frac{17 - 3c}{5}$

$$4 - 2x = g$$

2.  $-2x = g - 4$   
 $x = \frac{g - 4}{-2}$

3.  $x - 7f = f$   
 $x = 8f$

$$\frac{ax}{6} = 2b$$

4.  $\frac{ax}{6} \cdot \frac{6}{a} = 2b \cdot \frac{6}{a}$   
 $x = \frac{12b}{a}$