

# **Math Connections Worksheets**

MAT1033C Intermediate Algebra

## **Chapter 2**

Equations, Inequalities and Problem Solving



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**Chapter 2 Equations, Inequalities, and Problem Solving**  
**Section 2.1 Linear Equations in One Variable**

**Learning Objectives**

1. Solve linear equations using properties of equality.
2. Solve linear equations that can be simplified by combining like terms.
3. Solve linear equations containing fractions or decimals.
4. Recognize identities and equations with no solutions.

**Vocabulary**

Use the choices to complete each statement.

**Addition  
Multiplication**

**Equivalent  
Solution**

**Like  
Value**

1. A(n) \_\_\_\_\_ of an equation, is a value for the variable that will make the equation true.
2. \_\_\_\_\_ equations are equations that have the same solution.
3. By the \_\_\_\_\_ property of equality,  $8x = 64$  and  $\frac{8x}{8} = \frac{64}{8}$  are equivalent equations.
4. By the \_\_\_\_\_ property of equality,  $x + 4 = 9$  and  $x + 4 - 4 = 9 - 4$  are equivalent equations.

**Objective 1**

Solve each equation.

5.  $-8x = 24$

5. \_\_\_\_\_



6.  $4.1 - 7z = 3.6$

6. \_\_\_\_\_

7.  $3x + 7 = 2x - 14$

7. \_\_\_\_\_

8.  $z + 14.7 = 18.2$

8. \_\_\_\_\_

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**Objective 2**

Solve each equation.

9.  $6(x - 2) = 3x + 10$

9. \_\_\_\_\_

10.  $-3(x - 9) = 5x - 3(x + 2)$

10. \_\_\_\_\_

11.  $17 - 2x + 18 + 3x = -4x - 15 + 10x$

11. \_\_\_\_\_

12.  $-10(y - 2) = -15(y - 2)$

12. \_\_\_\_\_

**Objective 3**

Solve each equation.

13.  $\frac{1}{2}(x - 4) = \frac{3}{4}x + 1$

13. \_\_\_\_\_

14.  $\frac{x + 3}{4} + \frac{x - 2}{3} = \frac{1}{6}$

14. \_\_\_\_\_

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15.  $0.5x - 0.4 = 0.2(x - 1)$

15. \_\_\_\_\_

16.  $0.25x + 0.80 = -0.4(x - 1)$

16. \_\_\_\_\_



17.  $\frac{m-4}{3} - \frac{3m-1}{5} = 1$

17. \_\_\_\_\_

#### Objective 4

Solve each equation.

18.  $3(x + 1) + 5 = 3x + 2$

18. \_\_\_\_\_

19.  $4(x + 2) = 3(4x + 2) - 2(4x - 1)$

19. \_\_\_\_\_

20.  $4(x + 1) - x = 8(x - 1) - 5x$

20. \_\_\_\_\_

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21.  $3(2x+3) - (-x-2) = 4(3x+5) - (x+9)$

21. \_\_\_\_\_

### Concept Extensions

Solve each equation.

22.  $7.342x = -19.0892$

22. \_\_\_\_\_

23.  $\frac{5}{12}x + 3 = \frac{7}{12}x - 11$

23. \_\_\_\_\_

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### Section 2.2 An Introduction to Problem Solving

#### Learning Objectives

1. Write algebraic expressions that can be simplified.
2. Apply the steps for problem solving.

#### Objective 1

Write the following as algebraic expressions. Then simplify.

1. The area of a rectangle with a length of  $x$  and width of  $x - 2$ .

1. \_\_\_\_\_

2. The sum of four consecutive even integers.

2. \_\_\_\_\_



3. The total amount of money (in cents) in  $x$  nickels,  $x + 3$  dimes, and  $2x$  quarters.

3. \_\_\_\_\_

4. The area of a triangle with base of  $2x$  meters and height of  $x + 4$  meters.

4. \_\_\_\_\_

5. The circumference of a circle whose diameter is  $x + 4$ .

5. \_\_\_\_\_

#### Objective 2



Solve.

6. A second number is five times a first number. A third number is 100 more than the first number. If the sum of the three numbers is 415, find the numbers.

6. \_\_\_\_\_

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7. The sum of three consecutive integers is 75. Find the integers.

7. \_\_\_\_\_

8. One angle is  $20^\circ$  more than four times its supplement. Find the angles.

8. \_\_\_\_\_

9. In a recent survey, 40% of a developmental math class were females. If there were a total of 240 males in all the developmental classes, how many were females?

9. \_\_\_\_\_

10. Find the measures of the angles of a triangle if the measure of one angle is ten less than the second angle and the third angle is three times the first angle.

10. \_\_\_\_\_

11. A computer was purchased for \$594.12 including tax. If the tax rate was 6% what was the price of the computer.

11. \_\_\_\_\_



12. Two frames are needed with the same perimeter: one frame in the shape of a square and one in the shape of an equilateral triangle. Each side of the triangle is 6 centimeters longer than each side of the square. Find the dimensions of each frame.

12. \_\_\_\_\_



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**Concept Extensions**

Solve.

13. How many cubic centimeters of a 30% solution should be mixed with an 80% solution to get 50 cubic centimeters of a 60% solution?

13. \_\_\_\_\_

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### Section 2.3 Formulas and Problem Solving

#### Learning Objectives

1. Solve a formula for a specified variable.
2. Use formulas to solve problems.

#### Objective 1

Solve each equation for the specified variable.

1.  $y = mx + b$ ; for  $x$ .

1. \_\_\_\_\_

2.  $F = ma$ ; for  $m$ .

2. \_\_\_\_\_

3.  $F = \frac{9}{5}C + 32$ ; for  $C$ .

3. \_\_\_\_\_

4.  $4x + 6y = 12$ ; for  $x$

4. \_\_\_\_\_

5.  $S = \frac{n}{2}(a + L)$ ; for  $L$ .

5. \_\_\_\_\_

6.  $y = ax^2 + bx + c$ ; for  $b$ .

6. \_\_\_\_\_

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7.  $S = B + \frac{1}{2}pl$ ; for  $L$ .

7. \_\_\_\_\_

### Objective 2

Solve.

8. If it takes 3 hours to travel to Dallas, TX a total trip of 193 miles. How fast was the driver going?

8. \_\_\_\_\_

9. The surface area of a tomato sauce can is 52 square inches. If the company wants to make a can that has a diameter of 3 inches. How tall will the can be? Round to the nearest integer.

9. \_\_\_\_\_



10. If the area of a triangular kite is 18 square feet and its base is 4 feet, find the height of the kite.

10. \_\_\_\_\_

11. A banker invested \$3000 in an account that earns 6% interest that is compounded quarterly. How much interest will be earned in 3 years?

11. \_\_\_\_\_

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12. The low temperature in Las Vegas, NV was  $14^{\circ}\text{F}$ . What is the temperature in Celsius?

12. \_\_\_\_\_

13. The perimeter of a parking lot is 200 meters. If the length is 10 meters more than the width, find the dimensions of the parking lot.

13. \_\_\_\_\_

14. Given the perimeter of an isosceles right triangle is 127.5 inches and the hypotenuse is 49.5 inches. What is the measures of the legs?

14. \_\_\_\_\_

### Concept Extensions

Solve.

15. The formula  $E = mc^2$ , where E = energy, m = mass, and c = speed of light. The speed of light is  $1.8 \times 10^5$  meters per second squared. If the energy produced by an apple is  $2.4 \times 10^{12} \text{ kg} \cdot \frac{\text{m}}{\text{s}^2}$ , what is the mass of the apple.

15. \_\_\_\_\_

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### Section 2.4 Linear Inequalities and Problem Solving

#### Learning Objectives

1. Use interval notation.
2. Solve linear inequalities using the addition property of inequality.
3. Solve linear inequalities using the multiplication and the addition properties of inequality.
4. Solve problems that can be modeled by linear inequalities.

#### Objective 1

Graph each set on a number line and then write in interval notation.

1.  $\{x | x > 3\}$

1. \_\_\_\_\_

2.  $\{x | x \leq -4\}$

2. \_\_\_\_\_

3.  $\{x | -2 < x \leq 1.5\}$

3. \_\_\_\_\_

#### Objective 2

Solve. Write your answer in interval notation.

4.  $x - 8 \geq 12$

4. \_\_\_\_\_

5.  $x + 7 < 1$

5. \_\_\_\_\_

6.  $x - 3 > -8$

6. \_\_\_\_\_

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7.  $4 + x \leq 13$

7. \_\_\_\_\_

**Objective 3**

Solve. Write your answer in interval notation.

8.  $2x > 42$

8. \_\_\_\_\_

9.  $-3x - 7 \leq 2$

9. \_\_\_\_\_

10.  $\frac{3}{4}x - 1 > 7$

10. \_\_\_\_\_



11.  $3(x - 5) < 2(2x - 1)$

11. \_\_\_\_\_

12.  $7x + 2 \geq 3x - 1$

12. \_\_\_\_\_



13.  $\frac{5x+1}{7} - \frac{2x-6}{4} \geq -4$

13. \_\_\_\_\_

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#### Objective 4

Solve. Write your answer with an inequality.

14. A bride has a budget of \$1500 for her reception dinner. It costs \$28 per person for the meal she wants to serve. Use an inequality to find the number of guests the bride can invite to the reception.

14. \_\_\_\_\_



15. A small plane's maximum take-off weight is 2000 pounds or less. Six passengers weigh an average of 160 pounds each. Use an inequality to find the luggage and cargo weights the plane can carry.

15. \_\_\_\_\_

16. A rental car company offers two deals for their weekend special. (Weekend means 2 day rental)

Plan A: \$32 per day with unlimited miles.

Plan B: \$26 per day plus \$0.10 per mile.

Use an inequality to find the number of daily miles for which Plan B is more economical than Plan A.

16. \_\_\_\_\_

#### Concept Extension

17. Why is it wrong for an interval notation to be written as  $(-4, -\infty)$ ?

17. \_\_\_\_\_

18. Write an inequality that includes both multiplication and addition whose solution is  $\{x \mid x \geq -3\}$ .

18. \_\_\_\_\_

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### Section 2.5 Compound Inequalities

#### Learning Objectives

1. Find the intersection of two sets.
2. Solve compound inequalities containing and.
3. Find the union of two sets.
4. Solve compound inequalities containing or.

#### Vocabulary

Use the choices to complete each statement.

**Compound**

$\cap$

**Intersection**

$\cup$

**Union**

1. An inequality that contains two inequalities is called a(n) \_\_\_\_\_ inequality.
2. The word and means \_\_\_\_\_ and uses the symbol \_\_\_\_\_.
3. The word or means \_\_\_\_\_ and uses the symbol \_\_\_\_\_.

#### Objective 1

If  $A = \{x \mid x \text{ is an odd integer between } 0 \text{ and } 30\}$ ,  $B = \{x \mid x \text{ is an even number}\}$ ,  
 $C = \{2, 5, 7, 13, 18, 22, 27\}$ , and  $D = \{1, 6, 12, 15, 19, 23, 26, 29\}$ , list the elements of each set.

4.  $C \cap B$

4. \_\_\_\_\_

5.  $D \cap A$

5. \_\_\_\_\_

6.  $C \cap A$

6. \_\_\_\_\_

7.  $C \cap D$

7. \_\_\_\_\_



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**Objective 2**

Solve each compound inequality. Write your answer in interval notation.

8.  $x \geq 3$  and  $x < 10$

8. \_\_\_\_\_

9.  $x \leq 8$  and  $x \geq -4$

9. \_\_\_\_\_



10.  $x + 1 \geq 7$  and  $3x - 1 \geq 5$

10. \_\_\_\_\_

11.  $-6x \leq -18$  and  $x - 20 \leq 10$

11. \_\_\_\_\_

12.  $-4 \leq x + 3 < 11$

12. \_\_\_\_\_



13.  $1 \leq \frac{2}{3}x + 3 \leq 4$

13. \_\_\_\_\_

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### Objective 3

If  $A = \{x \mid x \text{ is an odd integer}\}$ ,  $B = \{x \mid x \text{ is an even number}\}$ ,  $C = \{2, 9, 12, 19\}$ , and  $D = \{3.8, 13, 18\}$ , list the elements of each set.

14.  $C \cup D$

14. \_\_\_\_\_

15.  $A \cup C$

15. \_\_\_\_\_

16.  $B \cup D$

16. \_\_\_\_\_

### Objective 4

Solve each compound inequality. Write your answer in interval notation.

17.  $x < 2$  or  $x < -3$

17. \_\_\_\_\_

18.  $x \geq 5$  or  $x \geq -5$

18. \_\_\_\_\_

19.  $2x > 12$  or  $x + 7 > 3$

19. \_\_\_\_\_

20.  $4(x - 1) < 9$  or  $5(x + 3) \leq 12$

20. \_\_\_\_\_

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21.  $x < 1$  or  $x > 5$

21. \_\_\_\_\_

22.  $x - 7 > -4$  or  $-2x - 14 \geq 20$

22. \_\_\_\_\_

**Concept Extension**

Solve each compound inequality. Write your answer in interval notation.

23.  $1 - 3x < 4x + 5 \leq x - 5$

23. \_\_\_\_\_

24.  $4(2 + 3x) \leq 2(x + 2) \leq -3(x - 2)$

24. \_\_\_\_\_

Chapter 2  
Section 2.1

1. Solution
2. Equivalent
3. Multiplication
4. Addition
5.  $-3$
6.  $\frac{1}{14}$  or about 0.0714
7.  $-21$
8. 3.5
9.  $\frac{22}{3}$
10.  $\frac{33}{5}$
11. 10
12. 2
13.  $-12$
14.  $\frac{1}{7}$
15.  $\frac{2}{3}$
16.  $-\frac{8}{13}$
17.  $-8$
18.  $\emptyset$
19. All real numbers
20.  $\emptyset$
21. All real numbers
22.  $-2.6$
23. 84

Section 2.2

1.  $x^2 - 12x$
2.  $4x + 12$
3.  $65x + 30$  cents
4.  $x^2 + 4x$  meters
5.  $\pi x + 4\pi$
6. 45, 145, 225
7. 24, 25, 26
8.  $148^\circ, 32^\circ$
9. 160 females
10. 34, 44, 102
11. \$560.49
12. square: 18 cm;  
triangle: 24 cm
13. 20 cc of 30% solution

Section 2.3

1.  $\frac{y-b}{m} = x$
2.  $\frac{F}{a} = m$
3.  $\frac{5}{9}(F - 32) = C$
4.  $x = 3 - \frac{3}{2}y$
5.  $\frac{25}{n} - a = L$
6.  $\frac{y-c-ax^2}{x} = b$
7.  $\frac{2(S-B)}{p} = l$
8. 64 mph
9. 4 inches
10. 9 feet
11. \$586.85
12.  $-10^\circ\text{C}$
13. 45 m by 55 m
14. 39 inches
15. 74.07 kg

Section 2.4

1.  $(3, \infty)$
2.  $(-\infty, -4]$
3.  $(-2, 1.5]$
4.  $[20, \infty)$
5.  $(-\infty, -6)$
6.  $(-5, \infty)$
7.  $(-\infty, 9]$
8.  $(21, \infty)$
9.  $[-3, \infty)$
10.  $(\frac{32}{3}, \infty)$
11.  $(-13, \infty)$
12.  $[-\frac{3}{4}, \infty)$
13.  $[\frac{79}{3}, \infty)$
14.  $\{x \mid x \leq 53\}$
15.  $\{x \mid x \leq 1040\}$
16.  $\{x \mid x < 120 \text{ miles}\}$
17. Answers may vary
18. Answers may vary

Section 2.5

1. Compound
2. Intersection;  $\cap$
3. Union;  $\cup$
4.  $\{2, 18, 22\}$
5.  $\{1, 15, 19, 23, 29\}$
6.  $\{5, 7, 13, 27\}$
7.  $\emptyset$
8.  $[3, 10)$
9.  $[-4, 8]$
10.  $[6, \infty)$
11.  $[3, 30]$
12.  $[-7, 8)$
13.  $[-3, \frac{3}{2}]$
14.  $\{2, 3, 8, 9, 12, 13, 18, 19\}$
15.  $\{x \mid x \text{ is an odd number or } x = 2 \text{ or } x = 12\}$
16.  $\{x \mid x \text{ is an even number or } x = 3 \text{ or } x = 13\}$
17.  $(-\infty, 2)$
18.  $[-5, \infty)$
19.  $(-4, \infty)$
20.  $(-\infty, \frac{13}{4})$
21.  $(-\infty, 1) \cup (5, \infty)$
22.  $(-\infty, -17] \cup (3, \infty)$
23.  $(-\frac{4}{7}, \frac{10}{3}]$
24.  $(-\infty, -\frac{2}{5}]$