



PASSING THE  
LOUISIANA  
ALGEBRA I  
END-OF-COURSE TEST

ERICA DAY  
COLLEEN PINTOZZI  
KALI DANIEL

---

AMERICAN BOOK COMPANY  
P. O. BOX 2638  
WOODSTOCK, GEORGIA 30188-1383  
TOLL FREE 1 (888) 264-5877 PHONE (770) 928-2834  
FAX (770) 928-7483  
WEB SITE: [www.americanbookcompany.com](http://www.americanbookcompany.com)

# Contents

<b>Acknowledgements</b>	<b>ii</b>
<b>Preface</b>	<b>viii</b>
<b>Diagnostic Test</b>	<b>1</b>
Part 1	1
Part 2	5
Part 3	10
<b>1 Real Numbers</b>	<b>12</b>
1.1 Real Numbers	12
1.2 Estimated and Exact Solutions	13
1.3 Reasonable Solutions	14
1.4 Decimal Word Problems	15
1.5 Fraction Word Problems	16
Chapter 1 Review	17
Chapter 1 Test	18
<b>2 Exponents and Roots</b>	<b>19</b>
2.1 Understanding Exponents	19
2.2 Multiplication with Exponents	20
2.3 Division with Exponents	21
2.4 Order of Operations	22
2.5 Scientific Notation	24
2.6 Using Scientific Notation for Large Numbers	24
2.7 Using Scientific Notation for Small Numbers	25
2.8 Multiplying and Dividing Numbers in Scientific Notation	26
2.9 Square Root	27
2.10 Adding and Subtracting Roots	28
2.11 Multiplying Roots	29
2.12 Dividing Roots	30
Chapter 2 Review	31
Chapter 2 Test	32
<b>3 Introduction to Algebra</b>	<b>33</b>
3.1 Algebra Vocabulary	33
3.2 Substituting Numbers for Variables	34
	iii

3.3	Understanding Algebra Word Problems	35
3.4	Setting Up Algebra Word Problems	37
3.5	Changing Algebra Word Problems to Algebraic Equations	38
	Chapter 3 Review	39
	Chapter 3 Test	40
<b>4</b>	<b>Solving Equations and Inequalities</b>	<b>41</b>
4.1	Two-Step Algebra Problems	41
4.2	Two-Step Algebra Problems with Fractions	42
4.3	More Two-Step Algebra Problems with Fractions	43
4.4	Simplifying/Combining Like Terms	44
4.5	Solving Equations with Like Terms	44
4.6	Removing Parentheses	46
4.7	Multi-Step Algebra Problems	47
4.8	Multi-Step Inequalities	49
	Chapter 4 Review	51
	Chapter 4 Test	52
<b>5</b>	<b>Ratios and Proportions</b>	<b>54</b>
5.1	Ratio Problems	54
5.2	Solving Proportions	55
5.3	Ratio and Proportion Word Problems	56
5.4	Proportional Reasoning	57
5.5	Direct and Indirect Variation	58
	Chapter 5 Review	61
	Chapter 5 Test	62
<b>6</b>	<b>Algebra Word Problems</b>	<b>63</b>
6.1	Geometry Word Problems	64
6.2	Age Problems	65
6.3	Consecutive Integer Problems	67
6.4	Inequality Word Problems	68
	Chapter 6 Review	69
	Chapter 6 Test	70
<b>7</b>	<b>Polynomials</b>	<b>71</b>
7.1	Adding and Subtracting Monomials	71
7.2	Adding Polynomials	72

## Contents

7.3	Subtracting Polynomials	73
7.4	Multiplying Monomials	74
7.5	Multiplying Monomials by Polynomials	75
7.6	Dividing Polynomials by Monomials	76
7.7	Removing Parentheses and Simplifying	77
7.8	Evaluating Polynomials for Given Values	77
	Chapter 7 Review	78
	Chapter 7 Test	79
<b>8</b>	<b>Graphing and Writing Equations and Inequalities</b>	<b>80</b>
8.1	Finding the Midpoint of a Line Segment	80
8.2	Graphing Linear Equations	81
8.3	Graphing Horizontal and Vertical Lines	84
8.4	Finding Intercepts of a Line	85
8.5	Understanding Slope as the Rate of Change	86
8.6	Slope-Intercept Form of a Line	89
8.7	Verify That a Point Lies on a Line	90
8.8	Graphing a Line Knowing a Point and Slope	90
8.9	Finding the Equation of a Line Using Two Points or a Point and Slope	92
8.10	Independent and Dependent Variables	93
8.11	Graphing Translations	95
8.12	Graphing Reflections	97
8.13	Graphing Inequalities	99
	Chapter 8 Review	102
	Chapter 8 Test	104
<b>9</b>	<b>Applications of Graphs</b>	<b>106</b>
9.1	Changing the Slope or $Y$ -Intercept of a Line	106
9.2	Writing an Equation from Data	109
9.3	Graphing Linear Data	110
9.4	Identifying Graphs of Linear Equations	112
9.5	Identifying Graphs of Real-World Situations	113
	Chapter 9 Review	116
	Chapter 9 Test	118
<b>10</b>	<b>Systems of Equations and Systems of Inequalities</b>	<b>120</b>
10.1	Finding Common Solutions for Intersecting Lines	122
10.2	Solving Systems of Equations by Substitution	123

10.3	Solving Systems of Equations by Adding or Subtracting	124
10.4	Graphing Systems of Inequalities	126
10.5	Solving Systems of Equations using Matrices	127
	Chapter 10 Review	128
	Chapter 10 Test	129
<b>11</b>	<b>Relations and Functions</b>	<b>130</b>
11.1	Relations	130
11.2	Determining Domain and Range from Graphs	132
11.3	Functions	134
11.4	Recognizing Functions	135
11.5	Function Notation	138
11.6	Function Tables	139
11.7	Recognizing Functions Algebraically	139
11.8	Function Machines	140
11.9	Flow Charts	141
11.10	Relations That Can Be Represented by Functions	142
	Chapter 11 Review	144
	Chapter 11 Test	145
<b>12</b>	<b>Measurement</b>	<b>147</b>
12.1	Customary Measure	147
12.2	Approximate English Measure	148
12.3	The Metric System	148
12.4	Understanding Meters	149
12.5	Understanding Liters	149
12.6	Understanding Grams	149
12.7	Estimating Metric Measurements	149
12.8	Significant Figures	151
12.9	Units and Scale	152
12.10	Accuracy and Precision	153
12.11	Error	155
12.12	Relative Error	156
	Chapter 12 Review	158
	Chapter 12 Test	159
<b>13</b>	<b>Statistics</b>	<b>161</b>
13.1	Range	161

## Contents

13.2	Mean	162
13.3	Median	163
13.4	Mode	164
13.5	Applying Measures of Central Tendency	165
13.6	Scatter Plots	166
13.7	Making Conclusions About Data	168
13.8	The Line of Best Fit	169
	Chapter 13 Review	170
	Chapter 13 Test	171
<b>14</b>	<b>Probability</b>	<b>172</b>
14.1	Probability Terms	172
14.2	Probability	173
14.3	Odds	175
14.4	Geometric Probability	176
14.5	Permutations	179
14.6	More Permutations	181
14.7	Combinations	182
14.8	More Combinations	183
14.9	Simulations	184
	Chapter 14 Review	185
	Chapter 14 Test	189
	<b>Practice Test 1</b>	<b>191</b>
	Part 1	191
	Part 2	195
	Part 3	200
	<b>Practice Test 2</b>	<b>201</b>
	Part 1	201
	Part 2	205
	Part 3	209
	<b>Index</b>	<b>210</b>

# Diagnostic Test

## Part 1

This section is not timed, but you should be able to complete these 25 questions in 40 minutes. You may NOT use a calculator on this section.

1. What kind of number is  $9 + \pi$ ?

- A. Odd
- B. Whole
- C. Rational
- D. Irrational

GLE 1

5. What is the best estimate for the length of a piece of chalk?

- A. millimeter
- B. centimeter
- C. meter
- D. kilometer

GLE 21

2.  $3\sqrt{5} + 9\sqrt{5} =$

- A.  $12\sqrt{5}$
- B.  $12\sqrt{10}$
- C.  $27\sqrt{25}$
- D.  $12\sqrt{25}$

GLE 6

6. Rewrite the following equation in slope-intercept form.

$$x - 5y = 5$$

- A.  $y = \frac{1}{5}x + 1$
- B.  $y = \frac{1}{5}x - 1$
- C.  $y = -\frac{1}{5}x + 1$
- D.  $y = -\frac{1}{5}x - 1$

GLE 13

3. Alexandria wants to locate the midpoint of a line segment with endpoints  $(-3, -2)$  and  $(6, -4)$ . What are the coordinates of the midpoint?

- A.  $(1.5, -3)$
- B.  $(4.5, -3)$
- C.  $(4.5, -6)$
- D.  $(3, -6)$

GLE 23

7. Aja works for an air sanitizing company selling their products at a home improvement store. She makes \$12 an hour plus \$20 for every product she sells. She works forty hours a week. If she were to write a function expressing the amount of pay she receives from her place of employment each week, what would the independent variable be?

- A. the number of products she sells
- B. the amount of money she makes
- C. the forty hours a week she works
- D. Aja

GLE 10

4. Andrea has 10 more jellybeans than her friend Chelsea, but Andrea has half as many as Rebecca. Which expression below best describes Rebecca's jelly beans?

- A.  $R = 2C + 20$
- B.  $R = C + 10$
- C.  $R = A + \frac{1}{2}C$
- D.  $R = 2A + 10$

GLE 9

### 1.3 Reasonable Solutions

Since you have already learned about estimation, you will now learn about reasonable solutions. A reasonable solution is found by taking what you know about estimation and applying it to real-world situations.

**Example 1:** Sarah's school is having an assembly on Thursday. If there are 400 students at her school and the teachers are lining chairs up in rows of 15, is it reasonable to say it will take 50 rows to hold all the students? If so, how many extra seats will there be? If not, how many rows of 15 do they need?

**Solution:** 50 rows is not a reasonable estimation. 50 rows of 15 chairs will hold 750 students. Since there are only 400 students in Sarah's school, the number of rows can be reduced to 27 and if there are 27 rows of 15 seats, there will only be 5 empty seats.

**Determine if the estimation is appropriate. If it is, state whether or not there will be any excess. If it is not appropriate, find a reasonable solution.**

- Russell is having a party. If he invites 35 people and plans on serving snacks, is it reasonable for him to go to Cost Club and buy a set of 50 plates, cups, forks, knives, and spoons (assume each person will only use one of each)? Or should he get the set of 100?
- Brittany is planning her wedding. If she sent out 73 invitations and each person brings 1 guest (assuming everyone invited attends), would 200 chairs be reasonable for her guests at the reception (The chairs only come in packages of 25)?
- Sharon just got a new job and she starts Monday at 9 AM. Her office is 25 minutes away and traffic is usually very light. Since it's her first day, she'd like to be at least 15 minutes early. Can she make it in time if she leaves at 8 : 30 AM?
- Eric is dog-sitting for his neighbor, Mr. McDonald. His dog, Nala, eats  $\frac{1}{2}$  lb. of food twice a day. If Eric is watching Nala for 6 days, should Mr. McDonald send a 15 lb. bag to Eric's? Bags of dog food come in 5 lb. increments (5, 10, 15, etc.).
- Sudy is baking cookies for the Christmas Show. She signed up to bring 300 cookies. Her oven can bake 75 cookies at one time, but 12 cookies usually end up burnt. Using the given information, how many batches of cookies will Sudy have to make?
- If Sudy's recipe calls for 3.5 cups of sugar per batch, and there are 8 cups of sugar per bag, using the information found in question 5, how many bags of sugar will she need?
- Branden is going to a baseball game. The first thing he does when he gets there is go to the concession stand. He decides to order 3 hot dogs (\$2 each), a bag of chips (\$1), some boiled peanuts (\$2.50), a candy bar (\$0.50), and 3 bottles of water (\$1.25 each). What is the best way for him to pay if he has a five, a ten, and a twenty?
- Jack is paving his driveway. It takes 1,000 lb. of concrete to do a 10 ft  $\times$  10 ft section, so he decides to measure the length of his driveway. If Jack's driveway is 53 feet long and 24 feet wide, how many pounds of concrete will he have to buy if you can only purchase it by the ton (2,000 lb.)?

## 1.5 Fraction Word Problems

**Solve and reduce answers to lowest terms.**

1. Alyssa loves buying candy during the summer. During the first week of summer she buys  $1\frac{1}{3}$  pounds of candy, during the second she buys  $\frac{3}{4}$  of a pound, and during the third she buys  $\frac{4}{5}$  pound. How many pounds did she buy during the first three weeks of summer?
2. Juan was competing in a 1000-meter race, but he had to pull out of the race after running  $\frac{3}{4}$  of it. How many meters did he run?
3. Rick chews on a piece of bubble gum for 120 minutes. About every  $1\frac{1}{4}$  minutes, he blows a bubble. How many bubbles did Rick make?
4. Beth has a bread machine that makes a loaf of bread that weighs  $1\frac{1}{2}$  pounds. If she makes a loaf of bread for each of her three sisters, how many pounds of bread will she make?
5. Jeff needs to measure where the free-throw line should be in front of his basketball goal. He knows his feet are  $1\frac{1}{8}$  feet long and the free-throw line should be 15 feet from the backboard. How many toe-to-toe steps does Tad need to take to mark off 15 feet?
6. Kali gives her puppy a bath and uses  $5\frac{1}{2}$  gallons of water. She throws away  $3\frac{2}{3}$  gallons of the water. How much water does she have left?
7. Marlena is driving 355 miles to visit her parents. After  $3\frac{1}{2}$  hours of driving, Marlena has gone  $\frac{2}{3}$  of the trip. How far has Marlena gone?
8. Zeldrin bought a 20 pound bag of dog food for his mastiff, Hunter. On Monday Hunter ate  $1\frac{3}{4}$  lbs of food, on Tuesday he ate  $2\frac{1}{3}$  lbs of food, and on Wednesday he ate  $2\frac{3}{5}$ . How much dog food is left in the bag?
9. Liz was baking blue berry muffins in batches of 20. If in a single batch 3 muffins are burnt, how many can she expect to burnt out of 100 muffins?
10. Hektor's truck gets about 16 miles per gallon and can hold 20 gallons of gasoline. If he has used  $\frac{2}{5}$  of his gasoline, how far has he driven?

## 2.3 Division with Exponents

**Rule 1:** Expressions can also have negative exponents. Negative exponents do not indicate negative numbers. They indicate reciprocals, which is 1 over the original number.

**Example 12:**  $2^{-3} = \frac{1}{2^3} = \frac{1}{8}$

**Example 13:**  $3a^{-5} = 3 \times \frac{1}{a^5} = \frac{3}{a^5}$

**Rule 2:** When dividing expressions with exponents that have the same base, subtract the exponents. Expressions in simplified form only have positive exponents.

**Example 14:**  $\frac{3^5}{3^3} = 3^{5-3} = 3^2 = 9$

**Example 15:**  $\frac{3^5}{3^8} = 3^{5-8} = 3^{-3} = \frac{1}{3^3} = \frac{1}{27}$

**Rule 3:** If a fraction is raised to a power, then both the numerator and the denominator are raised to the same power.

**Example 16:**  $\left(\frac{3}{4}\right)^3 = \frac{3^3}{4^3} = \frac{27}{64}$

**Example 17:**  $(2x)^{-2} = \frac{1}{(2x)^2} = \frac{1}{4x^2}$

**Reduce the following expressions to their simplest form. All exponents should be positive.**

1.  $5x^{-4}$

6.  $(5a)^{-2}$

11.  $\frac{(3y)^3}{3^2y}$

16.  $(2^{-2})^3$

2.  $\frac{2^2}{2^4}$

7.  $\frac{3^4}{3^3}$

12.  $\frac{(3a^2)^3}{a^4}$

17.  $\left(\frac{1}{2}\right)^2$

3.  $\left(\frac{2}{3}\right)^2$

8.  $\left(\frac{7}{8}\right)^3$

13.  $(2x^2)^{-5}$

18.  $\frac{1}{3^{-2}}$

4.  $6a^{-2}$

9.  $(6a)^{-2}$

14.  $2x^{-2}$

19.  $(4y)^{-5}$

5.  $\frac{3^6}{3^3}$

10.  $\frac{(x^2)^3}{x^4}$

15.  $(a^3)^{-2}$

20.  $4y^{-5}$

## 2.7 Using Scientific Notation for Small Numbers

Scientific notation also simplifies very small numbers that have many zeros. For example, the diameter of a helium atom is 0.000000000244 meters. It can be written in scientific notation as  $2.44 \times 10^{-10}$ . The first number is always greater than 0, and the first number is always followed by a decimal point. The negative exponent indicates how many digits the decimal point moved to the right. The exponent is negative when the original number is less than 1. To convert small numbers to scientific notation, use the following examples.

**Examples:**

0.00058 =  $5.8 \times 10^{-4}$   
 Decimal point moves 4 spaces to the right ————  
 negative exponent indicates the original number is less than 1.

0.00003059 =  $3.059 \times 10^{-5}$   
 decimal moves 5 spaces to the right

**Convert the following numbers to scientific notation.**

1. 0.00000254

5. 0.000000005478

9. 0.0000000501

2. 0.00000000508

6. 0.00000059

10. 0.0000006

3. 0.000008004

7. 0.00000004712

11. 0.0000000000875

4. 0.00047

8. 0.00025

12. 0.00004

Now convert small numbers written in scientific notation back to conventional form.

**Example 22:**

$$3.08 \times 10^{-5} = \underbrace{00003.08}_{\text{move decimal 5 spaces left}} = 0.0000308$$

Move the decimal 5 spaces to the left, and add zeros.

**Convert the following numbers from scientific notation to conventional numbers.**

13.  $1.18 \times 10^{-7}$

17.  $7.632 \times 10^{-4}$

21.  $5.2 \times 10^{-3}$

14.  $2.3 \times 10^{-5}$

18.  $5.48 \times 10^{-10}$

22.  $7.01 \times 10^{-6}$

15.  $6.205 \times 10^{-9}$

19.  $2.75 \times 10^{-8}$

23.  $4.4 \times 10^{-5}$

16.  $4.1 \times 10^{-6}$

20.  $4.07 \times 10^{-7}$

24.  $3.43 \times 10^{-2}$

### 3.3 Understanding Algebra Word Problems

The biggest challenge to solving word problems is figuring out whether to add, subtract, multiply, or divide. Below is a list of key words and their meanings. This list does not include every situation you might see, but it includes the most common examples.

<u>Words Indicating Addition</u>	<u>Example</u>	<u>Add</u>
and	6 <b>and</b> 8	$6 + 8$
increased	The original price of \$15 <b>increased</b> by \$5.	$15 + 5$
more	3 coins and 8 <b>more</b>	$3 + 8$
more than	Josh has 10 points. Will has 5 <b>more than</b> Josh.	$10 + 5$
plus	8 baseballs <b>plus</b> 4 baseballs	$8 + 4$
sum	the <b>sum</b> of 3 and 5	$3 + 5$
total	the <b>total</b> of 10, 14, and 15	$10 + 14 + 15$

<u>Words Indicating Subtraction</u>	<u>Example</u>	<u>Subtract</u>
decreased	\$16 <b>decreased</b> by \$5	$16 - 5$
difference	the <b>difference</b> between 18 and 6	$18 - 6$
less	14 days <b>less</b> 5	$14 - 5$
less than	Jose completed 2 laps <b>less than</b> Mike's 9.	$*9 - 2$
left	Ray sold 15 out of 35 tickets. How many did he have <b>left</b> ?	$*35 - 15$
lower than	This month's rainfall is 2 inches <b>lower than</b> last month's rainfall of 8 inches.	$*8 - 2$
minus	15 <b>minus</b> 6	$15 - 6$

\* In subtraction word problems, you cannot always subtract the numbers in the order that they appear in the problem. Sometimes the first number should be subtracted from the last. You must read each problem carefully.

<u>Words Indicating Multiplication</u>	<u>Example</u>	<u>Multiply</u>
double	Her \$1000 profit <b>doubled</b> in a month.	$1000 \times 2$
half	<b>Half</b> of the \$600 collected went to charity.	$\frac{1}{2} \times 600$
product	the <b>product</b> of 4 and 8	$4 \times 8$
times	Li scored 3 <b>times</b> as many points as Ted who only scored 4.	$3 \times 4$
triple	The bacteria <b>tripled</b> its original colony of 10,000 in just one day.	$3 \times 10,000$
twice	Ron has 6 CDs. Tom has <b>twice</b> as many.	$2 \times 6$
<u>Words Indicating Division</u>	<u>Example</u>	<u>Divide</u>
divide into, by, or among	The group of 70 <b>divided into</b> 10 teams	$70 \div 10$ or $\frac{70}{10}$
quotient	the <b>quotient</b> of 30 and 6	$30 \div 6$ or $\frac{30}{6}$

### Chapter 3 Test

- Gali earns \$490 for a 40 hour work week plus \$15 per hour for each hour of overtime over 40 hours. Which equation represents her weekly wages,  $w$ , if  $x$  is the number of hours of overtime?
  - $w = 490 + 15x$
  - $w = 15 + 490x$
  - $w = 15 \times 40x + 490$
  - $w = 490x - 15x^2$
- What are Gali's weekly wages in problem 1 if she works 48 hours?
  - 498
  - 505
  - 610
  - 625
- An electrician charges \$30 per hour plus a \$20 service charge. If  $c$  is his charge in dollars and  $b$  is the number of hours he works, which equation could represent his total charges?
  - $c = 20b + 30$
  - $c = 30b + 20$
  - $b = 30c + 20$
  - $c = 20b - 30$
- The difference of  $x$  and five divided by the sum of  $x$  and two.
  - $\frac{x - 5}{x + 2}$
  - $x - \frac{5}{x + 2}$
  - $\frac{x}{x + 2} - 5$
  - $\frac{x}{2} - \frac{5}{x}$
- Would it be cheaper to hire the electrician in problem 3 or an electrician that charges \$18 per hour with a \$40 service charge for four hours of work?
  - The electrician in problem 3 would be cheaper
  - The second electrician would be cheaper
  - The two charges would be the same
  - Not enough information
- Katie decided to sell the car she bought 8 years ago for 75% less than what she paid for it,  $c$ . Which equation represents the price of her car after the discount?
  - $p = 75 \times c$
  - $p = 0.75c$
  - $p = c - 0.75c$
  - $p = c + 75c$
- Solving the following expression using  $a = 4$ .
 
$$3a - 2$$
  - 14
  - 10
  - 16
  - 12
- A letter that can be replaced by a number is called a(n)
  - variable.
  - exponent.
  - constant.
  - base.
- A constant is
  - the number multiplied by the highest power.
  - a term that does not have a variable.
  - a sentence with an equal sign.
  - the number used as a factor.

### 4.4 Simplifying/Combining Like Terms

In an algebra problem, separate **terms** by + and - signs. The expression  $5x - 4 - 3x + 7$  has 4 terms:  $5x$ ,  $4$ ,  $3x$ , and  $7$ . Terms having the same variable can be combined (added or subtracted) to simplify the expression.  $5x - 4 - 3x + 7$  simplifies to  $2x + 3$ .

$$\begin{array}{c}
 \swarrow \quad \searrow \quad \swarrow \quad \searrow \\
 5x - 4 - 3x + 7 \\
 \swarrow \quad \searrow \quad \swarrow \quad \searrow \\
 5x - 3x \quad -4 + 7 = 2x + 3
 \end{array}$$

**Simplify the following expressions.**

- |                   |                        |                       |
|-------------------|------------------------|-----------------------|
| 1. $7x + 12x$     | 8. $21 - 10t + 9 - 2t$ | 15. $-d + 1 + 2d - 4$ |
| 2. $8y - 5y + 8$  | 9. $-3 + x - 4x + 9$   | 16. $-8 + 4h + 1 - h$ |
| 3. $4 - 2x + 9$   | 10. $7b + 12 + 4b$     | 17. $12x - 4x + 7$    |
| 4. $11a - 16 - a$ | 11. $4h - h + 2 - 5$   | 18. $10 + 3z + z - 5$ |
| 5. $9w + 3w + 3$  | 12. $-6k + 10 - 4k$    | 19. $14 + 3y - y - 2$ |
| 6. $-5x + x + 2x$ | 13. $2a + 12a - 5 + a$ | 20. $11p - 4 + p$     |
| 7. $w - 15 + 9w$  | 14. $5 + 9c - 10$      | 21. $11m + 2 - m + 1$ |

### 4.5 Solving Equations with Like Terms

When an equation has two or more like terms on the same side of the equation, combining like terms is the **first** step in solving the equation.

**Example 5:**  $7x + 2x - 7 = 21 + 8$

<b>Step 1:</b>	Combine like terms on both sides of the equation.	$  \begin{array}{r}  7x + 2x - 7 = 21 + 8 \\  9x - 7 = 29 \\  +7 \quad +7 \\  9x \div 9 = 36 \div 9 \\  x = 4  \end{array}  $
<b>Step 2:</b>	Solve the two-step algebra problem as explained previously.	

**Solve the equations below combining like terms first.**

- |                            |                            |                             |
|----------------------------|----------------------------|-----------------------------|
| 1. $3w - 2w + 4 = 6$       | 5. $-2t + 4t - 7 = 9$      | 9. $-4 - 3x - x = -16$      |
| 2. $7x + 3 + x = 16 + 3$   | 6. $9d + d - 3d = 14$      | 10. $9 - 12p + 5p = 14 + 2$ |
| 3. $5 - 6y + 9y = -15 + 5$ | 7. $-6c - 4 - 5c = 10 + 8$ | 11. $10y + 4 - 7y = -17$    |
| 4. $-14 + 7a + 2a = -5$    | 8. $15m - 9 - 6m = 9$      | 12. $-8a - 15 - 4a = 9$     |

## 4.8 Multi-Step Inequalities

Remember that adding and subtracting with inequalities follow the same rules as equations. When you multiply or divide both sides of an inequality by the same positive number, the rules are also the same as for equations. However, when you multiply or divide both sides of an inequality by a **negative** number, you must **reverse** the inequality symbol.

**Example 12:**

$$\begin{aligned} -x &> 4 \\ (-1)(-x) &< (-1)(4) \\ x &< -4 \end{aligned}$$

**Example 13:**

$$\begin{aligned} -4x &< 2 \\ \frac{-4x}{-4} &> \frac{2}{-4} \\ x &> -\frac{1}{2} \end{aligned}$$

Reverse the symbol when you multiply or divide by a negative number.

When solving multi-step inequalities, first add and subtract to isolate the term with the variable. Then multiply and divide.

**Example 14:**

$$2x - 8 > 4x + 1$$

**Step 1:** Add 8 to both sides.

$$\begin{aligned} 2x - 8 + 8 &> 4x + 1 + 8 \\ 2x &> 4x + 9 \end{aligned}$$

**Step 2:** Subtract  $4x$  from both sides.

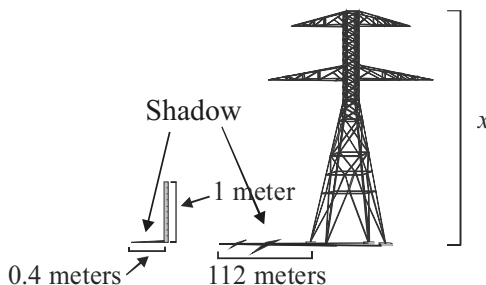
$$\begin{aligned} 2x - 4x &> 4x + 9 - 4x \\ -2x &> 9 \end{aligned}$$

**Step 3:** Divide by  $-2$ . Remember to change the direction of the inequality sign.

$$\begin{aligned} \frac{-2x}{-2} &< \frac{9}{-2} \\ x &< -\frac{9}{2} \end{aligned}$$

### 5.3 Ratio and Proportion Word Problems

**Example 3:** A stick one meter long is held perpendicular to the ground and casts a shadow 0.4 meters long. At the same time, an electrical tower casts a shadow 112 meters long. Use ratio and proportion to find the height of the tower.



**Step 1:** Set up a proportion using the numbers in the problem. Put the shadow lengths on one side of the equation and put the heights on the other side. The 1 meter height is paired with the 0.4 meter length, so let them both be top numbers. Let the unknown height be  $x$ .

$$\begin{array}{ccc} \text{shadow length} & & \text{object height} \\ \frac{0.4}{112} & = & \frac{1}{x} \end{array}$$

**Step 2:** Solve the proportion as you did on page 55.

$$112 \times 1 = 112 \qquad 112 \div 0.4 = 280$$

**Answer:** The tower height is 280 meters.

**Use ratio and proportion to solve the following problems.**

- Clete can mow a lawn that measures 1000 square feet in 2 hours. At that rate, how long would it take him to mow a lawn 3500 square feet?
- Faye wants to know how tall her school building is. On a sunny day, she measures the shadow of the building to be 6 feet. At the same time she measures the shadow cast by a 5 foot statue to be 2 feet. How tall is her school building?
- Out of every 5 students surveyed, 2 listen to country music. At that rate, how many students in a school of 800 listen to country music?
- Scarlet, a Labrador Retriever, has a litter of 8 puppies. Four are black. At that rate, how many puppies in a litter of 10 would be black?
- According to the instructions on a bag of fertilizer, 5 pounds of fertilizer are needed for every 100 square feet of lawn. How many square feet will a 25-pound bag cover?
- A race car can travel 2 laps in 5 minutes. At this rate, how long will it take the race car to complete 100 laps ?
- If it takes 7 cups of flour to make 4 loaves of bread, how many loaves of bread can you make from 35 cups of flour?
- If 3 pounds of jelly beans cost \$6.30, how much would 2 pounds cost?
- For the first 4 home football games, the concession stand sold a total of 600 hotdogs. If that ratio stays constant, how many hotdogs will sell for all 10 home games?

### Chapter 5 Test

1. Solve for  $x$ :  $\frac{3}{4} = \frac{9}{x}$

- A. 4
- B. 27
- C. 12
- D. 36

2. Solve for  $x$ :  $\frac{x}{2} = \frac{3}{6}$

- A. 1
- B. 2
- C. 3
- D. 4

3. Solve for  $x$ :  $\frac{3}{x} = \frac{9}{27}$

- A. 3
- B. 6
- C. 9
- D. 12

4. Solve for  $x$ :  $\frac{7}{5} = \frac{35}{x}$

- A. 1
- B. 30
- C. 5
- D. 25

5. Solve for  $x$ :  $\frac{1}{5} = \frac{25}{x}$

- A. 5
- B. 125
- C. 100
- D. 115

6. Solve for  $x$ :  $\frac{x}{4} = \frac{7}{28}$

- A. 4
- B. 3
- C. 2
- D. 1

7. Solve for  $x$ :  $\frac{7}{x} = \frac{3}{6}$

- A. 6
- B. 9
- C. 14
- D. 21

8. If  $x = 5$  and  $y = 7$ , what is  $y$  when  $x = 20$  using direct variation?

- A. 21
- B. 28
- C. 35
- D. 40

9. If  $x = 4$  and  $y = \frac{1}{2}$ , what is  $x$  when  $y = 4$  using indirect variation?

- A.  $\frac{1}{2}$
- B. 24
- C. 32
- D. 36

10. The ratio of girls to boys at summer camp is 5 : 3. If there are 90 girls, how many boys are there?

- A. 54
- B. 100
- C. 106
- D. 113

### 6.3 Consecutive Integer Problems

	<u>Examples:</u>	<u>Algebraic notation:</u>
Consecutive integers follow each other in order	1, 2, 3, 4 -3, -4, -5, -6	$n, n + 1, n + 2, n + 3$
Consecutive even integers:	2, 4, 6, 8, 10 -12, -14, -16, -18	$n, n + 2, n + 4, n + 6$
Consecutive odd integers:	3, 5, 7, 9 -5, -7, -9, -11	$n, n + 2, n + 4, n + 6$

**Example 5:** The sum of three consecutive odd integers is 63. Find the integers.

**Step 1:** Represent the three odd integers:  
 Let  $n$  = the first odd integer  
 $n + 2$  = the second odd integer  
 $n + 4$  = the third odd integer

**Step 2:** The sum of the integers is 63, so the algebraic equation is  
 $n + n + 2 + n + 4 = 63$ . Solve for  $n$ .  
 $n = 19$

**Solution:** the first odd integer = 19  
 the second odd integer = 21  
 the third odd integer = 23

**Check:** Does  $19 + 21 + 23 = 63$ ? Yes, it does.

**Solve the following problems.**

1. Find three consecutive odd integers whose sum is 141.
2. Find three consecutive integers whose sum is  $-21$ .
3. The sum of three consecutive even integers is 48. What are the numbers?
4. Find two consecutive even integers such that six times the first equals five times the second.
5. Find two consecutive odd integers such that seven times the first equals five times the second.
6. Find two consecutive odd numbers whose sum is forty-four.

### 7.4 Multiplying Monomials

When two monomials have the **same variable**, you can multiply them. Then, add the **exponents** together. If the variable has no exponent, it is understood that the exponent is 1.

**Example 5:**       $4x^4 \times 3x^2 = 12x^6$                        $2y \times 5y^2 = 10y^3$

**Multiply the following monomials.**

- |                        |                        |                           |
|------------------------|------------------------|---------------------------|
| 1. $6a \times 9a^5$    | 8. $2d^8 \times 9d^2$  | 15. $8w^7 \times w$       |
| 2. $2x^6 \times 5x^3$  | 9. $6k^3 \times 5k^2$  | 16. $10s^6 \times 5s^3$   |
| 3. $4y^3 \times 3y^2$  | 10. $7m^5 \times m$    | 17. $4d^5 \times 4d^5$    |
| 4. $10t^2 \times 2t^2$ | 11. $11z \times 2z^7$  | 18. $5y^2 \times 8y^6$    |
| 5. $2p^5 \times 4p^2$  | 12. $3w^4 \times 6w^5$ | 19. $7t^{10} \times 3t^5$ |
| 6. $9b^2 \times 8b$    | 13. $4x^4 \times 5x^3$ | 20. $6p^8 \times 2p^3$    |
| 7. $3c^3 \times 3c^3$  | 14. $5n^2 \times 3n^3$ | 21. $x^3 \times 2x^3$     |

**When problems include negative signs, follow the rules for multiplying integers.**

- |                         |                          |                          |
|-------------------------|--------------------------|--------------------------|
| 22. $-7s^4 \times 5s^3$ | 29. $10d \times -8d^7$   | 36. $-4w \times -5w^8$   |
| 23. $-6a \times -9a^5$  | 30. $-3g^6 \times -2g^3$ | 37. $-5y^4 \times 6y^2$  |
| 24. $4x \times -x$      | 31. $-7s^4 \times 7s^3$  | 38. $9x^3 \times -7x^5$  |
| 25. $-3y^2 \times -y^3$ | 32. $-d^3 \times -2d$    | 39. $-a^4 \times -a$     |
| 26. $-5b^2 \times 3b^5$ | 33. $11p \times -2p^5$   | 40. $-7k^2 \times 3k$    |
| 27. $9c^4 \times -2c$   | 34. $-5x^7 \times -3x^3$ | 41. $-15t^2 \times -t^4$ |
| 28. $-4t^3 \times 8t^3$ | 35. $8z^4 \times 7z^4$   | 42. $3x^8 \times 9x^2$   |

# Chapter 8

## Graphing and Writing Equations and Inequalities



This chapter covers the following Algebra 1 Standard(s):

	GLE
Algebra	10, 13, 14, 15
Geometry	23, 24, 25
Patterns, Relations, and Functions	38

### 8.1 Finding the Midpoint of a Line Segment

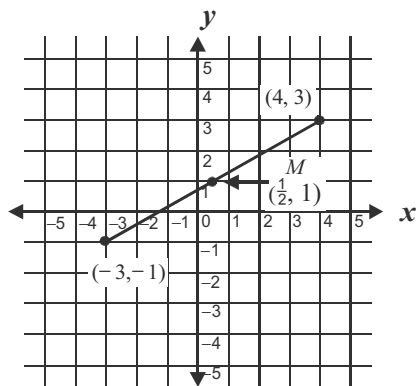
You can use the coordinates of the endpoints of a line segment to find the coordinates of the midpoint, a point **equidistant** from the endpoints, of the line segment. The formula to find the midpoint between two coordinates is:

$$\text{midpoint, } M = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

**Example 1:** Find the midpoint of the line segment having endpoints at  $(-3, -1)$  and  $(4, 3)$ .

Use the formula for the midpoint.  $M = \left( \frac{4 + (-3)}{2}, \frac{3 + (-1)}{2} \right)$

When we simplify each coordinate, we find the midpoint,  $M$ , is  $(\frac{1}{2}, 1)$ .



**For each of the following pairs of points, find the coordinate of the midpoint,  $M$ , using the formula given above.**

- |                         |                       |                           |
|-------------------------|-----------------------|---------------------------|
| 1. $(4, 5)$ $(-6, 9)$   | 4. $(2, 5)$ $(6, 9)$  | 7. $(-1, -5)$ $(-3, -11)$ |
| 2. $(-3, 2)$ $(-1, -2)$ | 5. $(8, 9)$ $(6, 11)$ | 8. $(4, 2)$ $(-2, 8)$     |
| 3. $(3, 6)$ $(9, 12)$   | 6. $(-4, 3)$ $(8, 7)$ | 9. $(4, 3)$ $(-1, -5)$    |