This free download includes three lessons from

# Algebra 1

## Unit 1

Following the lessons are corresponding pages from the Solution Key.

### Course description:

Algebra isn't easy, but it shouldn't intimidate students. Sunrise Algebra 1 helps students succeed by using the same methodology of incremental teaching and continuous review found in elementary Sunrise Math. Students will appreciate the reference numbers after each direction line that indicate the lesson where the concept was previously taught. "Math in History" notes spark students' interest and broaden their knowledge.

Algebra 1 is available in two formats: a textbook or 10 LightUnits. The exercises are the same in both the LightUnits and the textbook. The textbook is more colorful than the LightUnits.

UNIT 1

# Measurements

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1.1

# Types of Numbers

## Words to Know

**real numbers:** a set of numbers that includes all rational and irrational numbers

**empty set:** a set with no members sometimes called the null set. The symbol for the empty set is { } or ø.

### Math in History

*Before the metric system was developed in the late 1700s, merchants in Europe used barley grains as their "standard" for weight. People were tempted to choose larger or smaller grains depending upon whether they were buying or selling.*

There are many things in life that we think we know—things that perhaps have been taken for granted. But these things often need to be re-examined; when this happens, new discoveries are made.

The simple numbers familiar to children are easily taken for granted. But progression to higher levels of mathematics requires looking again at those numbers, asking questions about them, defining them precisely, and classifying them to be sure that different operations can be performed with them.

Algebra 1 deals with numbers classified as the **real numbers.** That may sound odd, but there are actually numbers called *imaginary numbers* that will be taught in Algebra 2.

## Categories of Real Numbers

**Rational Numbers** ► all the numbers that can be expressed as a quotient of two integers. In other words, these numbers can be expressed as fractions (denominator cannot be 0). All positive and negative whole numbers, mixed numbers, fractions, terminating and repeating decimals can be expressed as fractions, so they are all rational numbers.

$5, \frac{1}{2}, -\frac{7}{1}, 4\frac{1}{2},$
$1.5, 0.\overline{36}$

*Natural Numbers* ► the counting numbers with which the study of math begins.

1, 2, 3, 4 . . .

*Whole Numbers* ► the counting numbers *plus* 0. (counting never begins with 0).

0, 1, 2, 3, 4 . . .

*Integers* ► the whole numbers *and* their opposites (the negative numbers). Zero does not have an opposite.

. . . −3, −2, −1, 0, 1, 2 . . .

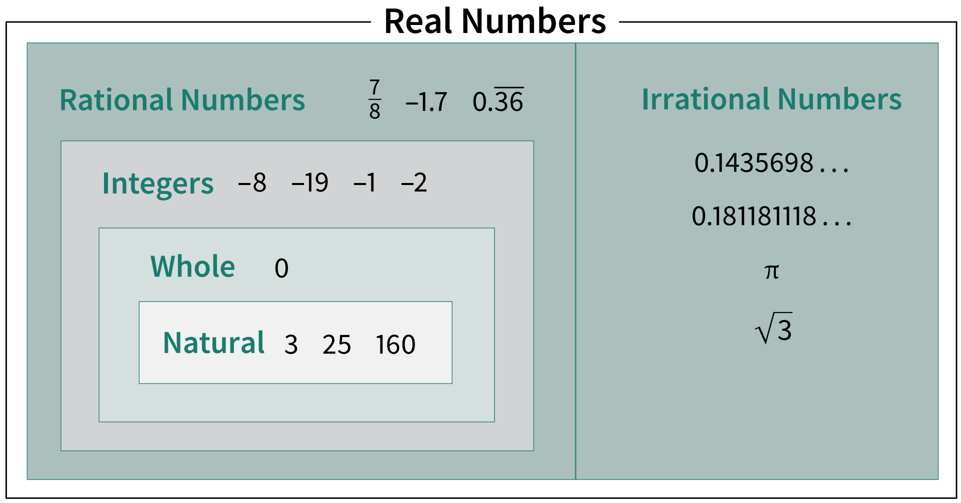
**Irrational Numbers** ► the numbers that cannot be *expressed* as a quotient of two integers. In decimal form these are non-terminating and non-repeating.

2.645751311 . . . , π

The diagram on the next page shows all the classifications of real numbers. The two largest sets of real numbers are rational and irrational numbers. Rational numbers are further broken down into the subsets of integers, whole numbers, and natural numbers.

The diagram illustrates that a number such as 25 is a natural number, a whole number, an integer, and a rational number.

Numbers that are non-terminating and non-repeating are usually written with an ellipsis (. . .).
Example: 8.1743 . . .




The set of whole numbers beginning with 1 that is used for counting are called *natural numbers*. For example, the days of the months on a calendar are natural numbers. They do not include 0, negative numbers, decimals, or fractions. However, the numbers used for the days of the months that are above 31 is a null or **empty set** because no month has over 31 days. The symbol for the empty or null set is {} or (ø).

It is incorrect to write both symbols together like this {ø}.

## Today's Lesson

**Write every real-number category in which the numbers can be classified.**

1. −473 ____________________
2. 0 ____________________
3. $\frac{1}{2}$ ____________________
4. 3.1415926 . . . ____________________
5. 0.677____________________
6. $1.\overline{6}$ ____________________
7. 18 ____________________
8. −4 ____________________

**Write the answer. If no answer is possible, write ø (the empty set).**

9. Which months have 32 days? ____________________
10. List the first five counting numbers. ____________________
11. Write an irrational number. ____________________
12. Write a proper fraction that is a natural number. ____________________
13. Write a mixed number that is a rational number. ____________________
14. Write the number that is a whole number but not a natural number. ______
15. Can a number be a member of all five real number categories? ____________

"The only way to learn mathematics is to do mathematics."
*Paul Halmos*

16. Can a decimal be an integer and have a value between 1 and 2?

______________________________

**Write the answer.**

17. Albert wanted to calculate the circular area watered by his irrigation system. He used the formula $\pi r^2$ where $r$ is the radius and $\pi = 3.14159265358979323846264338327 95\ldots$ In what real-number category does $\pi$ belong?

______________________________

18. Since it is impossible to type an infinitely long number into a calculator, Albert decided to use the fraction $\frac{22}{7}$ in the area formula instead of the number $\pi$. He can do this since $\frac{22}{7}$ is close to $\pi$. In what real-number category does $\frac{22}{7}$ belong?

______________________________

**Write** *rational numbers, integers, whole numbers, natural numbers,* **or** *irrational numbers.*

19. Which category contains numbers that can be expressed as a quotient of two integers? ______________________________

20. Which category contains the counting numbers plus 0?

______________________________

21. Which category contains numbers that cannot be expressed as a quotient of two integers? ______________________________

22. Which category contains the counting numbers?

______________________________

23. Which category contains whole numbers and their opposites?

______________________________

### Math in History

*In colonial America, systems of measurement varied. A bushel in Connecticut weighed 28 pounds, while a New Jersey bushel weighed 32 pounds.*

1.2

# Graphing Real Numbers; Absolute Values

## Words to Know

**absolute value:** the distance of a number from zero

**opposites:** a positive and a negative number with the same absolute value

**evaluate:** to find the value of an expression by completing the mathematical operations

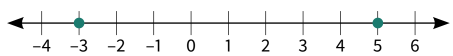
**simplify:** to perform all mathematical operations

> "The study of mathematics, like the Nile, begins in minuteness but ends in magnificence."
>
> *Charles Colton*

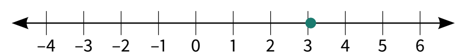
The value of any real number can be visually shown or graphed using a number line. A number line is a straight line divided into equal segments. Number line segments are usually labeled with integers, but segments can also be labeled with fractions or decimals such as halves, fourths, tenths, etc.

To graph a number, a dot is placed on the number line that corresponds to the value of the number.

graph of –3 and +5

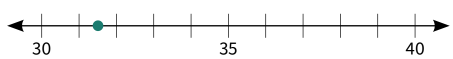



graph of π (3.141592 . . .)




The labeling of the segments on a number line depends on the precision or exactness needed to show the value being graphed. As an example, for graphing 31.5, labeling the segments with tenths allows the highest accuracy and makes it unnecessary to estimate the location.

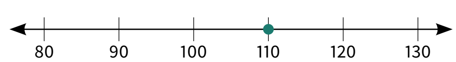
graphs of 31.5 using different precisions



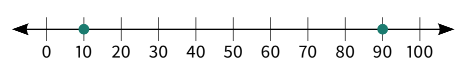


The labeling of a number line also depends on the size and range of the numbers used. For graphing the number 110, labeling could begin with 80 and end with 130. For graphing two numbers that have a wide range, such as 10 and 90, labeling could start with 0, end with 100, and segments could be labeled in increments of 10.

graph of 110



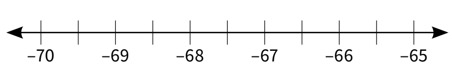

graph of 10 and 90



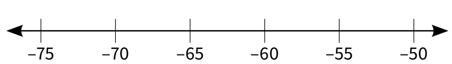

## Today's Lesson

**Graph –67.5 on each line.**

**1.**




**2.**



## Absolute Values

The **absolute value** of a number is its distance from zero. The numbers 4 and –4 are 4 units from zero. Therefore both of them have an absolute value of 4.

Regardless of whether a number is positive or negative, its absolute value is a positive number.

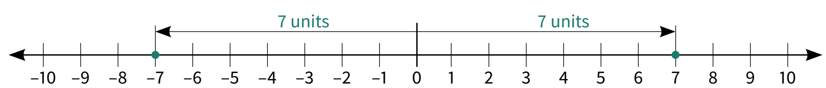
A vertical line on each side of a number indicates that the absolute value of the number is used. The absolute value of –18 is written $|-18|$.

***Rules*** **Absolute Value**

- $|6| = 6$ The absolute value of 6 is 6.
- $|-6| = 6$ The absolute value of –6 is 6.
- $|n|$ means "the absolute value of the number *n*."

## Opposites

Every real number except zero has a "twin" that has the same absolute value. For every negative number, there is a positive number that has the same absolute value. For every positive number, there is a negative number with the same absolute value. The absolute value of zero is zero.




$|-7| = 7$ $|7| = 7$

These pairs of numbers are called **opposites**, because they are the same distance from 0 (same absolute value), but in opposite directions.

–7 is opposite of 7 7 is opposite of –7

**Math in History**

*In 1824, Parliament replaced its standard yardstick with a new one, which became the first imperial standard for the yardstick. The standard's short official life ended at 9 years and 198 days in 1834 when it was damaged in a fire that burned down both houses of Parliament. Not until 1855, twenty-one years later, was a new standard adopted.*

## Today's Lesson

**Evaluate.**

**3.** $|51|$ ______ **4.** $|-4.5|$ ______ **5.** $|1{,}298|$ ______

**6.** $|-12|$ ______ **7.** $\left|-\frac{3}{8}\right|$ ______ **8.** $|-89.023|$ ______

**Write the pairs of numbers that have these absolute value(s).**

**9.** 17 ______________ **10.** 5 ______________ **11.** 2,784 ______________

## Absolute Values in Expressions

To **evaluate** an expression that contains absolute values, find the absolute values first and then **simplify.**

*Example* 1 **Evaluate: $|16| + |-43|$ and $|-69| - 38$.**

| | | |
|---|---|---|
| $\lvert 16 \rvert + \lvert -43 \rvert$ | Original problem. | $\lvert -69 \rvert - 38$ |
| $16 + 43$ | Absolute values found. | $69 - 38$ |
| $59$ | Simplified. | $31$ |

> ‘Obvious’ is the most dangerous word in mathematics.
> *Eric Temple Bell*

When an absolute value symbol contains a mathematical operation, such as $|3 + 4|$, complete the operation within the absolute value symbols first. Then use the absolute value of the answer to simplify the expression.

*Example* 2 **Evaluate: $28 \div |8 - 4|$ and $|2 \bullet 8| - |-10|$.**

| | | |
|---|---|---|
| $28 \div \lvert 8 - 4 \rvert$ | Original problem. | $\lvert 2 \bullet 8 \rvert - \lvert -10 \rvert$ |
| $28 \div \lvert 4 \rvert$ | Absolute value operation completed. | $\lvert 16 \rvert - \lvert -10 \rvert$ |
| $28 \div 4$ | Absolute values found. | $16 - 10$ |
| $7$ | Simplified. | $6$ |

In algebra, a raised dot ($\bullet$) indicates multiplication and is preferred over the $\times$ symbol.

## Today’s Lesson

**Evaluate, working from left to right.**

**12.** $|-4| + |4|$

**13.** $7 \bullet |3 + 2|$

**14.** $|-9| + |-9|$

**15.** $|-7| - |-7|$

**16.** $|-26| \div |5 - 3|$

**17.** $10 + |-7| - |12|$

## REVIEW

**Follow the directions.** 1.1

**18.** Write an irrational number. ______

**19.** Write a number that is a whole number, an integer, and a rational number. ______

**20.** Write a whole number that cannot be a natural number. ______

**21.** Write the first five counting numbers you first learned about in elementary school. ______

**Write the answer.** 1.1

**22.** Bob knew how far it was from third base to home plate, but he wondered how far a baseball would need to be thrown from second base to home plate. To calculate the distance, he used $d = s\sqrt{2}$, the formula for finding the diagonal of a square. He used the distance from third base to home for $s$ and 1.414213562373… for $\sqrt{2}$. In what real-number category does $\sqrt{2}$ belong? ____________________

**23.** To simplify calculations, Bob rounded the $\sqrt{2}$ in the formula to 1.4142. In what real-number category does 1.4142 belong? ____________________

**Write the word(s) for each definition.**

**24.** the distance of a number from zero 1.2 ____________________

**25.** the category of all whole numbers and their opposites 1.1 ____________________

**26.** numbers that cannot be expressed as a quotient of integers 1.1 ____________________

**27.** numbers that can be expressed as a quotient of integers 1.1 ____________________

## Today's Lesson

**Write an integer to represent the number in each problem. Then write the opposite of the number and the absolute value of the number.** Each exercise has 3 answers.

**28.** The coldest part of the atmosphere, the mesosphere—tens of miles above the ground—can be as low as one hundred degrees below zero Celsius. __________ __________ __________

**29.** The hottest part of the atmosphere is the air surrounding a lightning strike, where the air can get as hot as thirty thousand degrees Celsius. __________ __________ __________

**Write the pairs of numbers that have these absolute values.**

**30.** 987 _______________ **31.** 16 _______________ **32.** 2 _______________

**Evaluate.**

**33.** $|10| + |-22|$ **34.** $|-5| + |15 - 9|$ **35.** $8 \bullet |-9|$ **36.** $8 + |21 - 3|$

## Extra Practice

**Evaluate.**

**37.** $|-6| - 6$ **38.** $6 + |-3|$ **39.** $|3| \bullet |-3| + |6 - 2|$

# 1.3 Real Number Properties; Fractions

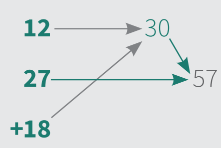
### Words to Know

**numerator:** the top number (dividend) in a fraction or rational expression

**denominator:** the bottom number (divisor) in a fraction or rational expression

**greatest common factor (GCF):** the largest number that can be divided evenly into both the numerator and the denominator

A practical application of the associative property can be used to add more than two numbers. Because it is difficult to mentally add more than two numbers in any one step, it is helpful to look for and pair (associate) addends that add up to multiples of ten first, then add the remaining number(s).




Lesson 1 defined and classified the real numbers used in Algebra 1. This lesson will define properties of real numbers. The properties are the foundation upon which the study and practice of algebra is built. In any construction endeavor, the building constructed is only as reliable as its foundation. This also applies to mathematics and is the reason for studying these properties.

### Properties of Addition

- **Commutative Property of Addition**

  Changing the order of addends does not change their sum. $a + b = b + a$ $\quad 2 + 3 = 3 + 2$

- **Identity Property of Addition**

  Adding zero to any number gives an identical number. $a + 0 = a$ $\quad 8 + 0 = 8$

- **Associative Property of Addition**

  Changing how numbers are associated (grouped) in addition does not change their sum. $(a + b) + c = a + (b + c)$ $\quad (3 + 5) + 7 = 3 + (5 + 7)$

- **Inverse Property of Addition**

  Adding the opposite (additive inverse) to any number will always result in zero. $a + (-a) = 0$ $\quad 7 + (-7) = 0$

## Today's Lesson

**Write the name of the property each equation illustrates.**

1. $6 + (12 + 7) = (6 + 12) + 7$ ____________________
2. $8 + (-8) = 0$ ____________________
3. $4 + 3 = 3 + 4$ ____________________
4. $2 + 0 = 2$ ____________________

**Write the missing number for each equation, then write the name of the property it illustrates.**

***Example:*** ____ $+ (-12) = 0$ 12, inverse property of addition

5. $4{,}897 +$ ____ $= 4{,}897$ ____________________
6. $45 + (21 + 5) = ($____ $+ 21) + 5$ ____________________
7. ____ $+ (-62) = 0$ ____________________
8. $43 +$ ____ $= 89 + 43$ ____________________

The zero property of multiplication can simplify problems. No matter how many factors are in a list, if there is just one zero, the product will be zero.

$358 \bullet 31 \bullet 2981 \bullet 0 = 0$

reciprocal

$\frac{3}{1}$ $\frac{1}{3}$

Be sure to memorize the properties on this page and the previous page.

## Properties of Multiplication

**Commutative Property of Multiplication**

Changing the order of factors does not change their product.

$a \bullet b = b \bullet a$
$2 \bullet 3 = 3 \bullet 2$

**Identity Property of Multiplication**

Multiplying any number by 1 gives an identical number.

$a \bullet 1 = a$
$8 \bullet 1 = 8$

**Associative Property of Multiplication**

Changing how numbers are associated (grouped) in multiplication does not change their product.

$(a \bullet b) \bullet c = a \bullet (b \bullet c)$
$(3 \bullet 5) \bullet 7 = 3 \bullet (5 \bullet 7)$

**Zero Property of Multiplication**

Multiplying any number by 0 results in zero.

$a \bullet 0 = 0$
$9 \bullet 0 = 0$

**Inverse Property of Multiplication**

Multiplying any nonzero number by its **reciprocal** will always result in 1.

$a \bullet \frac{1}{a} = 1$
$7 \bullet \frac{1}{7} = 1$

## Today's Lesson

**Write the name of the property each equation illustrates.**

**9.** $25 \bullet 1 = 25$ ______________________

**10.** $12 \bullet \frac{1}{12} = 1$ ______________________

**11.** $33 \bullet 0 = 0$ ______________________

**12.** $9 \bullet 3 = 3 \bullet 9$ ______________________

**13.** $5(7 \bullet 4) = (5 \bullet 7) \bullet 4$ ______________________

**Write the missing number for each equation, then write the name of the property it illustrates.**

**14.** $16 \bullet$ ______ $= 1$ ______________________

**15.** $368 \bullet$ ______ $= 0$ ______________________

**16.** $7 \bullet$ ______ $= 7$ ______________________

**17.** ______ $\bullet\ 4.3 = 4.3 \bullet 2.9$ ______________________

**18.** $9 \bullet (6 \bullet 8) = (9 \bullet$ ______ $) \bullet 8$ ______________________

In algebra, working with improper fractions is usually easier than working with mixed numbers.

## Fractions

Fractions show a relationship between two numbers using division. Fractions are written with a fraction bar between the **numerator** (dividend) and the **denominator** (divisor).

| Writing a Fraction | Fractions show division | Mixed number |
|---|---|---|
| fraction bar → $\frac{3}{5}$ ← Numerator ← Denominator | $6 \div 2 = \frac{6}{2}$ ← Dividend ← Divisor | $4\frac{3}{5}$ |

Fractions may be classified as proper or improper. Improper fractions have numerators equal to or larger than their denominators.

| Proper Fractions | Improper Fractions |
|---|---|
| $\frac{5}{8}$ $\frac{1}{6}$ $\frac{8}{15}$ | $\frac{4}{4}$ $\frac{15}{2}$ $\frac{9}{1}$ |

Improper fractions may be converted to whole or mixed numbers. The reverse is also true—whole numbers and mixed numbers may be converted to improper fractions.

**Example 1** **Convert an improper fraction to a whole or mixed number.**

$\frac{18}{7}$ Original problem.

$18 \div 7 = 2\text{ R}4$ Numerator divided by denominator.

$2\frac{4}{7}$ Quotient written as whole number. Remainder written as numerator over the original denominator.

**Example 2** **Convert a mixed number to an improper fraction.**

$5\frac{2}{3}$ Original problem.

$5 \bullet 3 + 2 = 17$ Whole number multiplied by denominator and numerator added.

$\frac{17}{3}$ Resulting number written as numerator over the original denominator.

An equivalent fraction is a fraction of equal value but with a different denominator. They may be formed by multiplying both the numerator and the denominator by the same factor.

An equivalent fraction can be formed when a specific denominator is given. First find the factor that the original denominator must be multiplied by to yield the given denominator. Then, multiply the original numerator and denominator by that factor.

### Math in History

*Early number systems were based on 10, the result of using 10 fingers to count. However, because 10 can only be divided evenly by 2, 5, and 10, trading quantities in these systems were limited to the subdivisions of ½, ⅕, and ⅒.*

**Example 3** **Finding an equivalent for a given denominator.**

$\frac{3}{4} = \frac{?}{12}$ Original problem.

$\frac{3}{4 \times 3} = \frac{?}{12}$ 4 must be multiplied by 3 to yield 12.

$\frac{3 \times 3}{4 \times 3} = \frac{9}{12}$ Numerator and denominator multiplied by 3.

A fraction is reduced by dividing both the numerator and the denominator by the same factor. To reduce a fraction to lowest terms, divide the numerator and the denominator by their **greatest common factor (GCF).**

**Example 4** **Reducing fractions to lowest terms.**

$\frac{18}{24}$ Original problem.

GCF = 6 Largest number that divides evenly into numerator and denominator.

$\frac{18 \div 6}{24 \div 6} = \frac{3}{4}$ Numerator and denominator divided by 6.

Answers for fraction problems should be reduced so that the answer is in lowest terms.

## Today's Lesson

**Convert to whole or mixed numbers.**

**19.** $\frac{28}{3}$ **20.** $\frac{7}{1}$ **21.** $\frac{36}{6}$

**Convert to improper fractions.**

**22.** $4\frac{3}{5}$ **23.** 5 **24.** $2\frac{7}{9}$

**Form equivalent fractions.**

**25.** $\frac{3}{5} = \frac{?}{10}$ **26.** $\frac{3}{4} = \frac{?}{12}$ **27.** $\frac{2}{5} = \frac{?}{15}$

**Reduce to lowest terms.**

**28.** $\frac{2}{8}$ **29.** $\frac{8}{12}$ **30.** $\frac{12}{30}$

## REVIEW

**Evaluate.** 1.2

**31.** $|-29|$ **32.** $|-9| \div |-3|$ **33.** $|78 - 21|$

**Write an integer to represent the number in each problem. Then write the opposite of the number and the absolute value of the number.** Each exercise has 3 answers.

**34.** The thickest ice measured on earth is over Wilkes Land, Antarctica, where the ice is roughly fifteen thousand, six hundred sixty-nine feet thick. 1.1, 1.2

______ ______ ______

**35.** The deepest part of the ocean occurs at the Mariana Trench in the Pacific. At one place in the Mariana Trench, the ocean floor was measured to be thirty-five thousand, seven hundred ninety-seven feet below sea level. 1.1, 1.2

______ ______ ______

**Write every real-number category in which the numbers can be classified.** 1.1

**36.** 3.7 ______

**37.** 22 ______

**38.** 4.7168593. . . ______

**39.** 0 ______

**Write the word(s) for each definition.**

**40.** the category of all whole numbers and their opposites 1.1 ______

**41.** the distance of a number from zero 1.2 ______

## Today's Lesson

**Write an equation to illustrate the properties using the variables** *a, b,* **and** *c,* **as needed.**

**42.** inverse property of addition ______

**43.** associative property of addition ______

**44.** commutative property of addition ______

**45.** commutative property of multiplication ______

**46.** associative property of multiplication ______

**47.** identity property of addition ______

**48.** inverse property of multiplication ______

**49.** identity property of multiplication ______

**Convert to improper fractions.**

**50.** 32

**51.** $12\frac{3}{4}$

**52.** $5\frac{3}{8}$

**Convert improper fractions to whole or mixed numbers and reduce to lowest terms.**

53. $\frac{75}{3}$

54. $\frac{27}{8}$

55. $\frac{15}{9}$

56. $\frac{22}{8}$

**Form equivalent fractions.**

57. $\frac{7}{8} = \frac{?}{24}$

58. $\frac{3}{7} = \frac{?}{21}$

59. $\frac{2}{9} = \frac{?}{63}$

60. $\frac{5}{6} = \frac{?}{30}$

## Extra Practice

**Convert improper fractions to whole or mixed numbers and reduce to lowest terms.**

61. $\frac{12}{8}$

62. $\frac{40}{15}$

63. $\frac{14}{4}$

64. $\frac{25}{10}$

**Convert to improper fractions.**

65. $125$

66. $8\frac{1}{3}$

67. $4\frac{3}{4}$

68. $16\frac{2}{3}$

**Form equivalent fractions.**

69. $\frac{5}{7} = \frac{?}{56}$

70. $\frac{7}{8} = \frac{?}{72}$

71. $\frac{3}{5} = \frac{?}{45}$

72. $\frac{1}{4} = \frac{?}{28}$

# How to Use this Full Solution Answer Key

### Full Solution Key

The full solution answer key provides answers to all Algebra 1 exercises. It gives detailed solutions for most exercises to make it easier for students, teachers, and parents to find errors in calculations. The original problem is given in black. Steps for simplifying and solving are in gray and final answers in bold black.

### Simplify, Solve, or Evaluate?

In this course, simplify means to remove grouping symbols and combine like terms. Solve means to find the numerical values of the variables in an equation. Evaluate means to find the numerical value of an expression.

### Exercise Coding

Direction lines are followed with a code telling where the concept was taught. 1.1 means Unit 1, Lesson 1; 1.7 means Unit 1, Lesson 7.

### Value for π

Use 3.14 as the numerical value for π unless directed otherwise.

### Rounding

Unless otherwise directed in the exercise, when doing calculations that result in decimals that do not terminate at tenths or hundredths, round to the nearest hundredth.

### Reporting Equation Answers

This solution key will generally report the answer with the variable on the left, regardless of the side the variable occurs in solving the equation.

### Terms in the Text

Italicized words in the text call attention to important concepts and terms that are not in the glossary. Bold words are Words to Know and their definitions are found in the margin of the lesson they first occur and the glossary at the back of the textbook.

### Rules, Properties, and Steps in the Text

Rules, properties, and steps for completing a process are set off in boxes. The sticky notes in the margins contain information students need to know. Other information in the sidebars are Words to Know, applications of algebra and interesting historical math facts that are related to the chapter theme.

### Tests and Quizzes

Tests and quizzes are designed for the student to write on. Each quiz is one two-sided sheet. Tests are usually three pages. Each test and quiz has a total of 100 points. Points allotted for each problem are shown at the end of each direction line. When students have the wrong answer, but did part of the work correctly, credit should be given based on how much they did correctly.

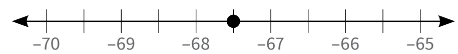
It is suggested that to calculate a final unit score, average the two quiz grades, then add the test score and divide by two.

# Unit 1

## Lesson 1.1 – pp. 3-4

1. **integers, rational numbers**
2. **whole numbers, integers, rational numbers**
3. **rational numbers**
4. **irrational numbers**
5. **rational numbers**
6. **rational numbers**
7. **natural numbers, whole numbers, integers, rational numbers**
8. **integers, rational numbers**
9. **ø**
10. **1, 2, 3, 4, 5**
11. Examples: $\pi$, $\sqrt{3}$, 2.23606 . . .
12. **ø**
13. **Any mixed number is correct.** Example: $2\frac{3}{4}$
14. **0**
15. **ø** OR **no**
16. **ø** OR **no**
17. **irrational numbers**
18. **rational numbers**
19. **rational numbers**
20. **whole numbers**
21. **irrational numbers**
22. **natural numbers**
23. **integers**

## Lesson 1.2 – pp. 5-8

1. 


   **–67.5**

2. 


   **–67.5**

3. $|51| =$ **51**
4. $|-4.5| =$ **4.5**
5. $|1{,}298| =$ **1,298**
6. $|-12| =$ **12**
7. $\left|\frac{3}{8}\right| =$ $\mathbf{\frac{3}{8}}$
8. $|-89.023| =$ **89.023**
9. **17, –17**
10. **5, –5**
11. **2,784; –2,784**
12. $|-4| + |4|$
    $4 + 4$
    **8**
13. $7 \bullet |3 + 2|$
    $7 \bullet |5|$
    $7 \bullet 5$
    **35**
14. $|-9| + |-9|$
    $9 + 9$
    **18**
15. $|-7| - |-7|$
    $7 - 7$
    **0**

**16.** $|-26| \div |5 - 3|$
$26 \div |2|$
$26 \div 2$
**13**

**17.** $10 + |-7| - |12|$
$10 + 7 - 12$
**5**

**18.** **Any non-terminating or non-repreating number.** Examples: $\pi$, $\sqrt{2}$

**19.** **Any positive number or 0.**

**20.** **0**

**21.** **1, 2, 3, 4, 5**

**22.** **irrational**

**23.** **rational**

**24.** **absolute value**

**25.** **integers**

**26.** **irrational**

**27.** **rational**

**28.** **–100°; 100°; 100**

**29.** **30,000°; –30,000°; 30,000**

**30.** **987; –987**

**31.** **16; –16**

**32.** **32; –32**

**33.** $|10| + |-22|$
$10 + 22$
**32**

**34.** $|-5| + |15 - 9|$
$5 + |6|$
$5 + 6$
**11**

**35.** $8 \bullet |-9|$
$8 \bullet 9$
**72**

**36.** $8 + |21 - 3|$
$8 + |18|$
$8 + 18$
**26**

**37.** $|-6| - 6$
$6 - 6$
**0**

**38.** $6 + |-3|$
$6 + 3$
**9**

**39.** $|3| \bullet |-3| + |6 - 2|$
$3 \bullet 3 + |4|$
$9 + 4$
**13**

## *Lesson 1.3 – pp. 9-13*

**1.** **associative property of addition**

**2.** **inverse property of addition**

**3.** **commutative property of addition**

**4.** **identity property of addition**

**5.** **0; identity property of addition**

**6.** **45; associative property of addition**

**7.** **62; inverse property of addition**

**8.** **89; commutative property of addition**

**9.** **identity property of multiplication**

**10.** **inverse property of multiplication**

**11.** **zero property of multiplication**

**12.** **commutative property of multiplication**

**13.** **associative property of multiplication**

**14.** $\frac{1}{16}$**; inverse property of multiplication**

**15.** **0; zero property of multiplication**

16. **1; identity property of multiplication**

17. **2.9; commutative property of multiplication**

18. **6; associative property of multiplication**

19. $\frac{28}{3}$

    $28 \div 3 = 9 \text{ R}1$

    $\mathbf{9\frac{1}{3}}$

20. $\frac{7}{1} = \mathbf{7}$

21. $\frac{36}{6}$

    $36 \div 6 = \mathbf{6}$

22. $4\frac{3}{5}$

    $4 \bullet 5 + 3 = 23$

    $\mathbf{\frac{23}{5}}$

23. $5 = \mathbf{\frac{5}{1}}$

24. $2\frac{7}{9}$

    $2 \bullet 9 + 7 = 25$

    $\mathbf{\frac{25}{9}}$

25. $\frac{3}{5} = \frac{?}{10}$

    $\frac{3 \times 2}{5 \times 2} = \mathbf{\frac{6}{10}}$

26. $\frac{3}{4} = \frac{?}{12}$

    $\frac{3 \times 3}{4 \times 3} = \mathbf{\frac{9}{12}}$

27. $\frac{2}{5} = \frac{?}{15}$

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

28. $\frac{2}{8}$

    $\frac{2 \div 2}{8 \div 2} = \mathbf{\frac{1}{4}}$

29. $\frac{8}{12}$

    $\frac{8 \div 4}{12 \div 4} = \mathbf{\frac{2}{3}}$

30. $\frac{12}{30}$

    $\frac{12 \div 6}{30 \div 6} = \mathbf{\frac{2}{5}}$

31. $|-29| = \mathbf{29}$

32. $|-9| \div |-3| = 9 \div 3 = \mathbf{3}$

33. $|78 - 21| = |57| = \mathbf{57}$

34. **15,669; –15,669; 15,669**

35. **–35,797; 35,797; 35,797**

36. **rational numbers**

37. **natural numbers, whole numbers, integers, rational numbers**

38. **irrational numbers**

39. **whole numbers, integers, rational numbers**

40. **integers**

41. **absolute value**

42. $\mathbf{a + (-a) = 0}$

43. $\mathbf{(a + b) + c = a + (b + c)}$

44. $\mathbf{a + b = b + a}$

45. $\mathbf{a \bullet b = b \bullet a}$

46. $\mathbf{(a \bullet b) \bullet c = a \bullet (b \bullet c)}$

47. $\mathbf{a + 0 = a}$

48. $\mathbf{a \bullet \frac{1}{a} = 1}$

49. $\mathbf{a \bullet 1 = a}$

50. $32 = \mathbf{\frac{32}{1}}$

51. $12\frac{3}{4}$

    $12 \bullet 4 + 3 = 51$

    $\mathbf{\frac{51}{4}}$

52. $5\frac{3}{8}$

    $5 \bullet 8 + 3 = 43$

    $\mathbf{\frac{43}{8}}$

53. $\frac{75}{3}$

    $75 \div 3 = \mathbf{25}$

**54.** $\frac{27}{8}$

$27 \div 8 = 3 \text{ R}3$

$\mathbf{3\frac{3}{8}}$

**55.** $\frac{15}{9}$

$15 \div 9 = 1 \text{ R}6$

$1\frac{6}{9} = \mathbf{1\frac{2}{3}}$

**56.** $\frac{22}{8}$

$22 \div 8 = 2 \text{ R}6$

$2\frac{6}{8} = \mathbf{2\frac{3}{4}}$

**57.** $\frac{7}{8} = \frac{?}{24}$

$\frac{7 \times 3}{8 \times 3} = \mathbf{\frac{21}{24}}$

**58.** $\frac{3}{7} = \frac{?}{21}$

$\frac{3 \times 3}{7 \times 3} = \mathbf{\frac{9}{21}}$

**59.** $\frac{2}{9} = \frac{?}{63}$

$\frac{2 \times 7}{9 \times 7} = \mathbf{\frac{14}{63}}$

**60.** $\frac{5}{6} = \frac{?}{30}$

$\frac{5 \times 5}{6 \times 5} = \mathbf{\frac{25}{30}}$

**61.** $\frac{12}{8}$

$12 \div 8 = 1 \text{ R}4$

$1\frac{4}{8} = \mathbf{1\frac{1}{2}}$

**62.** $\frac{40}{15}$

$40 \div 15 = 2 \text{ R}10$

$2\frac{10}{15} = \mathbf{2\frac{2}{3}}$

**63.** $\frac{14}{4}$

$14 \div 4 = 3 \text{ R}2$

$3\frac{2}{4} = \mathbf{3\frac{1}{2}}$

**64.** $\frac{25}{10}$

$25 \div 10 = 2 \text{ R}5$

$2\frac{5}{10} = \mathbf{2\frac{1}{2}}$

**65.** $125 = \mathbf{\frac{125}{1}}$

**66.** $8\frac{1}{3}$

$8 \bullet 3 + 1 = 25$

$\mathbf{\frac{25}{3}}$

**67.** $4\frac{3}{4}$

$4 \bullet 4 + 3 = 19$

$\mathbf{\frac{19}{4}}$

**68.** $16\frac{2}{3}$

$16 \bullet 3 + 2 = 50$

$\mathbf{\frac{50}{3}}$

**69.** $\frac{5}{7} = \frac{?}{56}$

$\frac{5 \times 8}{7 \times 8} = \mathbf{\frac{40}{56}}$

**70.** $\frac{7}{8} = \frac{?}{72}$

$\frac{7 \times 9}{8 \times 9} = \mathbf{\frac{63}{72}}$

**71.** $\frac{3}{5} = \frac{?}{45}$

$\frac{3 \times 9}{5 \times 9} = \mathbf{\frac{27}{45}}$

**72.** $\frac{1}{4} = \frac{?}{28}$

$\frac{1 \times 7}{4 \times 7} = \mathbf{\frac{7}{28}}$

## Lesson 1.4 – pp. 15-16

**1.** $\frac{1}{5} + \frac{3}{5} = \mathbf{\frac{4}{5}}$

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

$\frac{3 \times 3}{4 \times 3} = \frac{9}{12}$ $\qquad$ $\frac{1 \times 4}{3 \times 4} = \frac{4}{12}$

$\frac{9}{12} - \frac{4}{12} = \mathbf{\frac{5}{12}}$

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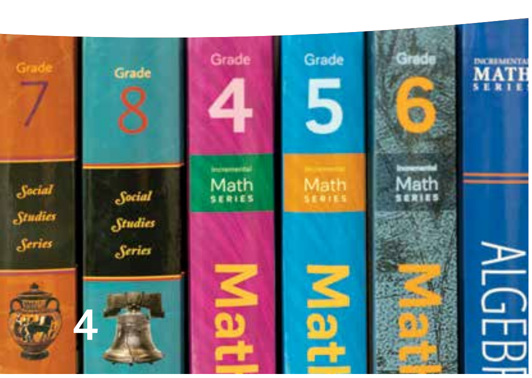


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