Algebra 1

Coursebook

Oak Meadow

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Introduction

Welcome to *Algebra 1*!

This course is designed for independent learning, so hopefully you will find it easy to navigate. However, it is assumed you will have an adult (such as a parent, tutor, or school-based teacher) supervising your work and providing support and feedback. We'll refer to this person as your teacher throughout this course. If you have a question about your work, ask your teacher for help.

Please read this entire course introduction before beginning lesson 1. This information will help you be more successful and get the most out of the course.

Course Materials

The following textbook is required for this course:

- *Algebra 1* by Elayn Martin-Gay (Pearson, 2016)

This textbook is accompanied by an online resource called MyMathLab (MML) that contains many helpful tools, such as instructional videos, chapter test prep videos, a detailed solution manual, and the digital textbook. Ask your teacher if you need help creating an MML account or accessing its many features. (Please note: The textbook refers to this resource as MyMathLab, but the website is now called MyLab Math. To match the textbook, in this course we'll use MyMathLab or MML to refer to this online resource.)

Note: MyMathLab is available for individual purchase for students using the course independently.

In addition, this course draws from a wide variety of online resources, all of which can be accessed through the Oak Meadow website at the following link:

"Curriculum Links"

oakmeadow.com/curriculum-links

Bookmark this page for easy access to all the online resources mentioned in the activities.

Course Organization

This course is organized into ten lessons that correspond to the ten chapters in the textbook. Each lesson is divided into two parts, which allows you to submit work to your teacher and get feedback approximately every two weeks.

In addition, there is one optional bonus unit included after the last lesson. If time allows, you are encouraged to complete part or all of this unit for extra enrichment at the end of the course. Please consult with your teacher first.

When you begin each lesson, take a few minutes to look over all the assignments and activity options. This will help you plan your time accordingly. Use the assignment checklist at the beginning of each lesson to check off tasks as you complete them so you can see at a glance what you still need to do.

Following the schedule suggested below will allow you to successfully complete the course within a ten-month school year.

Lesson and Textbook Chapter Title	Section	Time to Complete (weeks)
1. Review of Real Numbers	Part 1	1
	Part 2	1
2. Solving Equations and Problem-Solving	Part 1	2
	Part 2	2
3. Graphs and Functions	Part 1	2
	Part 2	2
4. Solving Inequalities and Absolute Value Equations	Part 1	1.5
	Part 2	1.5–2
5. Solving Systems of Linear Equations and Inequalities	Part 1	1.5
	Part 2	2.5
6. Exponents and Polynomials	Part 1	2
	Part 2	2
7. Factoring Polynomials	Part 1	2.5–3
	Part 2	1–1.5
8. Rational Expressions	Part 1	2.5
	Part 2	1.5
9. Roots, Radicals, and Trigonometric Ratios	Part 1	1.5
	Part 2	1.5

Lesson and Textbook Chapter Title	Section	Time to Complete (weeks)
10. Quadratic Equations	Part 1	1.5
	Part 2	1.5

Lessons include the following components:

Exploratory activities appear at the beginning of each textbook chapter. These activities are a chance to assess what you already know and to play with the ideas in a lesson before the textbook tells you much about them. Complete these activities first, and then check your answers in the appendix of this coursebook.

Exercise sets, found in the textbook, help you develop necessary skills. Please work on them daily, check your answers using the answer key at the back of the textbook or the online solution manual, and correct the problems where you made mistakes. **It is essential that you review and correct any problems you answered incorrectly before moving forward in the lesson.** Otherwise, you won't know whether or not you understand the ideas in the lesson. If you are not sure how to correct a mistake, please reach out to your teacher for help.

Chapter tests are found in the textbook at the end of each chapter. After completing a chapter test, you or a supervising adult will grade it and mark the score at the top, such as 18/20. Then, review any mistakes and make necessary corrections. (Students working with a school-based teacher may also be given a different test, which only the teacher will have the answers for.)

Activities are designed to help you apply your learning in new ways and to promote critical and creative thinking. You will be given opportunities to explore real-world applications, dive deeper into concepts with technology, analyze concepts from a historical and cultural perspective, apply math concepts artistically, look at issues in society through a mathematical lens, explore financial applications of the concepts you have learned, and more. Most importantly, you get to choose the activity that is most appealing to you. Whether that means investigating a concept you enjoy, challenging yourself with something outside your comfort zone, or exploring your creative side, this is the time to take ownership over the direction of your learning!

Share Your Work provides a reminder of what to share with your teacher at the end of each lesson.

It is important that you always show your work and/or explain your thinking, wherever relevant, so your teacher can see where you are having difficulty and better support your learning.

Note: In order to be considered complete, math assignments need to include handwritten computations showing how you arrived at your final answer.

Information About Exercise Sets

- The exercise sets listed are suggestions. More or fewer problems can be done as needed. The textbook includes answers to odd-numbered problems in the exercise sets. You can do even-numbered problems for extra practice, but you will not be able to check your answers.
- If you have access to MyMathLab, you are strongly encouraged to check your work using the online solution manual, which has fully worked out solutions for each problem.
- Primarily, odd-numbered problems are assigned. Note that many assignments suggest completing every other odd (abbreviated "EO odd"), which refers to problems 1, 5, 9, 13, and so on. You may want to circle these problems in the textbook to make sure you are completing the correct ones.
- Concept Extensions can be found at the end of each problem set in the textbook for additional learning and challenges. There are some extension problems included in the assignment list, but you are encouraged to explore as many of these problems as you wish.
- There is a Standardized Test Practice section at the end of each chapter that provides practice for standardized testing. You might consider completing a few of these throughout the course.

Academic Expectations

You are expected to complete your work with integrity and always submit your own original work. The appendix contains important material that you will need to read and incorporate into your work throughout the year.

A Note About the Workload

Students vary greatly in terms of reading speed, reading comprehension, and computational abilities. Some may find the reading in this course takes longer than expected; others may find the math problems or activities take a great deal of time. In general, you can expect to spend about five hours per week. If you need more time to complete the work, you can modify some lessons to focus on fewer assignments or skip activities in some lessons to spend more time on other assignments. Modifications like these will allow you to produce work of a higher quality. Each lesson in this course can be customized to suit your needs.

Keep an eye on the workload as you progress through the course. Make adjustments so you have time for meaningful learning experiences rather than rushing to try to get everything done. Consult with your teacher when making adjustments to the workload.

We wish you a challenging and successful year of *Algebra 1*!

Lesson

1

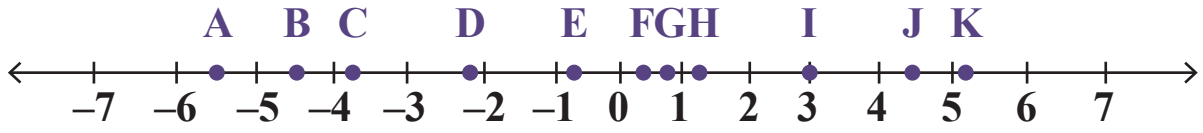
Part 1: Review of Real Numbers

ASSIGNMENT CHECKLIST

- ☐ Complete the exploratory activity.
- ☐ Complete the assigned problems in Exercise Sets 1.2–1.6.
- ☐ Choose an activity to complete:
  - Activity A: Integrated Review
  - Activity B: Get Creative with Sets of Real Numbers
  - Activity C: Think Outside the Box by Comparing Fractions with Reasoning
  - Activity D: Fill in the Blank—Dividing Fractions
  - Activity E: Matching—Translating Number Sentences

Exploratory Activity

Match the letters on the number line to the corresponding value listed below the number line.



$\frac{5}{4}$ -3.9 $5\frac{1}{5}$ -5.5 $\frac{9}{3}$ $\frac{4}{5}$ $-4\frac{1}{2}$ $-\frac{3}{4}$ 4.49 $-2\frac{1}{4}$ $\frac{1}{3}$

____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____

Which is bigger, the opposite of –9 or the opposite of 7?

Which number is closer to 0, –5.9 or –6.1?

Place these numbers in order from largest to smallest: –3.01 $-2\frac{99}{100}$ $-\frac{31}{10}$ –2.9 –3

Is there a number that you would find challenging to place on the number line?

When you have completed this activity, check your answers in the appendix of this coursebook.

Lesson Introduction

Suggested time: 1 week

The exploratory activity above shows some of the types of questions you are going to explore in lesson 1 as we begin to build the foundational skills you will need to be successful in Algebra 1 and subsequent courses.

As with anything new you are learning, it is important to start with the basics. In this lesson, we start with numbers—large numbers, small numbers, pieces of numbers—and explore different ways of comparing and combining them. We will investigate questions such as the following:

- What is an irrational number?
- What happens when I multiply a negative number by another negative number?
- Are there rules that can work for any number, no matter how big or small?

Let's get started!

Learning Objectives

Use the checklist below to track how your skills are developing over time, and identify skills that need more work as you progress through part 1 and part 2 of this lesson.

Skills	Notes
Translate sentences into mathematical expressions	
Simplify, add, subtract, multiply, and divide fractions, positive numbers, negative numbers, absolute value, and zero using the order of operations	
Compare numbers using appropriate symbols (<, =, >)	
Classify numbers into their appropriate subsets of real numbers	
Find the value of algebraic expressions when given the value of each variable	
Use the commutative, associate, distributive, identity, and inverse properties	
Interpret gains and losses in terms of positive and negative numbers	
Add and subtract matrices	

Exercise Sets

Read the following sections, and complete the accompanying problem sets. Plan to complete a portion each day. If you have online access to MyMathLab, you can watch the instructional videos as well.

As you complete each set of problems, check your answers using the answer key at the back of the textbook. Correct any problems where you made mistakes. If you need help, let your teacher know.

1. Read section 1.2, "Symbols and Sets of Numbers" (15), and then complete the following problems in Exercise Set 1.2.
    - ☐ 1–19 odd
    - ☐ 23–29 odd
    - ☐ 35–59 odd
    - ☐ 69–75 odd
2. Read section 1.3, "Fractions" (22), and then complete the following problems in Exercise Set 1.3.
    - ☐ 1–17 odd
    - ☐ 41–45 odd
    - ☐ 55–81 odd
    - ☐ 85 and 87
3. Read section 1.4, "Introduction to Variable Expressions and Equations" (33), and then complete the following problems in Exercise Set 1.4.
    - ☐ 1–41 odd
    - ☐ 57–61 odd
    - ☐ 65 and 67
    - ☐ 75–91 odd
4. Read section 1.5, "Adding Real Numbers" (41), and then complete the following problems in Exercise Set 1.5.
    - ☐ 1–61 every other (EO) odd
    - ☐ 65–81 odd
5. Read section 1.6, "Subtracting Real Numbers" (47), and then complete the following problems in Exercise Set 1.6.
    - ☐ 1–65 EO odd

Activities

Choose one of the following activities to complete.

- Activity A: Integrated Review
- Activity B: Get Creative with Sets of Real Numbers
- Activity C: Think Outside the Box by Comparing Fractions with Reasoning
- Activity D: Fill in the Blank—Dividing Fractions
- Activity E: Matching—Translating Number Sentences

Note: Many of the activities in this course contain reflection questions. You may choose to answer these questions in writing, as an audio recording, or as a video recording. Regardless of the method, make sure you thoroughly explain your answers. Please consult with your teacher if you have questions about how to submit audio or video recordings.

Activities can be assessed according to the criteria found in the rubric below.

	Notes
Problem-Solving and Precision Work is clear, organized, and detailed. Appropriate symbols, labels, units, and terminology are used.	
Reasoning and Explaining Symbols, words, and diagrams are interpreted with mathematical meaning. Prior knowledge is integrated into reasoning.	
Modeling and Using Tools Models, tools, and strategies are used to simplify, explain, give structure, and/or communicate a problem-solving strategy and a solution.	
Seeing Structure and Generalizing Structures and patterns are identified and extended to make generalizations and/or connections to prior learning.	

Activity A: Integrated Review

In your textbook, complete "Integrated Review: Operations on Real Numbers" on page 49, problems #1–45 odd. Show all your work. Check your answers thoroughly, and make corrections to any problems you missed.

Activity B: Get Creative with Sets of Real Numbers

In this chapter, you have learned about the different subsets of real numbers. Create a diagram that provides a visual representation of the relationship between the different sets of numbers. Your diagram can be as straightforward or creative as you'd like as long as the subsets are accurately depicted and everything is clearly labeled so that anyone looking at your diagram could understand it.

Your diagram must include and provide examples for the following categories:

- real numbers
- natural numbers
- whole numbers
- integers
- rational numbers
- irrational numbers

After you create your diagram, answer the following reflection questions.

1. What is your favorite part of your diagram?
2. What makes your diagram effective and useful to others?

Activity C: Think Outside the Box by Comparing Fractions with Reasoning

Compare the sizes of the following fractions using reasoning other than common denominators, reducing, cross-multiplying, or converting to decimals. Fill in the middle with the appropriate symbol (<, =, or >). Then, explain your reasoning for each problem using words, a visual representation, or both.

A. $\frac{16}{35}$ $\frac{37}{73}$

B. $\frac{17}{19}$ $\frac{19}{21}$

C. $\frac{17}{51}$ $\frac{15}{45}$

D. $\frac{37}{53}$ $\frac{36}{55}$

E. $\frac{5}{9}$ $\frac{14}{25}$

F. $\frac{11}{42}$ $\frac{8}{35}$

G. $\frac{21}{22}$ $\frac{22}{23}$

H. $\frac{34}{33}$ $\frac{65}{64}$

Activity D: Fill in the Blank—Dividing Fractions

Choose from the integers 1 through 12 to fill in the blue boxes in the following problem. You cannot use a number more than once.

$$\frac{\square}{\square} \div \frac{\square}{\square} = 6$$

1. Can you find two completely different solutions to this problem?
2. What strategies did you use to find your solutions?
3. Do you think there are other solutions? Why or why not?

Activity E: Matching—Translating Number Sentences

Match the following statements to the mathematical equation (boxes A through F) that best represents the situation, and use reasoning to determine the value of *x* that makes the statement true. For the equations that do not have a match, write a statement that would accurately represent them.

A $x + 2 = 8$	B $3x = 6$
C $2x - 3 = 9$	D $\frac{1}{3}x + 2 = 9$
E $3 \cdot 6 = x$	F $8x = 2$

1. Molly grabbed 6 pieces of gum from her bag, but her friend Sam had 3 times as many pieces of gum. How many pieces of gum did Sam have?
2. Mark scored 2 more points than Theo at the basketball game for a total of 8 points. How many points did Theo score?
3. Two more than one-third of the total number of flowers that Jesse picked was equal to the 9 flowers that Joel picked. How many flowers did Jesse pick?
4. A recipe calls for 3 cups of flour, but Juan uses 6 cups. What did he do to the recipe to achieve that?

SHARE YOUR WORK

When you have completed this portion of the lesson, please share the following work with your teacher.

- Exercise Sets 1.2–1.6 (showing handwritten computations and corrections)
- Choice of activity (labeled with the title of the activity):
    - Activity A: Integrated Review
    - Activity B: Get Creative with Sets of Real Numbers
    - Activity C: Think Outside the Box by Comparing Fractions with Reasoning
    - Activity D: Fill in the Blank—Dividing Fractions
    - Activity E: Matching—Translating Number Sentences

Make sure everything is labeled and you've included all your handwritten computations. If you have any questions about the work or how to share it, contact your teacher.

Lesson 1

Part 2: Review of Real Numbers

Lesson Introduction

Suggested time: 1 week

Lesson 1 continues with part 2. Refer to part 1 for learning objectives.

Exercise Sets

Read the following sections, and complete the accompanying problem sets. Plan to complete a portion each day. If you have online access to MyMathLab, you can watch the instructional videos as well.

As you complete each set of problems, check your answers using the answer key at the back of the textbook. Correct any problems where you made mistakes. If you need help, let your teacher know.

1. Read section 1.7, "Adding and Subtracting Matrices" (53), and then complete the following problems in Exercise Set 1.7.
    - 1–25 odd
2. Read section 1.8, "Multiplying and Dividing Real Numbers" (60), and then complete the following problems in Exercise Set 1.8.
    - 1–115 EO odd
3. Read section 1.9, "Properties of Real Numbers" (67), and then complete the following problems in Exercise Set 1.9.
    - 1–81 EO odd
4. Optional: If you would like more practice, you have the option of completing the following, doing as many problems as needed.
    - Chapter 1 Review and Vocabulary Check (76)
    - Chapter 1 Standardized Test Practice (80)

ASSIGNMENT CHECKLIST

- ☐ Complete the assigned problems in Exercise Sets 1.7–1.9.
- ☐ Complete the chapter 1 test.
- ☐ Choose an activity to complete:
    - Activity A: Error Analysis of the Commutative, Associative, Distributive, Inverse, and Identity Properties
    - Activity B: Math History—Maya Mathematics
    - Activity C: Calculating Percentages

Chapter Test

In your textbook, complete the chapter 1 test on page 79. After completing the test, you or a supervising adult will grade it and mark the score at the top (for instance, 18/20). Then, review any mistakes and make necessary corrections.

Activities

Choose one of the following activities to complete.

- Activity A: Error Analysis of the Commutative, Associative, Distributive, Inverse, and Identity Properties
- Activity B: Math History—Maya Mathematics
- Activity C: Calculating Percentages

Note: Many of the activities in this course contain reflection questions. You may choose to answer these questions in writing, as an audio recording, or as a video recording. Regardless of the method, make sure you thoroughly explain your answers. Please consult with your teacher if you have questions about how to submit audio or video recordings.

Activities can be assessed according to the criteria found in the rubric below.

	Notes
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Reasoning and Explaining Symbols, words, and diagrams are interpreted with mathematical meaning. Prior knowledge is integrated into reasoning.	
Modeling and Using Tools Models, tools, and strategies are used to simplify, explain, give structure, and/or communicate a problem-solving strategy and a solution.	
Seeing Structure and Generalizing Structures and patterns are identified and extended to make generalizations and/or connections to prior learning.	

Activity A: Error Analysis of the Commutative, Associative, Distributive, Inverse, and Identity Properties

Anisa gave answers to the following questions. Unfortunately, she got them all incorrect. For each problem, identify Anisa's mistake, explain how to solve the problem correctly, and give the correct answer.

1. What is the multiplicative inverse of $\frac{3}{4}$?

   Anisa: The multiplicative inverse of $\frac{3}{4}$ is $-\frac{3}{4}$ because it is the opposite number.

2. What is the additive identity for -3?

   Anisa: The additive identity for -3 is 1 because you add 1 for additive identities.

3. Use the commutative property of addition to finish the following statement:

   $9 + 4 =$ _____

   Anisa: $9 + 4 = 9 - 4$ because the commutative property means you can switch addition and subtraction.

4. Use the associative property of multiplication to finish the following statement:

   $(12 \times 3) \times 4 =$ _____

   Anisa: Using the associative property of multiplication, I got $(12 \times 3) \times 4 = 36 \times 4$.

5. Use the distributive property to finish the following statement: $-2(x - 5) =$ _____

   Anisa: Using the distributive property, I got $-2(x - 5) = -2x - 10$.

Activity B: Math History—Maya Mathematics

To look at how mathematics began, we have to go all the way back to the beginning of humankind and ponder some of the most basic questions: How did humans begin to count and understand quantity? How did they first represent numerical values in writing? When was the idea of zero, or "nothingness," conceived?

In thinking about the development of mathematics over time, many have often wondered if humans *invented* math or if they *discovered* it.

The Ishango Bone

The Ishango bone was discovered in 1960 in the Democratic Republic of Congo and is believed to be 20,000 years old. It is a four-inch baboon fibula with organized notches resembling tally marks in three rows to seemingly represent numbers. Their configuration is described in *Fibonacci's Rabbits and Forty-Nine Other Breakthroughs That Revolutionized Mathematics* as follows:

> "The top row has 7, 5, 5, 10, 8, 4, 6, and 3 (total 48). The second row has 9, 19, 21, and 11 (total 60). The third row has 19, 17, 13, and 11 (total 60)." (Hart-Davis 13)

Some have hypothesized that these numbers represented a six-month lunar calendar, a numerical game, or a counting system. There have been many patterns observed in the carved rows. For example, the first row from right to left takes 3, doubles it to 6; 4 then doubles to 8; and 10 then halves to 5. The numbers in the second row (left to right) could be represented as (10 – 1), (20 – 1), (20 + 1), and (10 + 1). The third row contains all the prime numbers between 10 and 20, even though it is unlikely humans at this time would have conceptualized prime numbers.

Even though we don't fully understand the Ishango bone—or older bones, such as the Lebombo, which dates back 44,000 years and has similar mathematical markings—it is clear that these first developments in counting by early humans began our mathematical journey.

View the link below to see a photograph of the Ishango bone:

"Mathematical Treasure: Ishango Bone"

www.maa.org/press/periodicals/convergence/mathematical-treasure-ishango-bone

Note: All the online resources used in this course can be accessed through the Oak Meadow website at oakmeadow.com/curriculum-links. Bookmark this page for easy access to all the online resources mentioned in the activities.

Counting in Base 10

Our current number system is base 10, meaning we have 10 digits (0 through 9) and each number position is 10 times the value to its right. There is strong evidence to suggest that this base system has its roots in the fact that ancient humans had 10 fingers on which they could count.

Sumerians (or Babylonians) who lived in Mesopotamia (modern-day Iraq) were the first to write down numerals around 3100 BCE. They used a base-60 system to count. We still see evidence of that today in the way we measure time (60 seconds in a minute, 60 minutes in an hour) and degrees in circles (360, which is 60 × 6).

You can learn more about the base-60 system at the link below:

"Sexagesimal"

en.wikipedia.org/wiki/Sexagesimal

In 3000 BCE, Egyptians developed a separate system for writing numbers using a base-10 system. The Chinese began using rods for calculations and counting over 2,500 years ago. They conceptualized the idea of zero by leaving a blank space and developed a color-coded system to represent positive (black) and negative (red) numbers. The decimal system we are familiar with today was established in India in the sixth century CE and further developed by the Arabs with the use of zero as a placeholder in the ninth century.

Learn more about the development of the concept of zero at the link below:

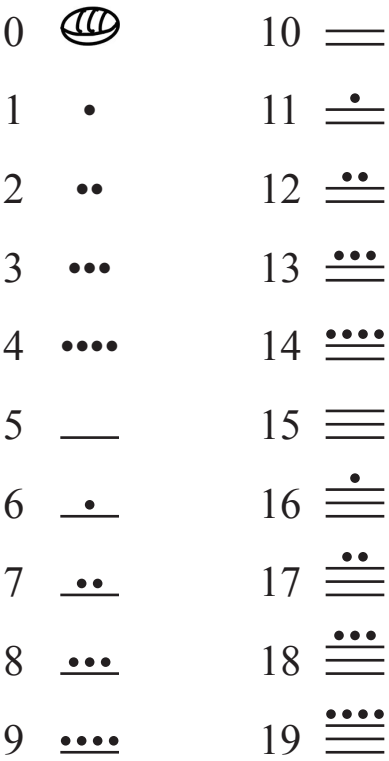
"Who Invented the Zero?"

www.history.com/news/who-invented-the-zero

Maya Mathematics

Now that you have a brief history of the development of real numbers, let's look closer at one ancient system of numerical representation. The Maya civilization (2000 BCE to 900 CE) in Central America developed a sophisticated numerical system and mathematical understanding independent of—and uninfluenced by—the rest of the world at the time. They used mathematics to understand astronomy and create an accurate calendar, developed complex accounting and calculation systems, and designated a symbol for zero.

The Maya used a vigesimal or base-20 system based on our 10 fingers and 10 toes. Below is a representation of their 20 symbols for the numbers 0 through 19.



They wrote numbers using a vertical system to represent each place value of 20. Examine the examples below to see how numbers can be broken down and represented in this system.

$27 = (1 \times 20) + 7 =$ •] 20^1 – 20s; ••] 20^0 – 1s — each level represents a power of 20

$435 = (1 \times 400) + (1 \times 20) + 15 =$ •] 20^2 – 400s; •] 20^1 – 20s; ≡] 20^0 – 1s

$3{,}146 = (7 \times 400) + (17 \times 20) + 6 =$ ••] 7 – 400s (2,800); ≡ ••] 17 – 20s (340); •] 6 – 1s (6)

You can explore Maya mathematics further at the link below:

"Maya Civilization"

www.historymuseum.ca/cmc/exhibitions/civil/maya/mmc05eng.html

1. Now it is your turn to try! Write the Maya representation of the following numbers. Include all your work, using the examples above as a model.
   a. 38
   b. 805
   c. 279
   d. 5,692
   e. 1,331
2. What would be the next level above the 400s row? How do you know?
3. What are some advantages and limitations of this system?
4. What would be different if the Maya used a base-7 system instead of a base-20 system?
5. How does the Maya system relate to your learning in chapter 1?

Activity C: Calculating Percentages

Complete the following activity from Next Gen Personal Finance to explore percentages in real-world budgeting situations. This activity covers percentages, discounts, budgeting, and translating number sentences.

1. Open the following document:

   "Math: Calculating Percentages"

   drive.google.com/file/d/1O25G2YV1acxV0HwMz7soHseFA2NRtVDz/view

2. Read the introduction, and watch the EdPuzzle video linked in the upper right corner.
3. Study the example problem in part 1 of the document, and then complete the practice problems in part 2 and the reflection questions in part 3. You can either print this document and complete your work directly on it or use a separate sheet of paper to answer all the questions.

   Remember to show all your work and answer the reflection questions.

SHARE YOUR WORK

When you have completed this portion of the lesson, please share the following work with your teacher.

- Exercise Sets 1.7–1.9 (showing handwritten computations and corrections)
- Chapter 1 test
- Choice of activity (labeled with the title of the activity):
  - Activity A: Error Analysis of the Commutative, Associative, Distributive, Inverse, and Identity Properties
  - Activity B: Math History—Maya Mathematics
  - Activity C: Calculating Percentages

Make sure everything is labeled and you've included all your handwritten computations. If you have any questions about the work or how to share it, contact your teacher.

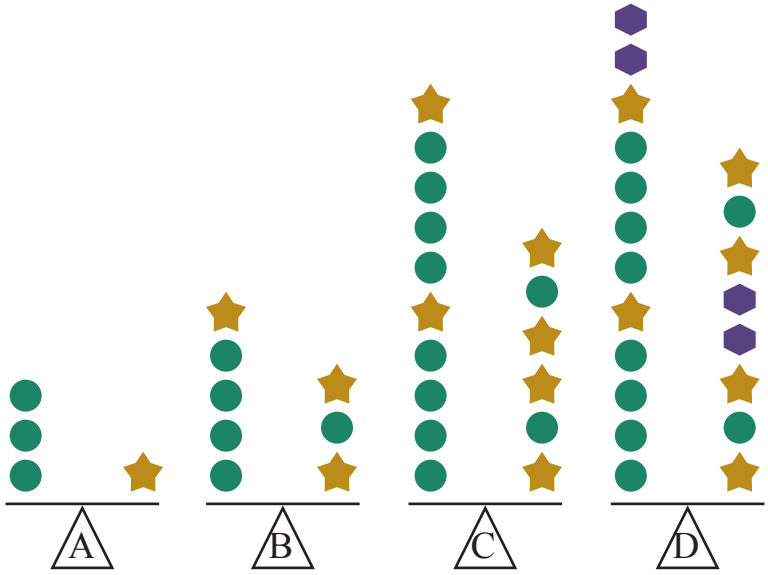
Lesson

2

Part 1: Solving Equations and Problem-Solving

Exploratory Activity

The following image depicts four evenly balanced scales. See if you can figure out how the scale progresses from A to D.



These scales can be represented with mathematical equations. Can you match each scale to its equation?

$4x + y = 2y + x$ Scale _____

$2(4x + y) + 2z = 2x + 2z + 4y$ Scale _____

$3x = y$ Scale _____

$2(4x + y) = 4y + 2x$ Scale _____

Which variable represents each shape?

Circle = _____ Star = _____ Hexagon = _____

(Check your answers in the appendix.)

ASSIGNMENT CHECKLIST

- ☐ Complete the exploratory activity.
- ☐ Complete the assigned problems in Exercise Sets 2.1–2.4.
- ☐ Choose an activity to complete:
  - Activity A: Integrated Review
  - Activity B: Which One Doesn't Fit? Combining Like Terms
  - Activity C: Fill in the Blank—The Distributive Property
  - Activity D: Error Analysis of Solving Linear Equations

Look at the equations and the scales in order. What changed from one equation to the next? How did the scales stay balanced?

You probably noticed that scale A shows that three circles (*x*) equal the weight of one star (*y*). On scale B, one *x* and one *y* was added to each side to maintain the balance. On scale C, each side was doubled, maintaining the balance. On scale D, two *z*s were added to both sides, again maintaining the balance. The key here is that the balance of the scale is always maintained when equal items of equal weight are placed on both sides. Balance is essential for solving equations!

Lesson Introduction

Suggested time: 2 weeks

When we add an equals sign between two mathematical expressions, we create an equation. Solving equations is an essential skill for all of mathematics and the sciences. Being able to solve for an unknown quantity opens infinite doors for exploring questions and making predictions in the world around us. You have likely solved equations in your daily life without even realizing it!

A good equation is like a good mystery novel—we start with some information, and then we use what we know to discover more.

We'll start by solving simple equations like this one:

$$3 \cdot x = 30$$

In this situation, what does the value of *x* have to be?

As we learn more about solving equations, we'll be able to write increasingly complicated equations to represent increasingly complicated mysteries. By the end of the course, you will be able to look at an equation like the one below and know how to use it to predict how high a small rocket will fly!

$$h(t) = 16t^2 + 10t + 5$$

Learning Objectives

Use the checklist below to track how your skills are developing over time, and identify skills that need more work as you progress through part 1 and part 2 of this lesson.

Skills	Notes
Combine like terms to simplify expressions	
Apply the distributive property	

Skills	Notes
Solve multistep linear equations and recognize when there is no solution	
Translate sentences or situations into algebraic expressions	
Solve application problems	
Isolate a particular variable in an equation	

Exercise Sets

Read the following sections, and complete the accompanying problem sets. Plan to complete a portion each day. If you have online access to MyMathLab, you can watch the instructional videos as well.

As you complete each set of problems, check your answers using the answer key at the back of the textbook. Correct any problems where you made mistakes. If you need help, let your teacher know.

1. Read section 2.1, "Simplifying Algebraic Expressions" (89), and then complete the following problems in Exercise Set 2.1.
    - ☐ 1–37 odd
    - ☐ 67–83 odd
2. Read section 2.2, "The Addition Property of Equality" (97), and then complete the following problems in Exercise Set 2.2.
    - ☐ 1–39 odd
    - ☐ 65 and 67
    - ☐ Extension 99–105 odd
3. Read section 2.3, "The Multiplication Property of Equality," (106), and then complete the following problems in Exercise Set 2.3.
    - ☐ 1–45 EO odd
    - ☐ 77–83 odd
4. Read section 2.4, "Solving Linear Equations" (114), and then complete the following problems in Exercise Set 2.4.
    - ☐ 1–33 EO odd
    - ☐ 35, 47, 49, 77, and 79
    - ☐ 1–35 odd

Activities

Choose one of the following activities to complete.

- Activity A: Integrated Review
- Activity B: Which One Doesn't Fit? Combining Like Terms
- Activity C: Fill in the Blank—The Distributive Property
- Activity D: Error Analysis of Solving Linear Equations

You may choose to answer reflection questions in writing, as an audio recording, or as a video recording. As always, make sure to thoroughly explain your answers.

Activities can be assessed according to the criteria found in the rubric below.

	Notes
Problem-Solving and Precision Work is clear, organized, and detailed. Appropriate symbols, labels, units, and terminology are used.	
Reasoning and Explaining Symbols, words, and diagrams are interpreted with mathematical meaning. Prior knowledge is integrated into reasoning.	
Modeling and Using Tools Models, tools, and strategies are used to simplify, explain, give structure, and/or communicate a problem-solving strategy and a solution.	
Seeing Structure and Generalizing Structures and patterns are identified and extended to make generalizations and/or connections to prior learning.	

Activity A: Integrated Review

Complete "Integrated Review: Solving Linear Equations" on page 116, problems 1–35 odd. Show all your work. Self-check your answers thoroughly, and make corrections to any problems you missed.

Activity B: Which One Doesn't Fit? Combining Like Terms

A $3a^2 - 2b + 4b + b^2$
B $3a^2 - 2b + 2b - 3a^2$
C $3(a^2 + 2ab - b^2)$
D $3a^2 - 2a + 3b + b^2$

When asked "Which one doesn't fit?" Yollie answered, "B doesn't fit because it is the only one without *b* squared."

1. What is another reason B does not fit?
2. Find another answer to the question "Which one doesn't fit?" and explain your reasoning.

Activity C: Fill in the Blank—The Distributive Property

1. Fill in the blue boxes with the digits 1 through 9, using each number no more than once to make the following equation true. (You can use another 9 in addition to the one given.) Fill in the red boxes with a plus or minus symbol, using each symbol only once to create an accurate statement.

$$-\square(\square a + \square b - c) = -\square\square a \square \square\square b \square 9c$$

2. What advice would you give someone trying to find a solution to this problem?

Activity D: Error Analysis of Solving Linear Equations

Two students each solved an equation incorrectly. Examine their work and identify their mistakes. Write each student a note (or make an audio recording or a video recording) describing their mistake and give advice to help ensure they don't make that mistake again. Then, solve the problem correctly.

Student 1:

$$\begin{aligned} -4(n-4)-23 &= -7 \\ -4n+16-23 &= -7 \\ -4n-7 &= -7 \\ +7 \quad &+7 \\ -4n &= 0 \\ \textit{No solution} & \end{aligned}$$

Student 2:

$$\begin{aligned} \frac{3(y+3)}{5} &= 2y+6 \\ 5 \cdot \frac{3(y+3)}{5} &= 2y+6 \cdot 5 \\ 3(y+3) &= 2y+30 \\ 3y+3 &= 2y+30 \\ -3 \quad &-3 \\ 3y &= 2y+27 \\ -2y \quad &-2y \\ y &= 27 \end{aligned}$$

SHARE YOUR WORK

When you have completed this portion of the lesson, please share the following work with your teacher.

- Exercise Sets 2.1–2.4 (showing handwritten computations and corrections)
- Choice of activity (labeled with the title of the activity):
  - Activity A: Integrated Review
  - Activity B: Which One Doesn't Fit? Combining Like Terms
  - Activity C: Fill in the Blank—The Distributive Property
  - Activity D: Error Analysis of Solving Linear Equations

Make sure everything is labeled and you've included all your handwritten computations. If you have any questions about the work or how to share it, contact your teacher.

Lesson 2

Part 2: Solving Equations and Problem-Solving

Lesson Introduction

Suggested time: 2 weeks

Lesson 2 continues with part 2. Refer to part 1 for learning objectives.

Exercise Sets

Read the following sections, and complete the accompanying problem sets. Plan to complete a portion each day. If you have online access to MyMathLab, you can watch the instructional videos as well.

As you complete each set of problems, check your answers using the answer key at the back of the textbook. Correct any problems where you made mistakes. If you need help, let your teacher know.

1. Read section 2.5, "An Introduction to Problem-Solving" (123), and then complete the following problems in Exercise Set 2.5.
    - ☐ 1–27 odd
    - ☐ 53, 55, and 59
2. Read section 2.6, "Formulas and Problem-Solving" (134), and then complete the following problems in Exercise Set 2.6.
    - ☐ 1–45 EO odd
3. Read section 2.7, "Percent and Problem-Solving" (144), and then complete the following problems in Exercise Set 2.7.
    - ☐ 1–21 odd
    - ☐ 33–41 odd
    - ☐ Extension 61–65 odd

ASSIGNMENT CHECKLIST

- ☐ Complete the assigned problems in Exercise Sets 2.5–2.8.
- ☐ Complete the chapter 2 test.
- ☐ Choose an activity to complete:
    - Activity A: Loan Repayments Using Simple Interest
    - Activity B: Making Sense of Percents
    - Activity C: Yield to Maturity

4. Read section 2.8, "Mixture and Distance Problem-Solving" (153), and then complete the following problems in Exercise Set 2.8.
    - ☐ 1–13 odd
    - ☐ 15–35 EO odd
5. Optional: If you would like more practice, you have the option of completing the following, doing as many problems as needed.
    - ☐ Chapter 2 Review and Vocabulary Check (163)
    - ☐ Chapter 2 Standardized Test Practice (166)

Chapter Test

In your textbook, complete the chapter 2 test on page 166. After completing the test, you or a supervising adult will grade it and mark the score at the top (for instance, 18/20). Then, review any mistakes and make necessary corrections.

Activities

Choose one of the following activities to complete.

- Activity A: Loan Repayments Using Simple Interest
- Activity B: Making Sense of Percents
- Activity C: Yield to Maturity

You may choose to answer reflection questions in writing, as an audio recording, or as a video recording. As always, make sure to thoroughly explain your answers.

Activities can be assessed according to the criteria found in the rubric below.

	Notes
Problem-Solving and Precision Work is clear, organized, and detailed. Appropriate symbols, labels, units, and terminology are used.	
Reasoning and Explaining Symbols, words, and diagrams are interpreted with mathematical meaning. Prior knowledge is integrated into reasoning.	

	Notes
Modeling and Using Tools Models, tools, and strategies are used to simplify, explain, give structure, and/or communicate a problem-solving strategy and a solution.	
Seeing Structure and Generalizing Structures and patterns are identified and extended to make generalizations and/or connections to prior learning.	

Activity A: Loan Repayments Using Simple Interest

Complete the following activity from Next Gen Personal Finance to explore percentages and formulas in real-world finance. This activity covers evaluating multistep expressions, percentages, and the simple interest formula.

1. Open the following document:

   "Math: Loan Repayments Using Simple Interest"

   drive.google.com/file/d/1q0J4OmrT895rbFdvvLhNFaj1xWvohhiV/view

2. Read the introduction, and watch the EdPuzzle video linked in the upper right corner.
3. Study the example problem in part 1 of the document, and then complete the practice problems in part 2 and the reflection questions in part 3. You can either print this document and complete your work directly on it or use a separate sheet of paper to answer all the questions.

   Remember to show all your work and answer the reflection questions.

Activity B: Making Sense of Percents

Complete the following activity from Next Gen Personal Finance to explore percentages in real-world behavioral finance. This activity covers percentages, problem-solving, and financial decision-making.

1. Open the following document:

   "Math: Making Sense of Percents"

   drive.google.com/file/d/1gQWuBOzsqYUzLqsBYKS3Fo_yLzVhoLsG/view

2. Read the introduction, and watch the EdPuzzle video linked in the upper right corner.
3. Study the example problem in part 1 of the document, and then complete the practice problems in part 2 and the reflection questions in part 3. You can either print this document and complete your work directly on it or use a separate sheet of paper to answer all the questions.

   Remember to show all your work and answer the reflection questions.

Activity C: Yield to Maturity

Challenge yourself with this activity from Next Gen Personal Finance to explore solving multistep equations and order of operations in real-world behavioral finance. This activity covers percentages, problem-solving, and investment bonds.

1. Open the following document:

   "Math: Yield to Maturity"

   drive.google.com/file/d/1KZar67aMeNA_Rqql7OgRzNMvDShhx4_M/view

2. Read the introduction, and watch the EdPuzzle video linked in the upper right corner.
3. Study the example problem in part 1 of the document, and then complete the practice problems in part 2 and the reflection questions in part 3. You can either print this document and complete your work directly on it or use a separate sheet of paper to answer all the questions.

   Remember to show all your work and answer the reflection questions.

SHARE YOUR WORK

When you have completed this portion of the lesson, please share the following work with your teacher.

- Exercise Sets 2.5–2.8 (showing handwritten computations and corrections)
- Chapter 2 test
- Choice of activity (labeled with the title of the activity):
  - Activity A: Loan Repayments Using Simple Interest
  - Activity B: Making Sense of Percents
  - Activity C: Yield to Maturity

Make sure everything is labeled and you've included all your handwritten computations. If you have any questions about the work or how to share it, contact your teacher.

Appendix

Bonus Unit 142

Answer Key to Exploratory Activities 143

Answer Key to Even-Numbered Exercises 149

Academic Expectations 150

Works Cited 151