



**Bluebonnet
Learning**

Secondary Mathematics

EDITION 1

Algebra I

Course Guide

Welcome to the Course Guide for Secondary Mathematics, Algebra I

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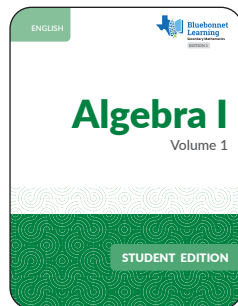
Instructional Design.....	FM-6
Lesson Structure.....	FM-9
Research-Based Strategies.....	FM-15
Thought Bubbles and Margin Notes.....	FM-17
TEKS Mathematical Process Standards.....	FM-18
Understanding the Problem-Solving Model.....	FM-21
The Problem-Solving Model Graphic Organizer.....	FM-22
Academic Glossary.....	FM-23
What is Productive Struggle?.....	FM-25
Resources for Students and Families.....	FM-26
Course Table of Contents.....	FM-31

INSTRUCTIONAL DESIGN

The instructional materials help you learn math in different ways. There are two types of resources: Learning Together and Learning Individually. These resources provide various learning experiences to develop your understanding of mathematics.

Learning Together

On **Learning Together** days, you spend time engaging in active learning to build mathematical understanding and confidence in sharing ideas, listening to one another, and learning together. The Student Edition is a consumable resource that contains the materials for each lesson.



STUDENT EDITION

I am a record of your thinking, reasoning, and problem solving.

My lessons allow you to build new knowledge from prior knowledge and experiences, apply math to real-world situations, and learn together in a collaborative classroom.

My purpose is to create mathematical thinkers who are active learners that participate in class.

Learning Individually

On **Learning Individually** days, Skills Practice offers opportunities to engage with skills, concepts, and applications that you learn in each lesson. It also provides opportunities for interleaved practice, which encourages you to flexibly move between individual skills, enhancing connections between concepts to promote long-term learning. This resource will help you build proficiency in specific skills based on your individual academic needs as indicated by monitoring your progress throughout the course.



SKILLS PRACTICE

I am targeted practice of each lesson's skills, mathematical concepts, and applications for each topic in the student edition.

My purpose is to provide problem sets for additional practice, enrichment, and extension.

INSTRUCTIONAL DESIGN

The instructional materials intentionally emphasize active learning and sense-making. Deep questions ensure you thoroughly understand the mathematical concepts. The instructional materials guide you to connect related ideas holistically, supporting the integration of your evolving mathematical understanding and developing proficiency with mathematical processes.

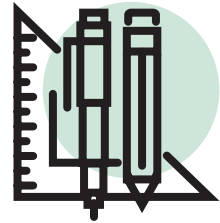
Intentional Mathematics Design

Mathematical Coherence: The path through the mathematics develops logically, building understanding by linking ideas within and across grades so you can learn concepts more deeply and apply what you've learned to more complex problems.

TEKS Mathematical Process Standards: The instructional materials support your development of the TEKS mathematical process standards. They encourage you to experiment, think creatively, and test various strategies. These mathematical processes empower you to persevere when presented with complex real-world problems.

Multiple Representations: The instructional materials connect multiple representations of mathematical concepts. Lessons present content visually, algebraically, numerically, and verbally.

Transfer: The instructional materials focus on developing transfer. Doing A and moving on isn't the goal; being able to do A and then do B, C, and D, transferring what you know from A, is the goal.



What principles guide the design and organization of the instructional materials?

Active Learning: Studies show that learning becomes more robust as instruction moves from entirely passive to fully interactive (Chi, 2009). Classroom activities require active learning as students engage by problem solving, explaining and justifying reasoning, classifying, investigate, and analyze peer work.

Discourse Through Collaborative Learning: Collaborative problem solving encourages an interactive instructional model, and we have looked to research to provide practical guidance for making collaboration work. The collaborative activities intentionally promote active dialogue centered on structured activities.

Personalized Learning: Research has proven that problems that capture your interests are more likely to be taken seriously (Baker et. al, 2009). In each lesson, learning is linked to prior knowledge and experiences, creating valuable and authentic opportunities for you to build new understanding on the firm foundation of what you already know. You move from concrete representations and an intuitive understanding of the world to more abstract representations and procedures.

Focus on Problem Solving: Solving problems is an essential life skill that you need to develop. The problem-solving model provides a structure to support you as you analyze and solve problems. It is a strategy you can continue to use as you solve problems in everyday life.

4

Point-Slope Form of a Line

LESSON STRUCTURE

1 Objectives

Objectives are stated for each lesson to help you take ownership of the objectives.

2 Essential Question

Each lesson begins with a statement connecting what you have learned with a question to ponder.

Return to this question at the end of this lesson to gauge your understanding.

3 New Key Terms

The new mathematical terms for each lesson are identified to help you connect your everyday and mathematical language.

1 OBJECTIVES

- Use the slope formula to derive the point-slope form of a linear equation.
- Construct an equation in point-slope form to model a linear relationship between two quantities.
- Write equations for vertical and horizontal lines.

3 NEW KEY TERM

- point-slope form

- 2 You have used the slope-intercept form to represent linear relationships. Are there other forms of a linear equation that you can use? How do you write equations for horizontal and vertical lines?



4 Getting Started

Each lesson begins with a Getting Started. When working on the Getting Started, use what you know about the world, what you have learned previously, or your intuition. The goal is just to get you thinking and ready for what's to come.



.....
I wonder whether
there is a way to
make writing the
equation of a line
more efficient.
.....

Getting Started

Draining the Pool

Miguel and Nia are pool cleaners who have been hired to drain the community diving pools at the end of the summer. They are comparing the rate at which the three pools drain.

1. For each pool, write an equation in slope-intercept form to represent the linear relationship.
 - a. Pool A is at a water level of 14 feet and drains at a rate of 3 feet per hour.
 - b. Pool B is at a water level of 10 feet after draining for 3 hours and drains at a rate of 2 feet per hour.
 - c. Pool C is at a water level of 15 feet after draining for 2 hours and at 12 feet after draining for 4 hours.
2. Compare your process for writing each equation. How are the processes different?

5

ACTIVITY
4.1Writing Equations in
Point-Slope Form

In the previous lesson, you used the slope, the y-intercept, and the slope formula to write a linear equation. You can also determine the equation of a line without knowing the y-intercept.

WORKED EXAMPLE

To write an equation of a line from a table of values, you can use the slope formula.

- First, calculate the slope.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - 6}{4 - 2} \\ = \frac{-1}{2} = -\frac{1}{2}$$

- Next, choose any point from the table.

(2, 6)

- Then, substitute what you know into the slope formula: $m = -\frac{1}{2}$, (2, 6), and the unknown point (x, y).

$$m = \frac{y_2 - y_1}{x_2 - x_1} \\ -\frac{1}{2} = \frac{y - 6}{x - 2}$$

- Finally, rewrite the equation with no variables in a denominator.

$$-\frac{1}{2} = \frac{y - 6}{x - 2} \\ -\frac{1}{2}(x - 2) = y - 6$$

The equation is $y - 6 = -\frac{1}{2}(x - 2)$.

x	y
2	6
4	5
6	4

This linear equation in the Worked Example is written in *point-slope form*. The **point-slope form** of a linear equation is $y - y_1 = m(x - x_1)$, where m is the slope of the line and (x_1, y_1) is any point on the line.

- Solve the equation in the Worked Example for y so that the linear equation is in slope-intercept form. What unique information does each form of the linear equation provide? How are they similar?

5

Activities

You are going to build a deep understanding of mathematics through a variety of activities in an environment where collaboration and conversations are important and expected.

You will learn how to solve new problems, but you will also learn why those strategies work and how they are connected to other strategies you already know.

Remember:

- It's not just about getting the answer. The process is important.
- Making mistakes is a critical part of learning, so take risks.
- There is often more than one way to solve a problem.

Activities may include real-world problems, sorting activities, Worked Examples, or analyzing sample student work.

Be prepared to share your solutions and methods with your classmates.



6 Talk the Talk

Talk the Talk gives you an opportunity to reflect on the main ideas of the lesson.

- Be honest with yourself.
- Ask questions to clarify anything you don't understand.
- Show what you know!

Don't forget to revisit the question posed on the lesson opening page to gauge your understanding.

6 Talk the Talk

Say What?

You have learned about two forms of a linear equation: the slope-intercept form, $y = mx + b$, and the point-slope form, $y - y_1 = m(x - x_1)$.

1. What information can you determine about each line by looking at the structure of the equation?

a. $y = \frac{3}{5}x - 4$

b. $y - 6 = 2(x + 1)$

c. $y + 4 = 2(x - 0)$

d. $y = -\frac{2}{7}x$

e. $y + 5 = -(x - 4)$

f. $y = 19$

2. Create a context that represents a linear relationship that passes through the point $(2, 56)$ and has an increasing slope. Then, write the equation of the line in point-slope form and slope-intercept form.

Lesson 4 Assignment

7 Write

Compare the slope-intercept and point-slope forms of a linear equation.

Remember 8

The point-slope form of a linear equation is $y - y_1 = m(x - x_1)$, where m is the slope of the line and (x_1, y_1) is a point on the line. The slope of a horizontal line is 0. The slope of a vertical line is undefined.

9 Practice

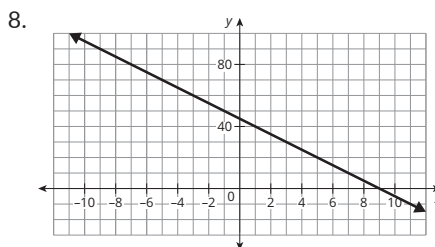
Write an equation in point-slope form.

- $m = 2$; $(5, 6)$
- $m = -9.2$; $(-17, 10)$
- $(-2, -3)$ and $(8, -8)$
- $(79, 52)$ and $(-87, 550)$
- A photography studio charges \$50 for a sitting fee and 6 prints. Luigi increased his order to 11 prints and paid \$65.
- Lucia is taking the stairs in her building from her floor to the top of the building. After 2 minutes, she was 100 steps from the bottom floor. After 5 minutes, she was 196 steps from the bottom floor.

Write an equation in any form.

- A newspaper charges a flat fee plus a charge per day to place a classified ad.

Number of Days	Total Charge (\$)
2	8.00
4	13.00
6	18.00



ASSIGNMENT

7 Write

Reflect on your work and clarify your thinking.

8 Remember

Take note of the key concepts from the lesson.

9 Practice

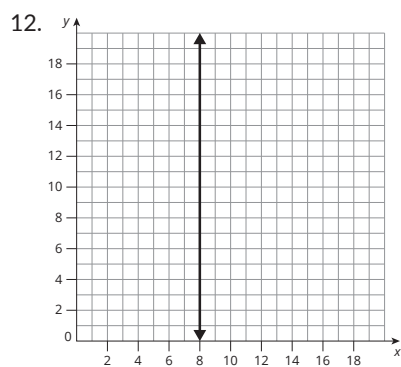
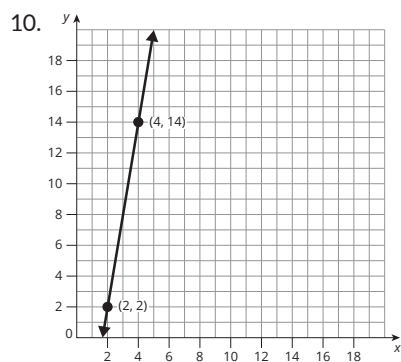
Use the concepts learned in the lesson to solve problems.

Lesson 4 Assignment

9.

x	y
-10	50
-2	10
4	-20
14	-70

11. Xavier is traveling on a toll road. He plans to exit the road 5 miles ahead and pay \$1.75. He changes his plans and travels 9 miles and pays \$2.75.



10 Prepare

Solve each equation for y.

1. $-2y = -x + 7$

2. $\frac{3}{4}y = x - 6$

3. $2x + 3y = 6$

4. $\frac{1}{2}x - 4y = 8$

ASSIGNMENT

10 Prepare

Get ready for the next lesson.

Research-Based Strategies

WORKED EXAMPLE

Consider the sequence generated using $a_n = a_{n-1} + (-2)$ where $a_1 = 11$ and n is a whole number greater than 1.

a_1 represents the first term of the sequence and a_n represents the n^{th} term of the sequence.

Since I know the first term of the sequence, to determine the second term a_2 , I add -2 to 11.

$$a_2 = a_{2-1} + -2 = a_1 + -2 = 11 + -2 = 9$$

I can determine the 3rd and 4th term of the sequence by continuing the pattern.

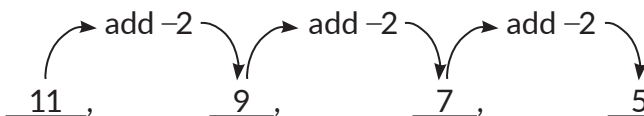
$$a_3 = a_{3-1} + -2 = a_2 + -2 = 9 + -2 = 7$$

$$a_4 = a_{4-1} + -2 = a_3 + -2 = 7 + -2 = 5$$

The sequence is 11, 9, 7, 5, ...

The pattern is to add the same negative number, -2 , to each term to determine the next term.

Sequence: $\underline{11}$, $\underline{9}$, $\underline{7}$, $\underline{5}$, ...



This sequence is arithmetic and the common difference d is -2 .

WORKED EXAMPLE

When you see a Worked Example:

- Take your time to read through it.
- Question your own understanding.
- Think about the connections between steps.

Ask Yourself ...

- What is the main idea?
- How would this work if I changed the numbers?
- Have I used these strategies before?

Maria and Abby each convert the given formula to degrees Fahrenheit.

THUMBS UP

When you see a Thumbs Up icon:

- Take your time to read through the correct solution.
- Think about the connections between steps.

THUMBS DOWN

When you see a Thumbs Down icon:

- Take your time to read through the incorrect solution.
- Think about what error was made.

WHO'S CORRECT?

When you see a Who's Correct icon:

- Take your time to read through the situation.
- Question the strategy or reason given.
- Determine whether the work is correct or incorrect.

Maria



$$\begin{aligned}C &= \frac{5}{9}(F - 32) \\C &= \frac{5}{9}F - \frac{160}{9} \\9(C) &= 9\left(\frac{5}{9}F - \frac{160}{9}\right) \\9C &= 5F - 160 \\9C + 160 &= 5F \\ \frac{9C}{5} + \frac{160}{5} &= \frac{5F}{5} \\ \frac{9}{5}C + 32 &= F\end{aligned}$$

Abby



$$\begin{aligned}C &= \frac{5}{9}(F - 32) \\C &= \frac{5}{9}F - 32 \\9(C) &= 9\left(\frac{5}{9}F - 32\right) \\9C &= 5F - 288 \\9C + 288 &= 5F \\ \frac{9C}{5} + \frac{288}{5} &= \frac{5F}{5} \\ \frac{9}{5}C + 57.6 &= F\end{aligned}$$

Ask Yourself . . .

- Why is this method correct?
- Have I used this method before?

Ask Yourself . . .

- Where is the error?
- Why is it an error?
- How can I correct it?



4. Consider a sequence in which the first term is 64 and each term after that is calculated by dividing the previous term by 4. Margaret says that this sequence ends at 1 because there are no whole numbers that come after 1. Jasmine disagrees and says that the sequence continues beyond 1. Who is correct? When Margaret is correct, explain why. When Jasmine is correct, predict the next two terms of the sequence.

Ask Yourself . . .

- Does the reasoning make sense?
- If the reasoning makes sense, what is the justification?
- If the reasoning does not make sense, what error was made?

Thought Bubbles and Margin Notes

Look for these margin notes as you journey through this course. Sometimes, they will remind you about things you already learned. Sometimes, they will ask you questions to help you think about different strategies. Sometimes, they will share fun facts. They are here to help and guide your learning.

.....

Remember ...

The first term in this sequence is the amount Jamal donates when the team hits 0 home runs. So, the 93rd term represents the amount Jamal donates if the team hits 92 home runs.

.....

Ask Yourself ...

How can graphs be used to tell a story in everyday life?

.....

Think About ...

Look closely when analyzing the graphs. What do you see?

.....

TEKS Mathematical Process Standards

TEKS Mathematical Process Standards

Effective communication and collaboration are essential skills of a successful learner. With practice, you can develop the habits of mind of a productive mathematical thinker. The “I Can” expectations listed below align with the TEKS mathematical process standards and encourage students to develop their mathematical learning and understanding.

Apply mathematics to problems arising in everyday life, society, and the workplace.

I CAN:

- use the mathematics that I learn to solve real-world problems.
- interpret mathematical results in the contexts of a variety of problem situations.

Use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying a solution, and evaluating the problem solving process and reasonableness of the solution.

I CAN:

- explain what a problem “means” in my own words.
- create a plan and change it if necessary.
- ask useful questions in an attempt to understand the problem.
- explain my reasoning and defend my solution.
- reflect on whether my results make sense.

Select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate; and techniques including mental math, estimation, and number sense as appropriate, to solve problems.

I CAN:

- use a variety of different tools that I have to solve problems.
- recognize when a tool that I have to solve problems might be helpful and when it has limitations.
- look for efficient methods to solve problems.
- estimate before I begin calculations to inform my reasoning.

Communicate mathematical ideas, reasoning, and their implications using multiple representations including symbols, diagrams, graphs, and language, as appropriate.

I CAN:

- communicate and defend my own mathematical understanding using examples, models, or diagrams.
- use appropriate mathematical vocabulary in communicating mathematical ideas.
- make generalizations based on results.
- apply mathematical ideas to solve problems.
- interpret my results in terms of various problem situations.

Create and use representations to organize, record, and communicate mathematical ideas.

I CAN:

- consider the units of measure involved in a problem.
- label diagrams and figures appropriately to clarify the meaning of different representations.
- create an understandable representation of a problem situation.

Analyze mathematical relationships to connect and communicate mathematical ideas.

I CAN:

- identify important relationships in a problem situation.
- use what I know to solve new problems.
- analyze and organize information.
- look closely to identify patterns or structure.
- look for general methods and more efficient ways to solve problems.

Display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

I CAN:

- work carefully and check my work.
- distinguish correct reasoning from reasoning that is flawed.
- use appropriate mathematical vocabulary when I talk with my classmates, my teacher, and others.
- specify the appropriate units of measure when I explain my reasoning.
- calculate accurately and communicate precisely to others.



Understanding the Problem-Solving Model

Productive mathematical thinkers are problem solvers. These instructional materials include a problem-solving model to help you develop proficiency with the TEKS mathematical process standards. An opportunity to use the problem-solving model is present every time you see the problem-solving model icon.

The problem-solving model represents a strategy you can use to make sense of problems you must solve. The model provides questions you can use to guide your thinking and the graphic organizer provides a place for you to show and organize your work.

Using the Problem-Solving Model



Notice | Wonder

Understand the situation by asking these questions.

- What do I notice?
- What do I wonder?
- How do I analyze the given information to identify what is important?
- Do I have enough information to formulate a plan and determine a solution?



Organize | Mathematize

Devise a plan for your mathematical approach by asking these questions.

- What mathematical relationships exist between this problem and similar problems I have solved?
- What plan or strategy can I use to solve this problem?
- How can I efficiently solve this problem?
- How can I organize, record, and communicate my mathematics?



Predict | Analyze

Carry out your plan to determine a solution. Then, ask yourself the following questions.

- Did I display my work using multiple representations?
- Did I explain my reasoning in terms of the problem situation?
- Did I communicate the strategy used to determine the solution?
- Did I justify my mathematical argument clearly using precise mathematical language?
- Can I use my mathematical reasoning to make any predictions?



Test | Interpret

Look back at your work and ask these questions.

- Does my solution clearly and completely answer the original question/problem?
- Is my solution reasonable?
- Does my solution make sense in terms of the problem situation?
- Can I solve the problem using a different strategy? Would another strategy be more efficient?
- Can I justify my solution?



Report

As you share your mathematical reasoning with others, ask these questions.

- Did you use multiple representations to represent your mathematics?
- Did you justify your mathematical reasoning?
- Can others understand my process and solution?

The Problem-Solving Model Graphic Organizer



NOTICE

Understand the Problem



ORGANIZE

Devise a Plan



PREDICT

Carry Out the Plan



INTERPRET

Look Back



REPORT

Report

Academic Glossary

Knowing what these terms mean and using them will help you demonstrate proficiency with the TEKS mathematical process standards as you think, reason, and communicate your ideas.

Analyze

Definition

Study or look closely for patterns. Analyzing can involve examining or breaking a concept down into smaller parts to gain a better understanding of it.

Ask Yourself

- Do I see any patterns?
- Have I seen something like this before?
- What happens if the shape, representation, or numbers change?

.....

- Examine
- Evaluate
- Determine
- Observe
- Consider
- Investigate
- What do you notice?
- What do you think?
- Sort and match

.....

Explain Your Reasoning

Definition

Give details or describe how to determine an answer or solution. Explaining your reasoning helps justify conclusions.

Ask Yourself

- How should I organize my thoughts?
- Is my explanation logical?
- Does my reasoning make sense?
- How can I justify my answer to others?

.....

- Show your work
- Explain your calculation
- Justify
- Why or why not?

.....

- Show
- Sketch
- Draw
- Create
- Plot
- Graph
- Write an equation
- Complete the table

Represent

Definition

Display information in various ways. Representing mathematics can be done using words, tables, graphs, or symbols.

Ask Yourself

- How should I organize my thoughts?
- How do I use this model to show a concept or idea?
- What does this representation tell me?
- Is my representation accurate?

- Predict
- Approximate
- Expect
- About how much?

Estimate

Definition

Make an educated guess based on the analysis of given data. Estimating first helps inform reasoning.

Ask Yourself

- Does my reasoning make sense?
- Is my solution close to my estimation?

- Demonstrate
- Label
- Display
- Compare
- Determine
- Define
- What are the advantages?
- What are the disadvantages?
- What is similar?
- What is different?

Describe

Definition

Represent or give an account of in words. Describing communicates mathematical ideas to others.

Ask Yourself

- How should I organize my thoughts?
- Is my explanation logical?
- Did I consider the context of the situation?
- Does my reasoning make sense?

What is Productive Struggle?

Imagine you are trying to beat a game or solve a puzzle. At some point, you are not sure what to do next. You don't give up; you keep trying repeatedly until you accomplish your goal. You call this process *productive struggle*. Productive struggle is when you choose to persist, think creatively, and try various strategies to accomplish your goal. Productive struggle supports you as you develop characteristics and habits that you will use in everyday life.

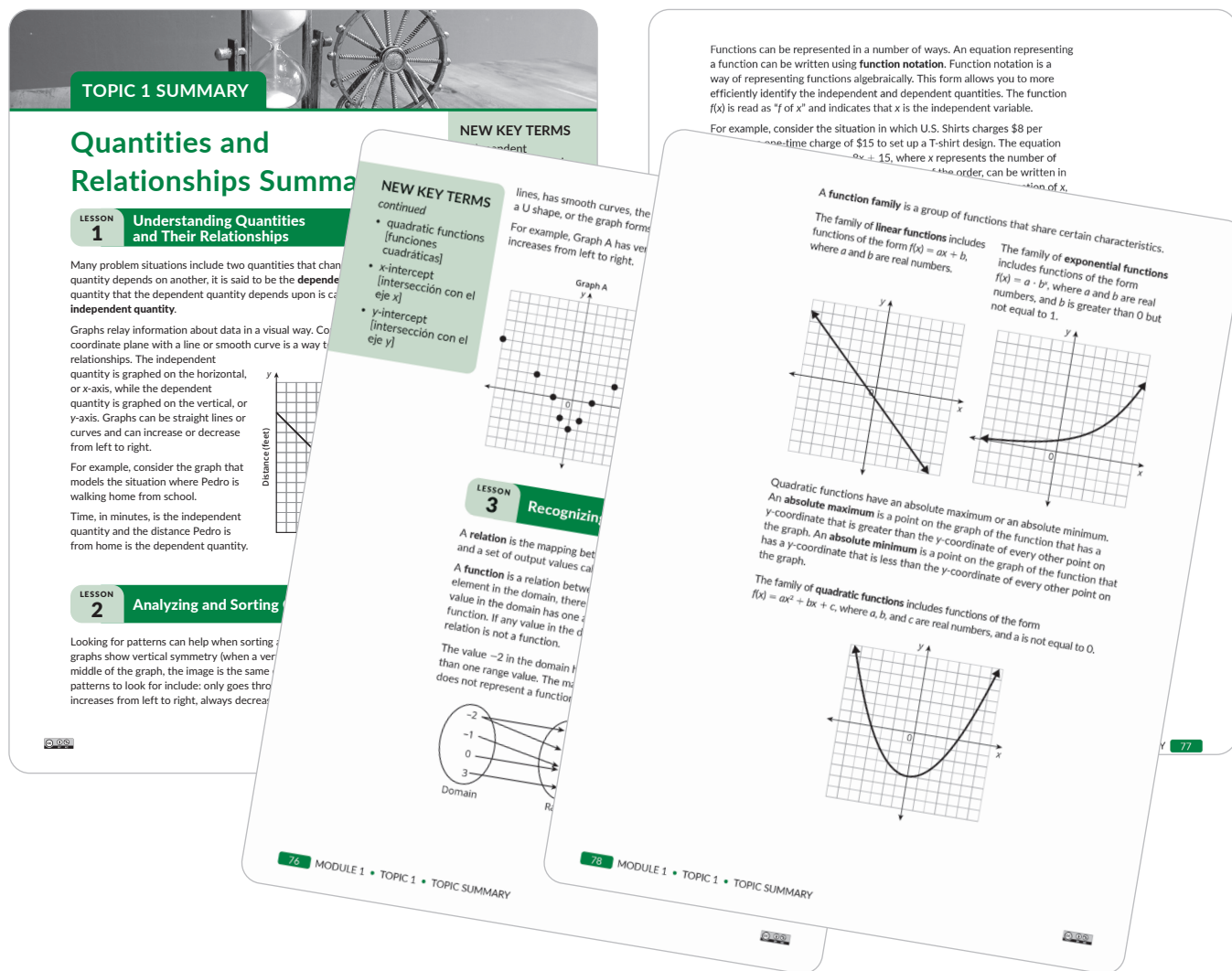
Things to do:	Things not to do:
• Persevere. • Think creatively. • Try different strategies. • Look for connections to other questions or ideas. • Ask questions that help you understand the problem. • Help your classmates without telling them the answers.	• Get discouraged. • Stop after trying your first attempt. • Focus on the final answer. • Think you have to make sense of the problem on your own.

This course will challenge you by providing you with opportunities to solve problems that apply the mathematics you know to the real-world. As you work through these problems, your first approach may not work. This is okay, even when your initial strategy does not work, you are learning. In addition, you will discover multiple ways to solve a problem. Looking at various strategies will help you evaluate the problem-solving process and identify an efficient approach. As you persist in problem-solving, you will better understand the math.

Resources for Students and Families

Topic Summary

Each topic includes a Topic Summary. The Topic Summary contains a list of all new key terms addressed in the topic and a summary of each lesson, including worked examples and new key term definitions. Use the Topic Summary to review each lesson's major concepts and strategies as you complete assignments and/or share your learning outside of class.



Topic Self-Reflection

The Topic Self-Reflection, provided at the end of each topic, empowers you to develop confidence in your mathematical understanding and monitor your own learning processes. Taking the time for self-reflection helps you identify your strengths and where you want to focus efforts to improve.

Use the Topic Self Reflection throughout the topic to monitor your progress toward the mathematical goals for the topic.

TOPIC 1 SELF-REFLECTION

Name: _____

Quantities and Relationships

When you reflect on what you are learning, you develop your understanding and know when to ask for help.

Reflect on these statements. Place a number in each circle from 1–3, where 1 represents **the skill is new to me**, 2 represents **I am building proficiency of the skill**, and 3 represents **I have demonstrated proficiency of the skill**.

I can demonstrate an understanding of the standards in the *Quantities and Relationships* topic by:

TOPIC 1: <i>Quantities and Relationships</i>	Beginning of Topic	Middle of Topic	End of Topic
choosing appropriate scale and origin for graphs.	☐	☐	☐
identifying the appropriate unit of measure for each variable or quantity.	☐	☐	☐
analyzing a graph and stating the key characteristics of the graph.	☐	☐	☐
using a problem situation to explain what the key features of a graph mean in real-world context.	☐	☐	☐
deciding whether relations represented verbally, tabularly, graphically, and symbolically define a function.	☐	☐	☐
recognizing a linear, exponential, or quadratic function by its equation or graph.	☐	☐	☐
evaluating functions, expressed in function notation, given one or more elements in their domain.	☐	☐	☐
determining the domain and range and the independent and dependent quantities in a relationship.	☐	☐	☐

continued on the next page

MODULE 1 • TOPIC 1 • SELF-REFLECTION 73

TOPIC 1 SELF-REFLECTION

continued

At the end of the topic, take some time to reflect on your learning and answer the following questions.

1. Describe a new strategy you learned in the *Quantities and Relationships* topic.

2. What mathematical understandings from the topic do you feel you are making the most progress with?

3. Are there any concepts within this topic that you find challenging to understand? How do you plan to improve your understanding of these concepts?

74 MODULE 1 • TOPIC 1 • SELF-REFLECTION

Math Glossary

A course-specific math glossary is available to utilize and reference while you are learning. Use the glossary to locate definitions and examples of math key terms.

Math Glossary

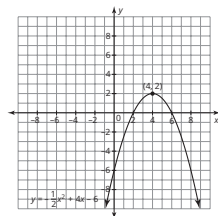
A

absolute maximum

A function has an absolute maximum if there is a point that has a y-coordinate that is greater than the y-coordinates of every other point on the graph.

Example

The ordered pair (4, 2) is the absolute maximum of the graph of the function $f(x) = -\frac{1}{2}x^2 + 4x - 6$.

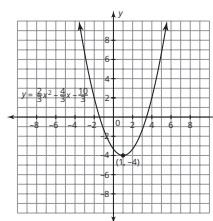


absolute minimum

A function has an absolute minimum if there is a point that has a y-coordinate that is less than the y-coordinates of every other point on the graph.

Example

The ordered pair (1, -4) is the absolute minimum of the graph of the function $y = \frac{2}{3}x^2 - \frac{4}{3}x - \frac{10}{3}$.



argument of a function

The argument of a function is the variable on which the function operates.

Example

In the function $f(x + 5) = 32$, the argument is $x + 5$.



MATH GLOSSARY G1

Course Family Guide

The Course Family Guide provides you and your family an overview of the course design. The guide details the resources available to support your learning, such as the Math Glossary, the Topic Family Guide, the Topic Self-Reflection, and the Topic Summaries.

The purpose of the Course Family Guide is to bridge your learning in the classroom to your learning at home. The goal is to empower you and your family to understand the concepts and skills learned in the classroom so that you can review, discuss, and solidify the understanding of these key concepts together.

COURSE FAMILY GUIDE

Algebra I

How to support your student as they learn

Algebra I Mathematics

Read and share with your student.

Research-Based Instructional Materials

Research-based strategies and best practices are woven throughout the instructional materials.

Research-based instruction presents thorough explanations of concepts in a logical manner. Every topic in this course builds on previous learning and connects to future learning. Each Topic Family contains information on where your student has been and where they are going when studying the mathematical content.

Where have we been?

Students have analyzed the shape of data, informally fit lines of best fit to model data sets, determined the equations of those lines, interpreted the slopes and y-intercepts of the lines, and used the equations to make and judge the reasonableness of predictions about the data. Students have also examined linear relationships and recognized that the slope of a line defines its steepness and direction.

Where are we going?

As students continue in mathematics courses, they will analyze more complex exponential and quadratic functions. From this topic, students will learn the key to defining a function: representing a relationship between two quantities, and graphing that relationship on a coordinate plane.

Research-based instruction contains a balance of conceptual and procedural understandings in mathematics. Students' progress through a CRA (Concrete-Representational-Abstract) continuum to develop conceptual understanding and toward procedural fluency.

Engaging with Grade Level Content

Your student will engage with grade-level content in multiple ways with the support of the teacher.

Learning Together	Learning Individually
During learning of lessons Thumbs Up, Thumbs Down, and Who's Correct questions address your student's common misconceptions and provide opportunities for peer work analysis.	The Skills Practice provides students the opportunity to engage in additional skill practice that aligns to each Learning Objective.

Concrete

Students explore a real-world scenario to develop their intuitive understanding of quadratic functions. They recognize they can use the basic quadratic function, x^2 , to represent the pattern.

Representational

Students learn that different forms of quadratic functions reveal specific characteristics of the function.

Problem Solving

Research-based instruction includes questions your student can use the problem-solving model.

Research-based instructional materials include features throughout the product that provide your student can continually refer to.

When you see a Worked Example

- Take your time to read through the worked example.
- Question your own understanding.
- Think about the connections between steps.

When you see a Thumbs Up/Down

- Take your time to read through the worked example.
- Question the strategy of reason plans.
- Check for correct or incorrect.

When you see a Who's Correct

- Take your time to read through the situation.
- Question the strategy of reason plans.
- Check for correct or incorrect.

When you see a Skills Practice

Each lesson features one or more ELPS (English Language Proficiency Standards) and provides the teacher with implementation strategies incorporating best practices for supporting language acquisition. In addition, students are provided with cognates for New Key Terms in the Topic Summaries and Topic Family Guides.

NEW KEY TERMS

- solution [solución]
- infinite solutions [soluciones infinitas]
- no solution [sin solución]
- literal equation [ecuación literal]
- linear inequality [desigualdad lineal]

Refer to the Math Glossary for definitions of the New Key Terms.

Topic Family Guides

Each topic contains a Topic Family Guide that provides an overview of the math of the topic and answers the questions, “Where have we been?” and “Where are we going?” Additional components of the Topic Family Guide are an example of a math model or strategy taught in the topic, definitions of key terms, busting of a math myth, and questions family members can ask you to support your learning.

Learning outside of the classroom is crucial to student success at school. The Topic Family Guide serves to assist families in talking to students about the learning that is happening in the classroom.

Family Guide

MODULE 1 Searching for Patterns

Algebra I

TOPIC 1 Quantities and Relationships

In this topic, students explore a variety of different functions. This guide is merely to introduce these new functions, providing an overview of a deep understanding at this point. The topic is designed to help students recognize that different function families have different key characteristics. In later study in this course, they will formalize their understanding of the defining characteristics of each type of function.

Where have we been?

In previous grades, students defined a function and used linear functions to model the relationship between two quantities. They have written linear functions in slope-intercept form and should be able to identify the slope and y-intercept in the equation. Students have also characterized graphs as functions using the terms increasing, decreasing, constant, linear, and nonlinear.

TALKING POINTS

DISCUSS WITH YOUR STUDENT

Functions are an important topic to know for making predictions in the sciences, creating computer programs, and college admissions tests.

NEW KEY TERMS

- dependent quantity [cantidad dependiente]
- independent quantity [cantidad independiente]
- relation [relación]
- domain [dominio]
- range [rango]
- function [función]
- function notation [notación de función]
- Vertical Line Test [Prueba de la línea vertical]
- discrete graph [gráfica discreta/discontinua]
- continuous graph [gráfica continua]
- increasing function [función creciente]
- decreasing function [función decreciente]
- constant function [función constante]
- function family [familia de funciones]
- linear functions [funciones lineales]
- exponential functions [funciones exponenciales]
- absolute maximum [máximo absoluto]
- absolute minimum [mínimo absoluto]
- quadratic functions [funciones cuadráticas]
- x-intercept [intersección con el eje x]
- y-intercept [intersección con el eje y]

Refer to the Math Glossary for definitions of the New Key Terms.

Where are we going?

The **Vertical Line Test** to determine if a graph is a function. The equation $y = x^2$ is a function. The graph of the vertical line test shows there are no vertical lines that can be drawn that would intersect the graph at more than one point.

A **continuous graph** of points connects or smooth curve. The graph shown is continuous.

A function has an **absolute maximum** when it has a y-coordinate greater than the y-coordinate of every other point on the graph. It is the highest point that the curve reaches.

The absolute maximum of the function $f(x) = -\frac{1}{2}x^2 + 4x$ is 8.

MYTH

"I don't have the math gene."

Let's be clear about something. There isn't a gene that controls the development of mathematical thinking. Instead, there are probably **hundreds** of genes that contribute to it.

Some believe mathematical thinking arises from the ability to learn a language. Given the right input from the environment, children learn to speak without formal instruction. They can learn number sense and pattern recognition the same way.

To further nurture your student's mathematical growth, attend to the learning environment. You can support this by discussing math in the real world, offering encouragement, being available to answer questions, allowing your student to struggle with difficult concepts, and providing space for plenty of practice.

#mathmythbusted

Function Notation

Functions can be represented in a number of ways. An equation representing a function can be written using **function notation**. This form allows you to more easily identify the independent and dependent quantities. The function $f(x)$ is read as "f of x" and shows that x is the independent variable.

$f(x) = 8x + 15$

name of function → independent variable

The linear equation $y = 8x + 15$ can be written to represent a relationship between the variables x and y. You can write this linear equation as a function with the name f to represent it as a mathematical object that has a specific set of inputs (the domain of the function) and a specific set of outputs (the range of the function).

Function Families

In **Lesson 4: Recognizing Functions by Characteristics**, students associate function families with specific sets of characteristics.

A **function family** is a group of functions that share certain properties. Function families have key properties that are common among all functions in the family. Knowing these key properties is useful when sketching a graph of the function.

The graph of a **linear function** is represented by a straight line which can be vertical, horizontal and diagonal.

The graph of an **exponential function** is represented by a smooth curve.

The graph of a **quadratic function** is represented by a parabola.

Table of Contents

MODULE 1 Searching for Patterns

TOPIC 1 Quantities and Relationships3

Introduction to the Problem-Solving Model and Learning Resources

LESSON 1 Understanding Quantities and Their Relationships

LESSON 2 Analyzing and Sorting Graphs

LESSON 3 Recognizing Functions and Function Families

LESSON 4 Recognizing Functions by Characteristics

TOPIC 2 Sequences81

LESSON 1 Recognizing Patterns and Sequences

LESSON 2 Arithmetic and Geometric Sequences

LESSON 3 Determining Recursive and Explicit Expressions from Contexts

MODULE 2 Exploring Constant Change

TOPIC 1 Linear Functions 145

LESSON 1 Least Squares Regression

LESSON 2 Correlation

LESSON 3 Making Connections Between Arithmetic Sequences and Linear Functions

LESSON 4 Point-Slope Form of a Line

LESSON 5 Using Linear Equations

LESSON 6 Making Sense of Different Representations of a Linear Function

TOPIC 2 Transforming and Comparing Linear Functions . . . **267**

LESSON 1 Transforming Linear Functions

LESSON 2 Vertical and Horizontal Transformations of Linear Functions

LESSON 3 Determining Slopes of Perpendicular Lines

LESSON 4 Comparing Linear Functions in Different Forms

MODULE 3 Modeling Linear Equations and Inequalities

TOPIC 1 Linear Equations and Inequalities **343**

LESSON 1 Solving Linear Equations

LESSON 2 Literal Equations

LESSON 3 Modeling Linear Inequalities

TOPIC 2 Systems of Linear Equations and Inequalities . . . **391**

LESSON 1 Using Graphing to Solve Systems of Equations

LESSON 2 Using Substitution to Solve Linear Systems

LESSON 3 Using Linear Combinations to Solve a System of Linear Equations

LESSON 4 Graphing Inequalities in Two Variables

LESSON 5 Systems of Linear Inequalities

LESSON 6 Solving Systems of Equations and Inequalities

MODULE 4 Investigating Growth and Decay

TOPIC 1 Introduction to Exponential Functions **509**

LESSON 1 Properties of Powers with Integer Exponents

LESSON 2 Analyzing Properties of Powers

LESSON 3 Geometric Sequences and Exponential Functions

LESSON 4 Rewriting Square Roots

LESSON 5 Rational Exponents and Graphs of Exponential Functions

TOPIC 2 Using Exponential Equations **607**

LESSON 1 Exponential Equations for Growth and Decay

LESSON 2 Interpreting Parameters in Context

LESSON 3 Modeling Using Exponential Functions

MODULE 5 Maximizing and Minimizing

TOPIC 1 Introduction to Quadratic Functions **657**

LESSON 1 Exploring Quadratic Functions

LESSON 2 Key Characteristics of Quadratic Functions

LESSON 3 Quadratic Function Transformations

LESSON 4 Horizontal Transformations and Vertex Form

TOPIC 2 Polynomial Operations **757**

LESSON 1 Adding and Subtracting Polynomials

LESSON 2 Multiplying Polynomials

LESSON 3 Polynomial Division

TOPIC 3 Solving Quadratic Equations **825**

LESSON 1 Representing Solutions to Quadratic Equations

LESSON 2 Solutions to Quadratic Equations in Vertex Form

LESSON 3 Factoring and Completing the Square

LESSON 4 The Quadratic Formula

LESSON 5 Using Quadratic Functions to Model Data

Math Glossary **G-1**

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Secondary Mathematics

EDITION 1

