



Algebra II

Course Guide

Welcome to the Course Guide for Secondary Mathematics, Algebra II

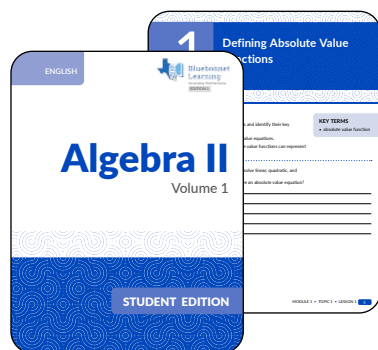
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INSTRUCTIONAL DESIGN

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

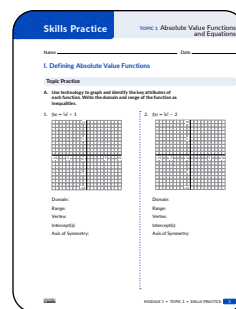
I am a record of your thinking, reasoning, and problem solving.

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.

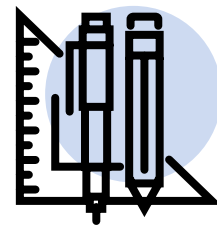
Intentional Mathematics Design

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.

1

Solving Systems of Equations

OBJECTIVES

1

- Solve systems of two linear equations.
- Write and solve systems of three linear equations in three variables by using substitution.
- Write and solve systems of three linear equations in three variables by using Gaussian elimination.

3

KEY TERM

- Gaussian elimination

You know how to solve a system of linear equations in two variables using graphs, linear combinations, and substitution. How can you use similar methods to solve systems of equations involving three linear equations?

2



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 Key Terms

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

4 Getting Started

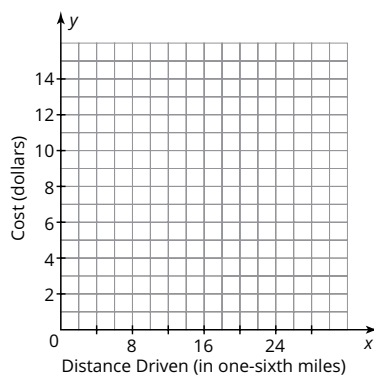
Each lesson begins with a Getting Started. When working on the Getting Started, use what you know about the world, what you have learned previously, or your intuition. The goal is just to get you thinking and ready for what's to come.

4 Getting Started

Which Fare Is Fair?

You would like to take a taxi to the airport. There are two local taxi companies. Cab Company A charges \$2.60 plus \$0.20 per one-sixth of a mile driven. Cab Company B charges \$5.00 plus \$0.10 per one-sixth of a mile driven.

1. Write a system of two linear equations in two variables to represent this problem situation. Be sure to define your variables.
2. Graph the system of linear equations.



Remember...

The solution to a system of linear equations occurs when the values of the variables satisfy all of the linear equations.

3. Estimate the solution to the system of linear equations. Justify your reasoning.

ACTIVITY
1.1**Solving Systems of Three
Linear Equations****5**

You can solve systems of three linear equations in three variables by using substitution. First, solve one equation for a variable and then substitute that expression into the other two equations. This reduces the system of three equations in three variables to a system of two equations in two variables, which you can then solve using any method.

1. As a fundraising event, a club sold tickets to a special viewing of a classic movie. The club sold all 800 seats in the school's auditorium. The tickets were three different prices based on the age of the ticket holder: \$2.50 for children under 12 years old, \$3.50 for youth between 12 and 18 years old, and \$5.00 for adults. The total amount of money taken in was \$2937.50, and there were 4 times as many youth tickets as children's tickets sold.

- a. Write a system of three linear equations in three variables to represent this situation. Be sure to define your variables.

- b. Which equation from your system is solved for a single variable?
Use substitution to create a system of two equations in two variables.

**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.

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!

Talk the Talk

You can use either substitution or Gaussian elimination to solve systems of three linear equations in three variables.

1. List an advantage and a disadvantage to the substitution method.
2. List an advantage and a disadvantage to the Gaussian elimination method.

Lesson 1 Assignment

Write 7

Define Gaussian elimination in your own words.

Remember 8

A system of equations can be solved graphically or algebraically. When solving a system of three linear equations algebraically, you can use substitution or Gaussian elimination.

Practice 9

1. Solve each system of equations using Gaussian elimination.

a.
$$\begin{cases} x + y + z = 6 \\ 2x - y + 3z = 14 \\ x - 2y + z = 0 \end{cases}$$

.....

b.
$$\begin{cases} 2x + 3y + z = 11 \\ 4x - 2y + 5z = 15 \\ 3x + y - z = 2 \end{cases}$$

c.
$$\begin{cases} 4x + 3y + 2z = 25 \\ 5x - y + z = 11 \\ -2x + 4y - z = 4 \end{cases}$$

2. You are helping a friend with her flower garden. She decided to add some clematis vines, rose bushes, and peony plants to her garden. The price of a clematis vine is \$3 more than twice a peony plant. The price of a rose bush is \$5 more than a clematis vine. She decided to buy 3 clematis plants, 4 rose bushes and 2 peony plants for a total of \$233.

a. Write a system of three linear equations in three variables to represent this situation. Define your variables.

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 1 Assignment

ASSIGNMENT

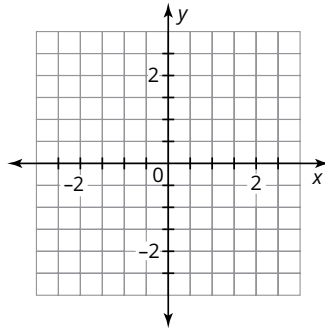
10 Prepare

Get ready for the next lesson.

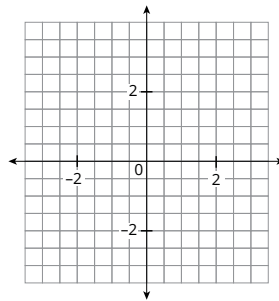
Prepare 10

Graph each linear inequality.

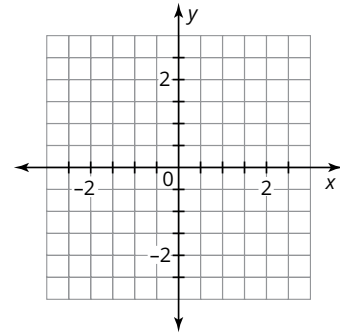
1. $y > x - 1$



3. $x + y \geq 3$



2. $y \leq -\frac{1}{2}x + 2$



Research-Based Strategies

WORKED EXAMPLE

Consider the system $\begin{cases} 2x + 2y + 3z = 3 \\ x + 3y + 2z = 5 \\ 3x + y + z = 5 \end{cases}$

You can use the second equation to eliminate the x in the other two equations.

1. Multiply the second equation by -2 and add the result to the first equation.

$$\begin{array}{r} -2(x + 3y + 2z = 5) \rightarrow -2x - 6y - 4z = -10 \\ +2x + 2y + 3z = 3 \\ \hline -4y - z = -7 \end{array}$$

2. Replace the first equation in the system with the new equation.

$$\begin{cases} -4y - z = -7 \\ x + 3y + 2z = 5 \\ 3x + y + z = 4 \end{cases}$$

3. Multiply the second equation by -3 and add the result to the third equation.

$$\begin{array}{r} -3(x + 3y + 2z = 5) \rightarrow -3x - 9y - 6z = -15 \\ +3x + y + z = 4 \\ \hline -8y - 5z = -11 \end{array}$$

4. Replace the third equation in the system with the new equation.

$$\begin{cases} -4y - z = -7 \\ x + 3y + 2z = 5 \\ -8y - 5z = -11 \end{cases}$$

You have now eliminated the x -variable in all equations except the second equation. Continue in this same manner to isolate y and z .

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?

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 and Abby each convert the given formula to degrees Fahrenheit.

Lauren



$$\begin{array}{lcl} |x| - 4 = 5 & & \\ x - 4 = 5 & -(x) - 4 = 5 & \\ x = 9 & -x = 9 & \\ & x = -9 & \end{array}$$

Nakota



$$\begin{array}{lcl} |x| - 4 = 5 & & \\ |x| = 9 & & \\ x = 9 & -(x) = 9 & \\ & x = -9 & \end{array}$$

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?



1. Xavier and Lucia are working on a homework assignment for which they must identify all functions that are one-to-one functions. Xavier says that all linear functions are one-to-one functions, so they don't even need to look at the linear functions. Lucia disagrees and says that not all linear functions are one-to-one functions. Who is correct? Explain how you determined which student is correct.

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.

Ask Yourself ...

Before you solve each equation, think about the number of solutions each equation may have. You may be able to save yourself some work—and time!

Remember ...

The *domain* is the set of all input values in a relation. The *range* is the set of output values in a relation.

Think About ...

What are some different methods you have learned to solve a system of linear equations in two variables algebraically?

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 organizer your work.

Using the Problem-Solving Model



NOTICE

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

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

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?



INTERPRET

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

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 key terms addressed in the topic and a summary of each lesson, including worked examples and 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 1 SUMMARY

Absolute Value Functions and Equations

LESSON 1 Defining Absolute Value Functions

The graph of the parent **absolute value function**, $f(x) = |x|$, is the combination of the graphs of $f(x) = x$ and $f(x) = -x$.

You can model many real-world situations with absolute value functions. For example, the equation $y = |x - 97.5|$ represents internal body temperature. A deviation, y , of 2.9 units from the average, x , indicates a serious medical issue. Hypothermia is below the average, and a fever can start above the average.

You can determine when a fever and hypothermia begin with an absolute value equation $|x - 97.5| = 2.9$ with a graph. First, graph $y = |x - 97.5|$ and $y = 2.9$.

LESSON 2 Transforming Absolute Value Functions

The graph of the absolute value function is a combination of the graphs of $f(x) = |x|$ and $f(x) = -|x|$. For the parent function $f(x) = |x|$, a vertical translation of the function up or down is represented by $f(x) = |x - d| + k$. For $d < 0$, the graph vertical shifts down by $|d|$.

For the parent function $f(x) = |x|$, a vertical dilation of the function by a factor of a units, for $0 < |a| < 1$, is represented by $f(x) = |ax|$. A reflection of a graph is the opposite of a graph across a line. A **line of reflection** is a horizontal line of reflection at $y = k$.

For the parent function $f(x) = |x|$, a horizontal translation of the function shifts right. For $c < 0$, the graph shifts left by $|c|$.

For the parent function $f(x) = |x|$, a horizontal dilation of the function compressed by a factor of $\frac{1}{|b|}$ is represented by $f(x) = |bx|$. For $b < 0$, the graph is stretched by a factor of $\frac{1}{|b|}$ units.

LESSON 3 Absolute Value Equations and Inequalities

To solve an **absolute value equation**, write the positive and negative equations that the absolute value equation represents. Then, solve each equation.

$$|5x - 4| = 21$$

$$5x - 4 = 21 \quad 5x - 4 = -21$$

$$5x - 4 + 4 = 21 + 4 \quad 5x - 4 + 4 = -21 + 4$$

$$5x = 25 \quad 5x = -17$$

$$\frac{5x}{5} = \frac{25}{5} \quad \frac{5x}{5} = \frac{-17}{5}$$

$$x = 5 \quad x = -\frac{17}{5}$$

If there is a range of solutions that satisfy a problem situation, you can write an **absolute value inequality**. To evaluate for a specific value, substitute the value for the variable.

For example, suppose a swimmer who wants to compete on a city swim club must be able to swim the 100-meter freestyle in 54.24 seconds plus or minus 1.43 seconds. Can a swimmer with a time of 53.15 seconds qualify for the team?

$$|t - 54.24| \leq 1.43$$

$$|53.15 - 54.24| \leq 1.43$$

$$|-1.09| \leq 1.43$$

$$1.09 \leq 1.43$$

The swimmer qualifies because his time is less than 1.43 seconds from the base time.

Absolute value inequalities can take four different forms with the absolute value expression compared to a value, c . To solve an absolute value inequality, you must first write it as an **equivalent compound inequality**. "Less than" inequalities will be conjunctions and "greater than" inequalities will be disjunctions.

Absolute Value Inequality	Equivalent Compound Inequality
$ ax + b < c$	$-c < ax + b < c$
$ ax + b \leq c$	$-c \leq ax + b \leq c$
$ ax + b > c$	$ax + b < -c$ or $ax + b > c$
$ ax + b \geq c$	$ax + b \leq -c$ or $ax + b \geq c$

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: _____

Absolute Value Functions and Equations

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 *Absolute Value Functions and Equations* topic by:

TOPIC 1: <i>Absolute Value Functions and Equations</i>	Beginning of Topic	Middle of Topic	End of Topic
Graphing an absolute value function.	☐	☐	☐
Describing the key attributes of the graph of an absolute value function.	☐	☐	☐
Transforming an absolute value function noting the results of changing the a -, b -, c -, and d -values.	☐	☐	☐
Formulating an absolute value equation.	☐	☐	☐
Solving absolute value equations and inequalities using a graph of the properties of equality.	☐	☐	☐

continued on the next page



TOPIC 1 SELF-REFLECTION *continued*

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

- Describe a new strategy you learned in the *Absolute Value Functions and Equations* topic.

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

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



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

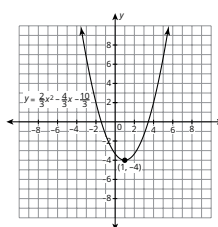
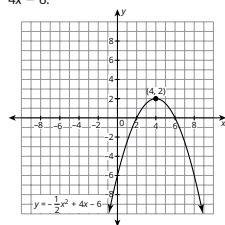
A

absolute maximum [máximo absoluto]

An absolute maximum is the highest point in the entire graph.

Example

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



absolute value equation [ecuación de valor absoluto]

An absolute value equation is an equation that contains an absolute value expression.

Example

$|a| = 6$, $|x| - 1 = 4$, $3|c - 2| = 12$ and $20 = |y + 3| - 5$ are all examples of absolute value equations.

absolute minimum [mínimo absoluto]

An absolute minimum is the lowest point in the entire graph.

Example

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



MATH GLOSSARY G-1

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 II

How to support your student as they learn

Algebra II Mathematics

Read and share with your student.

Research-Based Instruction

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

Thorough explanation of key concepts are presented in a manner. Every topic in this course builds on prior learning and connects to future learning. Each Topic Family Guide provides information on where your student has been and where they are going when studying the mathematical content in this course.

Where have we been?

In Grade 6, students learned that absolute value is a measure of magnitude and calculated the absolute value of a given number. They use their knowledge of solving linear equations in one variable to solve absolute value equations. In Algebra I, students solved compound linear inequalities and build on those experiences to solve absolute value inequalities in this topic.

Where are we going?

Although derived from the linear function, the absolute value function is not linear but they also use functions they have learned in this course and radical functions and functions.

The instructional materials balance conceptual understanding and build toward procedural fluency.

In this course, students' prior knowledge of the Concrete-Representational-Abstract (CRA) model is used to build conceptual understanding and build toward procedural fluency.

Concrete

Students explore a real-world scenario to develop their intuitive understanding of quadratic functions. They use a sheet of paper to model a drain.

Representational

Students use a table and graph to represent the area of the drain.

Learning Together

Teacher facilitates active learning of lessons and students are confident in sharing their learning.

Learning Individually

Skills Practice provides students the opportunity to engage in additional skill building that aligns to each Learning Together lesson. The Learning Together Days target discrete skills that may be practiced individually to achieve proficiency.

Thumbs Up, Thumbs Down, and Who's Correct

your student's common misconceptions and provide opportunities for peer work analysis.

Thumbs Up Thumbs Down

When you see a Thumbs Up icon:

- Take your time to read through the content.
- Think about the connection between steps.

Ask Yourself

- Was this method correct?
- What if I used this method before?

When you see a Thumbs Down icon:

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

Ask Yourself

- What if I did it this way?
- What if I did it this way?
- What if I did it this way?

Who's Correct

When you see a Who's Correct icon:

- Take your time to read through the content.
- Question the strategy or method shown.
- Decide if correct or incorrect.

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?

Targeted Skills Practice

Targeted Skills Practice provides support to your student as they work to gain proficiency of the course material. Spaced Practice provides a spaced retrieval of key concepts to your student. Extension opportunities provide challenges to accelerate your student's learning.

KEY TERMS

- absolute value function (función de valor absoluto)
- reflection (reflexión)
- line of reflection (línea de reflexión)
- argument of a function (argumento de una función)
- absolute value equation (ecuación de valor absoluto)
- absolute value inequality (desigualdad de valor absoluto)
- equivalent compound inequality (desigualdad compuesta equivalente)

WORKED EXAMPLE

Consider this absolute value equation:

$$|x - 4| = 6$$

There are two points that are 6 units to the right of 4.

$$x - 4 = 6$$
$$x = 10$$

Now consider the case:

$$|x - 4| = -6$$

If you know that $|x - 4| = 6$, you can conclude that $|x - 4| = -6$ is not possible.

FG-8 ALGEBRA II • COURSE FAMILY GUIDE

ALGEBRA II • COURSE FAMILY GUIDE FG-9

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, applying math in the real world, 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 Extending Linear Relationships Algebra II

TOPIC 1 Absolute Value Functions and Equations

Students begin this topic by reviewing what they know about absolute value from Grade 6. Students graph the function $f(x) = |x|$, $h(x) = |x|$ and $f(x) = |-x|$, discussing how each graph changes in a real-world situation, they formulate an absolute value function, an absolute value equation graphically. Students explore the absolute value parent function before moving on to solving equations and inequalities based on real-world situations.

Where have we been?

In Grade 6, students learned that absolute value is a measure of magnitude and calculated the absolute value of a given number. They use their knowledge of solving linear equations in one variable to solve absolute value equations. In Algebra I, students solved compound linear inequalities and build on those experiences to solve absolute value inequalities in this topic.

TALKING POINTS

DISCUSS WITH YOUR STUDENT

Absolute value functions have many real-world applications including financial planning, measuring the magnitudes of earthquakes, and measuring heart rate variability.

Parent Absolute Value Function

The parent absolute value function is $f(x) = |x|$.

The function has the following key attributes:
 Domain: $-\infty < x < \infty$
 Range: $y \geq 0$
 Minimum: $(0, 0)$

Where are we going?

Math in the Real World

Absolute value functions connect to many real-world situations in health sciences. For example, consider measuring how far a person's heart rate or temperature is from the normal range. Whether it's above or below that range, what matters is the size of the difference, not the direction. That is precisely what absolute value shows us—it focuses on the distance from zero, whether positive or negative.

Take blood pressure as another example. Doctors track how much a patient's blood pressure numbers go up or down compared to a healthy level. Absolute value helps show how significant the change is, whether it's an increase or a decrease. Absolute value equations solve real problems in healthcare, like monitoring patients to see the effects of treatments. It is incredible to think about how these absolute value equations can help save lives!

Key Terms

- absolute value function [función de valor absoluto]
- reflection [reflexión]
- line of reflection [línea de reflexión]
- argument of a function [argumento de una función]
- absolute value equation [ecuación de valor absoluto]
- absolute value inequality [desigualdad de valor absoluto]
- equivalent compound inequality [desigualdad compuesta equivalente]

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

Absolute Value Equations and Inequalities

In Lesson 3: Absolute Value Equations and Inequalities, students extend their understanding of solving equations to include those that include absolute values.

For example, solve the equation $|5x - 4| = 21$.

$$|5x - 4| = 21$$

$$+(5x - 4) = 21 \quad -(5x - 4) = 21$$

$$5x - 4 = 21 \quad 5x - 4 = -21$$

$$5x - 4 + 4 = 21 + 4 \quad 5x - 4 + 4 = -21 + 4$$

$$5x = 25 \quad 5x = -17$$

$$\frac{5x}{5} = \frac{25}{5} \quad \frac{5x}{5} = \frac{-17}{5}$$

$$x = 5 \quad x = -\frac{17}{5}$$

Absolute value inequalities can take four different forms with the absolute value expression compared to a value, c . To solve an absolute value inequality, you must first write it as an **equivalent compound inequality**. “Less than” inequalities will be conjunctions and “greater than” inequalities will be disjunctions.

Absolute Value Inequality	Equivalent Compound Inequality
$ ax + b < c$	$-c < ax + b < c$
$ ax + b \leq c$	$-c \leq ax + b \leq c$
$ ax + b > c$	$ax + b < -c$ or $ax + b > c$
$ ax + b \geq c$	$ax + b \leq -c$ or $ax + b \geq c$

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Math Glossary.....G-1

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