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How to Use This Addenda

Make sure you're ready to teach by noting the **Necessary Materials and Pre-Lesson Prep** you will need to gather or complete prior to the lesson

Find high-leverage instructional moves in the **Lesson Look Fors**. This is what leaders should see when observing your instruction

Note how your lesson objective ties to your state **Standards**

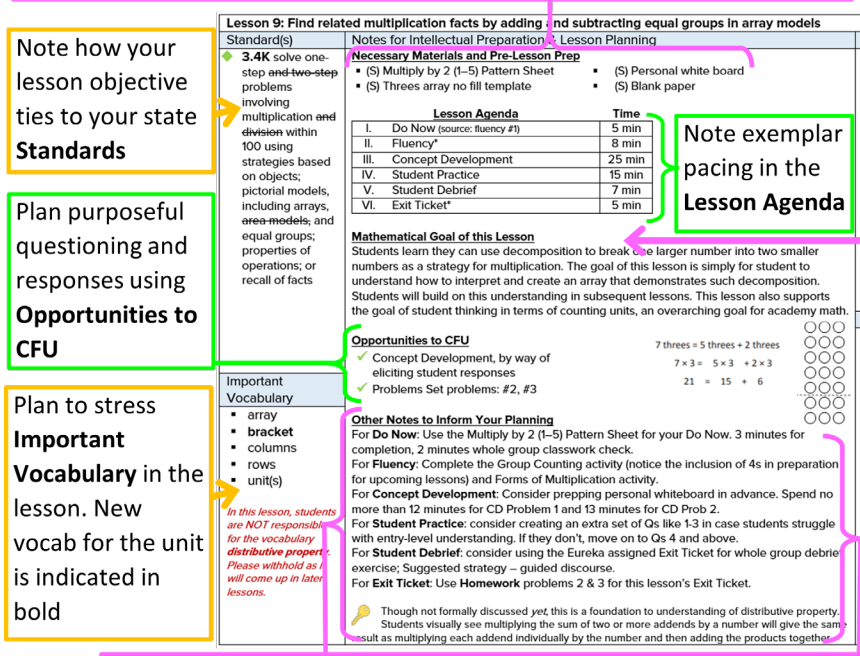
Note exemplar pacing in the **Lesson Agenda**

Use the **Mathematical Goal of the Lesson** to keep you focused on the appropriate student outcome

Plan purposeful questioning and responses using **Opportunities to CFU**

Plan instruction around what students need to Know & Do to be successful on the Exit Ticket using the identified **Student Know/Do Chart**

Plan to stress **Important Vocabulary** in the lesson. New vocab for the unit is indicated in bold



Lesson 9: Find related multiplication facts by adding and subtracting equal groups in array models Date: _____

Standard(s)

3.4K solve one-step ~~and two-step~~ problems involving multiplication ~~and division~~ within 100 using strategies based on objects; pictorial models, including arrays, ~~area models,~~ and equal groups; properties of operations; or recall of facts

Important Vocabulary

- array
- **bracket**
- columns
- rows
- unit(s)

*In this lesson, students are NOT responsible for the vocabulary **distributive property**. Please withhold as it will come up in later lessons.*

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- (S) Multiply by 2 (1–5) Pattern Sheet
- (S) Threes array no fill template
- (S) Personal white board
- (S) Blank paper

Lesson Agenda		Time
I.	Do Now (source: fluency #1)	5 min
II.	Fluency*	8 min
III.	Concept Development	25 min
IV.	Student Practice	15 min
V.	Student Debrief	7 min
VI.	Exit Ticket*	5 min

Mathematical Goal of this Lesson

Students learn they can use decomposition to break one larger number into two smaller numbers as a strategy for multiplication. The goal of this lesson is simply for student to understand how to interpret and create an array that demonstrates such decomposition. Students will build on this understanding in subsequent lessons. This lesson also supports the goal of student thinking in terms of counting units, an overarching goal for academy math.

Opportunities to CFU

- ✓ Concept Development, by way of eliciting student responses
- ✓ Problems Set problems: #2, #3

7 threes = 5 threes + 2 threes
7 × 3 = 5 × 3 + 2 × 3
21 = 15 + 6

Other Notes to Inform Your Planning

For **Do Now**: Use the Multiply by 2 (1–5) Pattern Sheet for your Do Now. 3 minutes for completion, 2 minutes whole group classwork check.
For **Fluency**: Complete the Group Counting activity (notice the inclusion of 4s in preparation for upcoming lessons) and Forms of Multiplication activity.
For **Concept Development**: Consider prepping personal whiteboard in advance. Spend no more than 12 minutes for CD Problem 1 and 13 minutes for CD Prob 2.
For **Student Practice**: consider creating an extra set of Qs like 1-3 in case students struggle with entry-level understanding. If they don't, move on to Qs 4 and above.
For **Student Debrief**: consider using the Eureka assigned Exit Ticket for whole group debrief exercise; Suggested strategy – guided discourse.
For **Exit Ticket**: Use **Homework** problems 2 & 3 for this lesson's Exit Ticket.

Though not formally discussed *yet*, this is a foundation to understanding of distributive property. Students visually see multiplying the sum of two or more addends by a number will give the same result as multiplying each addend individually by the number and then adding the products together.

Lesson Look Fors

Look for teachers to...

- ❑ Have established a signaling routine for choral response or work show during the respective fluency activities
- ❑ Use a think aloud to describe why they shade what portions of the array, or use a different symbol in the array
- ❑ Make the focus of the lesson understanding the visual representations

Look for students to...

- ❑ Explain what they see in the array and how it relates to a given number sentence.

Student Criteria for Success

Know: Shading, brackets, and/or dotted lines on an array will have mathematical significance
-brackets can identify parts or wholes
-dotted lines and shading represent decompositions

Know: We count units; In an array, counting rows is the same as counting units.

Know: Addition/subtraction and multiplication math facts (up to 4)

Do: Interpret an array
-identify decompositions within an array
-Relate an annotated or labeled array to one or more number sentences

Do: Addition/subtraction (+/- up to 4) Multiplication (2, 3, and 4)

Find recommended lesson modifications, content knowledge boosters, and/or high-leverage instructional moves that may not be in your Teacher Edition located in **Other Notes to Inform Your Planning**

UNIT SYNOPSIS

This unit focuses on the Absolute Value function family of graphs as well as Absolute Value inequalities. Prior to this course students will have solved one variable absolute value equations and solved linear inequalities but will not have seen absolute value inequalities. In Algebra 1, students focus heavily on linear functions and inequalities which will be a basis for this unit's exploration of Absolute Value functions.

Solving Equations and Inequalities: Solving an equation is the process of rewriting the equation to make what it says about its variable(s) as simple as possible. Properties of numbers and equality can be used to transform an equation (or inequality) into equivalent, simpler equations (or inequalities) in order to find solutions. Useful information about equations and inequalities (including solutions) can be found by analyzing graphs or tables. The numbers and types of solutions vary predictably, based on the type of equation.

- An absolute value quantity is nonnegative. Since opposites have the same absolute value, an absolute value equation can have two solutions.
- Absolute value inequalities can be written as compound inequalities without absolute value symbols.

Functions: A function is a relationship between variables in which each value of the input variable is associated with a unique value of the output variable. Functions can be represented in a variety of ways, such as graphs, tables, equations, or words. Each representation is particularly useful in certain situations. Some important families of functions are developed through transformations of the simplest form of the function.

- Just as the absolute value of x is its distance from 0, the absolute value of $f(x)$, or $|f(x)|$ gives the distance from the line $y = 0$ for each value of $f(x)$.
- You can quickly graph absolute value functions by transforming the graph of $y = |x|$.

Modeling: Many real-world mathematical problems can be represented algebraically. These representations can lead to algebraic solutions. A function that models a real-world situation can then be used to make estimates or predictions about future occurrences.

- Graphing an absolute value function is one way to identify key attributes of the function, such as domain, range, intercepts, symmetries, and the maximum or minimum values of the function.
- Graphing an absolute value function is one way to identify key attributes of the function, such as domain, range, intercepts, symmetries, and the maximum or minimum values of the function.
- Graphing an absolute value inequality in two variables is similar to graphing a linear inequality, the graph of an absolute value inequality contains all points on one side of the V-shaped boundary and may or may not include the points on the boundary.

Misconceptions:

- *Absolute values change the sign of a value.* Absolute value represents the distance a value is away from zero on the number line and is therefore always positive. Often students will think that absolute values are about changing a sign, but this would mistakenly yield negative results at times.
- *Since absolute values are positive $|x|$ cannot yield negative results*. The absolute value cannot be negative (for example: $|x| \neq -1$), but the inputs for x may be (for example: $|x| = 2, \text{then } x = 2 \text{ or } x = -2$). Students need to know that x may be positive or negative and they need to solve for both cases. Also, it is important to check solutions for validity because there may be extraneous solutions.

Underdeveloped Concepts:

- Some students may not understand why they must switch the second inequality when separating an absolute value inequality; like $|x| < 1 \Rightarrow x < 1 \text{ and } x > -1$.

Key Questions:

- How can Absolute Value functions be used to model situations involving distance or other measurements that do not yield negative outputs?
- How do transformations change the graph of an absolute value function?

CONTENT STANDARDS

Below are the standards addressed in this unit.

Readiness Standards	Supporting Standards
2A.2A Graph the functions ~~$f(x) = \sqrt{x}$, $f(x) = 1/x$, $f(x) = x^2$, $f(x) = \sqrt[3]{x}$, $f(x) = b^x$~~, $f(x) = |x|$, ~~and $f(x) = \log_b(x)$ where b is 2, 10, and e,~~ and, when applicable, analyze the key attributes such as domain, range, intercepts, symmetries, asymptotic behavior, and maximum and minimum given an interval.	**2A.6C** Analyze the effect on the graphs of $f(x) = |x|$ when $f(x)$ is replaced by $af(x)$, $f(bx)$, $f(x - c)$, and $f(x) + d$ for specific positive and negative real values of a, b, c, and d.
2A.6E Solve absolute value linear equations.	**2A.6D** Formulate absolute value linear equations.
	2A.6F Solve absolute value linear inequalities.

Focus on Disciplinary Literacy 	Mathematical Process Standard (F) – Analyze mathematical relationships to connect and communicate mathematical ideas.
	Mathematical Process Standard (G) – Display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

LEARNING SUPPORTS BY LESSON

There is a checkmark for the math support if the lesson	Lessons → Math Supports	L1	L2	L3	L4	L5
makes a connection to prior content or from a previous unit or academic year	Access Prior Knowledge	✓	✓	✓	✓	✓
uses familiar contexts or experiences to make the learning relevant to students	Real-World Connections		✓		✓	✓
makes use of graphic organizers	Graphic Organizers					
includes tools like rulers, protractors, patty paper, algebra tiles, etc.	Tools or Manipulatives					
incorporates tables, reference charts, displays, pictures, models, or color-coding	Visual Aids	✓	✓	✓	✓	✓
includes definitions, examples vs. nonexamples, cognates, etc.	Vocabulary Supports	✓	✓	✓	✓	✓
includes strategies that support language development						
asks students to discuss with their partner to prepare for whole class discussion	- Turn and Talk	✓	✓	✓	✓	✓
teacher facilitates a whole class discussion to debrief key learnings	- Guided Discussion		✓	✓	✓	✓
asks students to think independently, test their idea with a partner, and share whole group	- Think, Pair, Share	✓	✓	✓	✓	✓
includes sentence stems to support students with explanations	- Sentence Stems					
provides opportunities for students to work with a partner or a group	Peer Collaboration	✓	✓	✓	✓	✓
uses mnemonics such as SohCahToa	Mnemonics					
includes websites or equipment that enhances the lesson	Technological Support	✓				
content can be presented in different forms						
uses hands-on tools or manipulatives to represent the math	- Concrete					
uses drawings to represent the math	- Pictorial	✓	✓	✓	✓	✓
uses numbers and number sentences to represent the math	- Abstract	✓	✓	✓	✓	✓

The EFFL Model

Before You EFFL!

Here are helpful resources that you guide you in the right direction before your first EFFL lesson!

Why Should We EFFL?

The article advocates for the Experience First, Formalize Later (EFFL) teaching model, emphasizing its effectiveness in fostering deep understanding and flexible thinking in students. The author compares traditional teaching to a game of "Simon Says," where students merely mimic instructions without grasping underlying concepts. In contrast, EFFL encourages students to engage actively with problems, enhancing their ability to understand and apply calculus concepts creatively.

Tips for Lesson Planning

The article offers practical advice for effective lesson planning beyond the exhaustive and overly detailed approaches often emphasized during teacher training. It underscores the importance of thoughtful preparation but rejects the notion that teachers need to script every minute or detail of a class session.

Making the Most of Your EFFL Lesson Debrief

The article discusses the significance of the debriefing phase in the Experience First, Formalize Later (EFFL) lesson model, emphasizing its role in reinforcing learning and highlighting student contributions. The debrief session is seen as crucial for integrating academic vocabulary, emphasizing key lesson understandings, and valuing students' mathematical insights.

While You EFFL!

While each lesson may be unique in context and skills, all lessons benefit from the following practices:

Teacher Look Fors:

- ❑ Utilizing the Do Now to spark students' interest in the Activity.
- ❑ Use questioning to promote small group discussion and exploration, guided by monitoring questions.
- ❑ Connects Experience First to formal concepts using a colored pencil/pen to take notes along the margin during the Debrief.
- ❑ Facilitates whole-class discussions for students to reflect, share insights, and provides feedback that reinforces key concepts.
- ❑ Tracks time to adapt lesson pacing and support based on student response and engagement.

Students Look Fors:

- ❑ In the Activity, students engage in group work and discourse.
- ❑ Exploring the activity, testing hypotheses and approaches (trial & error).
- ❑ Take notes on key ideas and concepts using different colored pencil/pen to take notes along the margin.
- ❑ Share thoughts and ideas that demonstrate their approach to their work.

Other considerations

- During the **Experience First** phase, if most of your students seem stuck or disengaged, take a moment to pause, reset, and provide clear instructions. Some problems of the Activity are more suitable to do a whole-class discussion as a means to save some instructional time for Student Practice or the Exit Ticket. You are encouraged to adapt the EFFL (Experience First, Formalize Later) process to meet your students' needs while maintaining a focus on student-centered instruction.

ROADMAP

AT A GLANCE: Unit 2 – Absolute Value Functions			
Day	Date	Lesson	Lesson Title
1		1	Absolute Value Functions and Dilations
2		2	Modeling with Absolute Value Functions
3		3	Graphing Two Variable Absolute Value Inequalities
4		4	Writing and Solving Absolute Value Equations
5		5	Writing and Solving Absolute Value Inequalities
6			*Unit 2 Success Day 1 – Use as needed based on your data*
7			*Unit 2 Success Day 2 – Unit Assessment Review*
8			End of Unit 2 Assessment

Date: _____

Lesson 1: The Absolute Value Functions and Dilations

Standard(s)

- **2A.2A** Graph the functions ~~$f(x) = \sqrt{x}$, $f(x) = 1/x$, $f(x) = x^3$, $f(x) = \sqrt[3]{x}$, $f(x) = b^x$~~, $f(x) = |x|$, ~~and $f(x) = \log_b(x)$ where b is 2, 10, and e~~, and, when applicable, analyze the key attributes such as domain, range, intercepts, symmetries, asymptotic behavior, and maximum and minimum given an interval.
- **2A.6C** Analyze the effect on the graphs of $f(x) = |x|$ when $f(x)$ is replaced by $af(x)$, $f(bx)$, $f(x - c)$, and $f(x) + d$ for specific positive and negative real values of a, b, c, and d.

Important Vocabulary

- **absolute value function**
- **axis of symmetry**
- vertex

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Student Workbook
- Computer for Desmos Activity
- 3 colors of pens per student

Lesson Structure:

- Do Now (5 min)
- INM (20 min)
- Debrief (10 min)
- Student Practice (20 min)
- Exit Ticket (5 min)

Mathematical Goal of this Lesson

In this lesson, students will be able to use the graph of an absolute value function to analyze the domain, range, intercepts, symmetry, and maximum and minimum given an interval. Students will identify, describe, and graph transformations of absolute value functions.

Opportunities to CFU

- ✓ After each problem on INM
- ✓ Debrief

Focus on Disciplinary Literacy

INM & Debrief

Other Notes to Inform Your Planning

In this lesson we will investigate transformations of absolute value functions with special attention on dilations. Absolute value functions make the dilations very easy to notice and understand how they are changing the vertical or horizontal steepness of a graph.
You should consider what familiarity students have with the absolute value. Ask the group if anyone has seen this symbol before and to explain what it means. You could even add a margin note right away so that everyone uses the same definition of absolute value. From there, students can work in groups through the entire activity. They will need 3 different color pens or pencils for their graphs.

Lesson Look Fors

Look for teachers to…

- ❑ Help students focus on vertical or horizontal stretch/shrink of the graph.
- ❑ Have students share one coordinate plane for each set of three graphs so they can focus on the changes.

Look for students to…

- ❑ Make observations about shifts and dilations based on sketches and use Desmos to visualize the changes to the graphs.
- ❑ Build on their prior knowledge to describe changes to absolute value functions given their equations.

Student Know/Do Chart

Students can

Graph absolute value functions with specified transformations.

Know that the domain of the absolute value parent function is all real numbers and the range is all nonnegative values of y.

Know that absolute value functions relate values to their distance away from zero on a number line so the outputs must be nonnegative.

Date: _____

Lesson 2: Modeling with Absolute Value Functions

Standard(s)

2A.2A Graph the functions ~~$f(x) = \sqrt{x}$, $f(x) = 1/x$, $f(x) = x^3$, $f(x) = \sqrt[3]{x}$, $f(x) = b^x$~~, $f(x) = |x|$, ~~and $f(x) = \log_b(x)$ where b is 2, 10, and e,~~ and, when applicable, analyze the key attributes such as domain, range, intercepts, symmetries, asymptotic behavior, and maximum and minimum given an interval.

Important Vocabulary

- model

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Student Workbook

Lesson Structure:

- Do Now (5 min)
- INM (25 min)
- Debrief (5 min)
- Student Practice (20 min)
- Exit Ticket (5 min)

Mathematical Goal of this Lesson

In this lesson, students will be able to write and analyze absolute value functions to model real-world scenarios. Students will model real world situations and scenarios using absolute value functions. Students will use the absolute value functions to make predictions or approximations for future values. Students should consider how the scenarios would affect the domain and range of the absolute value function.

Opportunities to CFU

✓ End of the INM

✓ Student Practice #2, 3

Other Notes to Inform Your Planning

This lesson connects students' prior understanding of attributes of absolute value graphs to write functions for real-world scenarios. Students have written functions for linear and quadratic real-world scenarios in Algebra I. In Algebra II, students will use the equations written to solve equations for real-world situations. Students will use understanding writing functions to be successful in future units.

Lesson Look Fors

Look for teachers to…

- ❑ Guide students through the scenarios and support them in their models.
- ❑ Have students write their steps for creating models.

Look for students to…

- ❑ Make connections with the shape of absolute value functions and real-world applications.
- ❑ Relate the vertex of the absolute function as well as the intercepts to key features in the scenario.

Student Know/Do Chart

Students can

Do: Write and analyze absolute value functions to model real-world scenarios.

Know: Absolute value function models can be used to make predictions for future values in the scenario.

Date: _____

Lesson 3: Graphing Two Variable Absolute Value Inequalities

Standard(s)

2A.2A Graph the functions ~~$f(x) = \sqrt{x}$, $f(x) = 1/x$, $f(x) = x^3$, $f(x) = \sqrt[3]{x}$, $f(x) = b^x$~~, $f(x) = |x|$, ~~and $f(x) = \log_b(x)$ where b is 2, 10, and e~~, and, when applicable, analyze the key attributes such as domain, range, intercepts, symmetries, asymptotic behavior, and maximum and minimum given an interval.

2A.6F Solve absolute value linear inequalities.

Important Vocabulary

- **boundary (solid/dotted)**
- **test point**
- two-variable absolute value inequality

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Student Workbooks
- graphing calculators

Lesson Structure:

- Do Now (5 min)
- INM (20 min)
- Debrief (10 min)
- Student Practice (20 min)
- Exit Ticket (5 min)

Mathematical Goal of this Lesson

In this lesson, students will be able to graph the solution set of two-variable absolute value inequalities. Students will graph absolute value inequalities by graphing the function and then determining if it should be solid or dotted and then use a test point not on the graph to determine where to shade. These shaded regions are the areas of all the possible solutions of the absolute value inequality.

Opportunities to CFU

- ✓ After INM #2 and 5
- ✓ Debrief
- ✓ Student Practice #1-4

Focus on Disciplinary Literacy

INM & Debrief

Other Notes to Inform Your Planning

This lesson connects students' prior understanding of graphing absolute value functions to graphing absolute value inequalities. Students graph linear inequalities in Algebra I. In Algebra II, students will use the same inequality rules to graph absolute value inequalities. Students will use the understanding of graphing the inequalities to solving absolute value inequalities algebraically in lesson 5.

Lesson Look Fors

Look for teachers to…

- ❑ Focus students on what they already know about graphing inequalities.
- ❑ Guide students through group work without giving them answers or too much information. Be supportive but let the students lead the thinking.

Look for students to…

- ❑ Graph the absolute value curves as they have in prior lessons then determine if the curve should be solid or dotted and use a test point to shade only one side.

Student Know/Do Chart

Students can

Do — Properly graph and shade a two-variable absolute value inequality.

Do — Practice writing inequalities that match given graphs of two-variable absolute value inequalities.

Know — Know that a point can be tested that is on one side of a curve to test if the original inequality is true or false for the (x, y) of the test point to determine shading.

Date: _____

Lesson 4: Writing and Solving Absolute Value Equations

Standard(s)

- **2A.6E** Solve absolute value linear equations.
- **2A.6D** Formulate absolute value linear equations.

Important Vocabulary

- absolute value equation
- **central value**
- **empty set**
- **extraneous solution**
- solution set
- **variance**

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Student Workbook
- graphing calculator

Lesson Structure:

- Do Now (5 min)
- INM (30 min)
- Debrief (5 min)
- Student Practice (15 min)
- Exit Ticket (5 min)

Mathematical Goal of this Lesson

In this lesson, students will be able to write and solve absolute value equations and interpret the solution set in context. Students will write and solve absolute value equations by setting appropriate variables for a variety of scenarios. Students will also identify when an absolute value function has one or no solutions.

Opportunities to CFU

- ✓ Each solution type in the INM
- ✓ Debrief
- ✓ Student Practice #6-9

Focus on Disciplinary Literacy

INM & Debrief

Other Notes to Inform Your Planning

This lesson connects students' prior understanding of writing and solving equations to writing and solving absolute value equations. Students solve linear equations in Algebra I. In Algebra II, students will use the same inverse rules to solve absolute value equations. Students write linear and exponential equations in Algebra I. In Algebra II, students will use vocabulary and understanding of equations to write absolute value equations.

Lesson Look Fors

Look for teachers to…

- ❑ Connect what students have found with solving and graphing absolute value functions to how to write absolute value equations.
- ❑ Build on students' prior knowledge of how to solve a linear equation and work with absolute values in Algebra 1 and up to now.
- ❑ Support students that still have an algebra gap.

Look for students to…

- ❑ Check if the solution to an absolute value equation is possible and check for extraneous solutions.
- ❑ Use the details from the scenario given to write an absolute value equation.
- ❑ Solve the equations they set up and give their answers in context to the original problem.

Student Know/Do Chart

Students can

Do Solve absolute value equations and represent the solutions in a variety of ways.

Do Write and solve absolute value equations and interpret the solution set in context.

Know Know when to check for an extraneous solution when working with absolute value equations.

Date: _____

Lesson 5: Writing and Solving Absolute Value Inequalities

Standard(s)

◆ **2A.6F** Solve absolute value linear inequalities.

Important Vocabulary

- absolute value inequality
- and
- compound inequality
- exclusive
- inclusive
- intersection
- or
- solution set
- union

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Student Workbook

Lesson Structure:

- Do Now (5 min)
- INM (25 min)
- Debrief (5 min)
- Student Practice (20 min)
- Exit Ticket (5 min)

Mathematical Goal of this Lesson

In this lesson, students will be able to write and solve absolute value inequalities and interpret the solution set in context. Students will write absolute value inequalities to approximate given scenarios and then solve them. Students solve absolute value inequalities by converting the absolute value into a compound inequality. Students will determine if an absolute value yields an intersection or union depending on the original inequality. Students need to test their solutions against the reasonableness for the given scenario. Often a scenario will cause one or both solutions to be extraneous.

Opportunities to CFU

✓ After INM #6

✓ Student Practice #1-6

Other Notes to Inform Your Planning

In this lesson, students will explore why absolute value inequalities are solved using compound inequalities. Students will use understanding of how to solve a compound inequality with the knowledge that an absolute value is the distance from zero towards the negative or the positive value to solve. They will then use their understanding of writing absolute value equations and solving absolute value inequalities to write and apply them to real-world scenarios. Students will work forwards and backwards to create full meaning of the context and identify necessary values.

Lesson Look Fors

Look for teachers to…

- ❑ Connect this lesson to absolute value inequality graphs in two-variables for students to understand the solution sets.
- ❑ Actively monitor students to be sure they are correctly shading the solution regions on their number lines.

Look for students to…

- ❑ Solve absolute value inequalities and give their solutions using a number line.
- ❑ Split the absolute value inequality into two inequalities joined by an “and” or an “or” depending on the type of inequality sign in the problem.
- ❑ Write their own absolute value inequalities and connect the solutions back to the context of the scenarios.

Student Know/Do Chart

Students can

Do Solve absolute value inequalities and graph the solution set on a number line.

Do Write and solve absolute value inequalities and interpret the solution set in context.

Know Absolute value inequalities can be written to model real-world scenarios that have a symmetrical range of solutions.

Recommended Unit 2 Success Day Material and Resources

Date: _____

To review topics taught in Unit 2, use the following resources. Your exit ticket data should be used to determine individualized needs. The resources can be used in small groups, whole groups, or independent groups and be integrated with other classroom routines, like computer aligned practice and teacher-led groups.

To review or practice about the Absolute Value Function, use...

Sample Activities & Tasks:

- Constructing & Graphing Piecewise Definitions for Absolute Value Functions Problem Set (answers)

Content Video Lessons:

- What is Absolute Value Anyway?

To review or practice Attributes of Absolute Value Functions, use...

Sample Activities & Tasks:

- Attributes of Absolute Value Functions Pearson Form G

Content Video Lessons:

- Attributes (extra) of the Absolute Value Parent Function

To review or practice Transformations of Absolute Value Functions, use...

Desmos Interactive Applets:

- Exploring Absolute Value Transformations

Sample Activities & Tasks:

- Springboard Algebra 2: Transforming Absolute Value Function Investigation & Exercises (answers)
- Graphing Transformations of Absolute Value Functions Problem Set

Khan Academy Lessons:

- Shifting Absolute Value Graphs
- Scaling & Reflecting Absolute Value Functions (Equation)
- Scaling & Reflecting Absolute Value Functions (Graph)
- Graphing Absolute Value Functions

To review or practice Writing and Solving Absolute Value Equations, use...

Content Video Lessons:

- Introduction to Absolute Value Equations and Graphs
- Solving Absolute Value Equations
- Solving Equations with Two Absolute Value Expressions
- Absolute Value Equation: Two Solutions
- Absolute Value Equation: One Solution
- Absolute Value Equation: No Solution
- Absolute Value Application Problems
- Applications of Absolute Value

To review or practice Writing and Solving Absolute Value Inequalities, use...

Sample Activities & Tasks:

- Absolute Value Inequalities Word Problems

Content Video Lessons:

- Introduction to Absolute Value Inequalities
- Solving Absolute Value Inequalities
- Solving Absolute Value Inequalities Another Example, Part 1
- Solving Absolute Value Inequalities Another Example, Part 2
- Solving Absolute Value Inequalities: No Solution
- Absolute Value Inequalities Word Problem, Example 1
- Absolute Value Inequalities Word Problem, Example 2
- Writing Absolute Value Inequality from Word Problem

Date: _____

Unit 2 Exam

Standard(s)	Notes for Intellectual Preparation & Lesson Planning
◆ **2A.2A** Graph the functions ~~$f(x) = \sqrt{x}$, $f(x) = 1/x$, $f(x) = x^3$, $f(x) = \sqrt[3]{x}$, $f(x) = b^x$~~, $f(x) = \lvert x \rvert$, ~~and $f(x) = \log_b(x)$ where b is 2, 10, and e~~, and, when applicable, analyze the key attributes such as domain, range, intercepts, symmetries, asymptotic behavior, and maximum and minimum given an interval. **Problems #3, 5** ◆ **2A.6E** Solve absolute value linear equations. **Problems #4, 7, 8a** ◆ **2A.6C** Analyze the effect on the graphs of $f(x) = \lvert x \rvert$ when $f(x)$ is replaced by $af(x)$, $f(bx)$, $f(x - c)$, and $f(x) + d$ for specific positive and negative real values of a, b, c, and d. **Problems #1, 2** ◆ **2A.6F** Solve absolute value linear inequalities. **Problems #6, 8bc**	**Necessary Materials and Pre-Lesson Prep** ▪ Algebra 2 Unit 2 Exam ▪ Assessment Companion for Algebra 2 Unit 2 Exam found on Curriculum Corner **Notes to Inform Your Planning** Review the Unit 2 Exam on Curriculum Corner. Internalize & create an exemplar for the assessment prior to teaching the unit as part of unpacking the unit. Use the exemplar to spar with the answer key provided on Curriculum Corner. Administer the Unit 2 Exam following guidance on the Scope & Sequence to ensure the scoring deadline is met.

UNPACKED STANDARDS

Focus standards for this unit.

Standards Clarification		
Standards	**Specificity**	**Notes/Explanations/Examples**

2A.2A Graph the functions ~~$f(x) = \sqrt{x}$, $f(x) = 1/x$, $f(x) = x^3$, $f(x) = \sqrt[3]{x}$, $f(x) = b^x$,~~ $f(x) = |x|$, ~~and $f(x) = \log_b(x)$ where b is 2, 10, and e,~~ and, when applicable, analyze the key attributes such as domain, range, intercepts, symmetries, asymptotic behavior, and maximum and minimum given an interval.	Including, but not limited to:
	• Representations of functions, including graphs, tables, and algebraic generalizations
	  ○ Absolute value, $f(x) = |x|$
	• Connections between representations of families of functions
	• Comparison of similarities and differences of families of functions
	Analyze
	• Domain and range of the function
	  ○ Domain – set of input values for the independent variable over which the function is defined
	  ○ Range – set of output values for the dependent variable over which the function is defined
	  ○ Representation for domain and range
	  ▪ Verbal description
	  ▪ Inequality notation – notation in which the solution is represented by an inequality statement
	  ▪ Set notation – notation in which the solution is represented by a set of values
	  ▪ Interval notation – notation in which the solution is represented by a continuous interval
	  ○ Domain and range of the function versus domain and range of the contextual situation
	• Key attributes of functions
	  ○ Intercepts/Zeros
	  ○ Symmetries
	  ▪ Reflectional symmetry
	  ○ Maximum and minimum (extrema)
	  ▪ Relative maximum
	  ▪ Relative minimum
	• Use key attributes to recognize and sketch graphs
	• Application of key attributes to real-world problem situations
		• Grade Level(s):
		  ○ The notation $\Re$ represents the set of real numbers, and the notation Z represents the set of integers.
		  ○ Algebra I studied parent functions $f(x) = x$, $f(x) = x^2$, and $f(x) = b^x$ and their key attributes.
		  ○ Precalculus will study polynomial, power, trigonometric, inverse trigonometric, and piecewise defined functions, including step functions.
		  ○ Various mathematical process standards will be applied to this student expectation as appropriate.

2A.6E Solve absolute value linear equations.	Including, but not limited to:
	• Methods for solving absolute value linear equations with and without technology
	  ○ Graphs
	  ○ Algebraic methods
	  ○ Justification of solutions with and without technology
		• Grade Level(s):
		  ○ Grade 6 defined absolute value and identified the absolute value of a number.
		  ○ Algebra II introduces the absolute value equation and its applications.
		  ○ Various mathematical process standards will be applied to this student expectation as appropriate.

Standards Clarification		
Standards	**Specificity**	**Notes/Explanations/Examples**
	▪ Extraneous solutions Real-world problem situations modeled by absolute value functions ○ Justification of reasonableness of solutions in terms of the real-world problem situations or data collections	
2A.6C Analyze the effect on the graphs of $f(x) = \|x\|$ when $f(x)$ is replaced by $af(x)$, $f(bx)$, $f(x - c)$, and $f(x) + d$ for specific positive and negative real values of a, b, c, and d.	Including, but not limited to: • General form of the absolute value function ○ Absolute value $f(x) = \|x\|$ • Representations with and without technology ○ Graphs ○ Tables ○ Verbal descriptions ○ Algebraic generalizations • Effects on the graph of $f(x) = \|x\|$ when parameters a, b, c, and d are changed in $f(x) = a\|b(x - c)\| + d$ ○ Effects on the graph of $f(x) = \|x\|$ when $f(x)$ is replaced by $af(x)$ with and without technology ○ Effects on the graph of $f(x) = \|x\|$, when $f(x)$ is replaced by $f(bx)$ with and without technology ○ Effects on the graph of $f(x) = \|x\|$, when $f(x)$ is replaced by $f(x - c)$ with and without technology ○ Effects on the graph of $f(x) = \|x\|$, when $f(x)$ is replaced by $f(x) + d$ with and without technology • Connections between the critical attributes of transformed function and $f(x) = \|x\|$ • Descriptions of the effects on the domain and range by the parameter changes • Effects of multiple parameter changes	• Grade Level(s): ○ Algebra I determined effects on the graphs of the parent functions, $f(x) = x$ and $f(x) = x^2$ when $f(x)$ is replaced by $af(x)$, $f(x) + d$, $f(x - c)$, $f(bx)$ for specific values of a, b, c, and d. ○ Algebra II introduces the absolute value function and its transformations. ○ Various mathematical process standards will be applied to this student expectation as appropriate.
2A.6D Formulate absolute value linear equations.	Including, but not limited to: • Data collection activities with and without technology ○ Data modeled by absolute value functions • Real-world problem situations ○ Real-world problem situations modeled by absolute value functions • Data tables • Technology methods ○ Transformations of $f(x) = \|x\|$	• Grade Level(s): ○ Grade 6 defined absolute value and identified the absolute value of a number. ○ Algebra II introduces the absolute value equation and its applications. ○ Various mathematical process standards will be applied to this student expectation as appropriate.
2A.6F Solve absolute value linear inequalities.	Including, but not limited to: • Methods for solving absolute value linear inequalities with and without technology ○ Graphs ○ Algebraic methods ○ Justification of solutions of absolute value inequalities with and without technology	• Grade Level(s): ○ Grade 6 defined absolute value and identified the absolute value of a number. ○ Algebra II introduces absolute value inequalities. ○ Various mathematical process standards will be applied to this student expectation as appropriate.

Standards Clarification		
Standards	Specificity	Notes/Explanations/Examples
	▪ Graphs ▪ Substitution of solutions into original functions ▪ Removal of extraneous solutions	

VERTICAL STANDARDS

This section details the **progression** of key student expectations in the courses **before** and **after** this course. This will help you understand what **prior knowledge skills to build upon** and guide you in knowing what **skills you are preparing your students** for in the subsequent course.

Algebra 1	Algebra 2	Pre-Calculus
• **A.2H** Write linear inequalities in two variables given a table of values, a graph, and a verbal description. • **A.3D** Graph the solution set of linear inequalities in two variables on the coordinate plane. • **A.3E** Determine the effects on the graph of $f(x) = x$ when $f(x)$ is replaced by $af(x)$, $f(bx)$, $f(x - c)$, and $f(x) + d$ for specific positive and negative real values of a, b, c, and d. • **A.5A** Solve linear equations in one variable, including those for which the application of the distributive property is necessary and for which variables are included on both sides. • **A.5B** Solve linear inequalities in one variable, including those for which the application of the distributive property is necessary and for which variables are included on both sides.	• **2A.2A** Graph the functions ~~$f(x) = \sqrt{x}$, $f(x) = 1/x$, $f(x) = x^3$, $f(x) = \sqrt[3]{x}$, $f(x) = b^x$,~~ $f(x) = |x|$, ~~and $f(x) = \log_b(x)$ where b is 2, 10, and e,~~ and, when applicable, analyze the key attributes such as domain, range, intercepts, symmetries, asymptotic behavior, and maximum and minimum given an interval. • **2A.6C** Analyze the effect on the graphs of $f(x) = |x|$ when $f(x)$ is replaced by $af(x)$, $f(bx)$, $f(x - c)$, and $f(x) + d$ for specific positive and negative real values of a, b, c, and d. • **2A.6D** Formulate absolute value linear equations. • **2A.6E** Solve absolute value linear equations. • **2A.6F** Solve absolute value linear inequalities.	• **(2.D)** Describe symmetry of graphs of even and odd functions. • **(2.I)** Determine and analyze the key features of exponential, logarithmic, rational, polynomial, power, trigonometric, inverse trigonometric, and piecewise defined functions, including step functions such as domain, range, symmetry, relative maximum, relative minimum, zeros, asymptotes, and intervals over which the function is increasing or decreasing. • **(5.J)** Solve polynomial equations with real coefficients by applying a variety of techniques in mathematical and real-world problems. • **(5.K)** Solve polynomial inequalities with real coefficients by applying a variety of techniques and write the solution set of the polynomial inequality in interval notation in mathematical and real-world problems. • **(5.L)** Solve rational inequalities with real coefficients by applying a variety of techniques and write the solution set of the rational inequality in interval notation in mathematical and real-world problems.