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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**

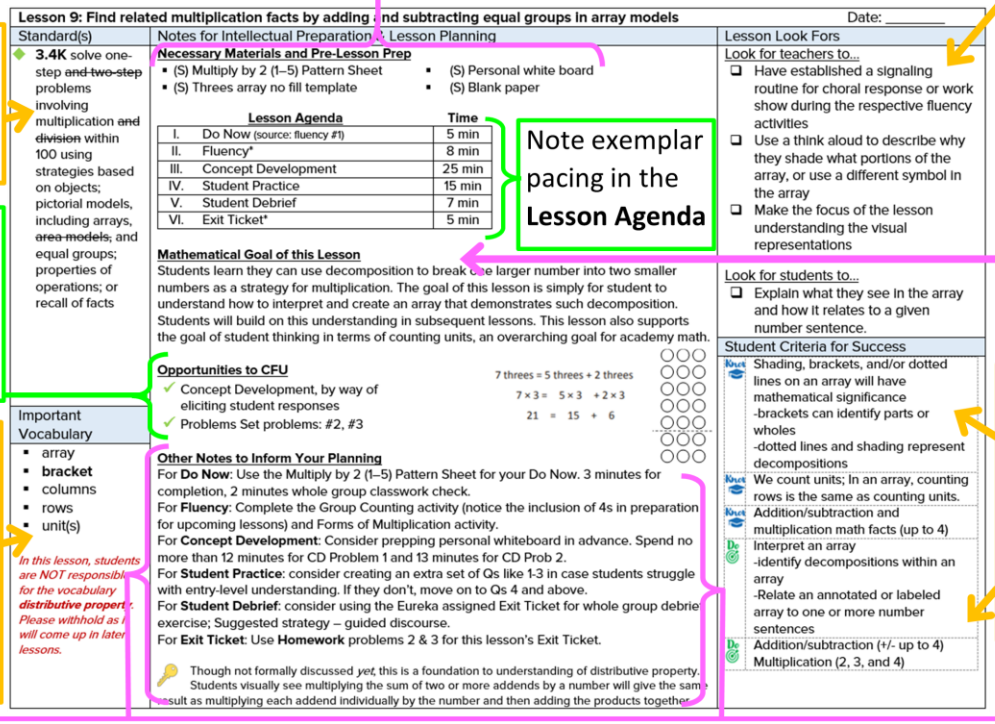
Note exemplar pacing in the **Lesson Agenda**

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 Criteria for Success**

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

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

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.*

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 introduces students to mathematical ways of thinking that they will apply throughout this course and the rest of their math careers. In this unit, students will experience the complexity, and sometimes ambiguity, involved with thinking and reasoning mathematically. They will get to play with patterns to build their inductive reasoning skills, and work with conditional statements so that they can generate logically sound arguments (and in later units, proofs). They'll get to experience the difference between inductive and deductive reasoning by looking at patterns and logic puzzles, and they'll also explore the power of visuals to create a convincing argument.

Students will apply these foundational reasoning skills and concepts throughout the rest of the units in this course.

CONTENT STANDARDS

Below are the standards addressed in this unit.

Readiness Standards	Supporting Standards
G.4(C) verify that a conjecture is false using a counterexample	**G.5(A)** investigate patterns to make conjectures about geometric relationships, ~~including angles formed by parallel lines cut by a transversal, criteria required for triangle congruence, special segments of triangles, diagonals of quadrilaterals, interior and exterior angles of polygons, and special segments and angles of circles choosing from a variety of tools.~~ **G.4(B)** identify and determine the validity of the converse, inverse, and contrapositive of a conditional statement and recognize the connection between a biconditional statement and a true conditional statement with a true converse

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	L6	L7
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	Language Supports	✓	✓	✓	✓	✓	✓	✓
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	Different Modalities							
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

Experience First, Formalize Later (EFFL) Model

Opening

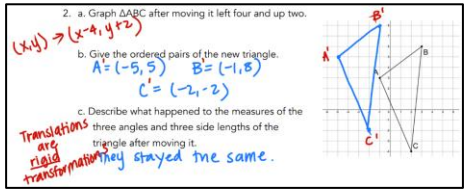
For every new lesson, the teacher begins by making the goals of the lesson crystal clear. The teacher does more than simply read the objective to the class. They make connections to previous learning, share how this learning fits into a bigger picture, or explain why this learning is important for future learning.

Activity / Interaction With New Material (INM)

For this part of the lesson, students work in pairs or groups of four to experience new content through an activity. Students might be discussing a proposed scenario, working with other groups, or doing a simulation. The student activity is designed for students to be able to do without the help of the teacher. Of course, the teacher is watching and listening in to conversations in order to formatively assess student understanding. The teacher provides questions, cues, and prompts (not answers!) to help push groups forward when they are stuck or have made a mistake. As students begin to finish the activity, the teacher identifies students to write their work on the board. Most often, the teacher selects student work that will easily allow them to connect the experience to formal learning. Students write their work on the whiteboard in a single-color marker.

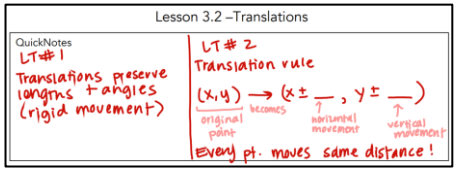
Debrief Activity

Once students have recorded their responses in their workbook (see blue writing to the right), the teacher calls the whole group back together for a debrief. It is in this discussion that the teacher will help students formalize the learning. The teacher connects the student activity experience to new vocabulary, definitions, formulas, and algorithms. The formal learning is attached specifically to the experiences of the activity so that students can enhance their constructed understanding of the new content. The teacher writes all of the formal learning in a different color in the margins of the activity (see red writing to the right). The students add these ideas in the margins on their activity page and often think of this as the formal "notes" of the lesson. In all of the answer keys we provide on Math Medic, the teacher formal learning points are provided in the margins in a different color.



QuickNotes

In this part of the lesson, the teacher uses the whole experience of the activity and the formalization in the debrief to summarize the learning from the lesson. Notice that we use the box to constrain the amount of formal "notes" that the teacher can provide.



Student Practice

Now that students have arrived at some new learning, they need to be able to apply it in new contexts. Most often we have students complete these questions in pairs and occasionally we select one question to use as an exit ticket. If we have time, we have students write solutions on the whiteboard.

Extra Practice

We typically give students around 3-5 "Extra Practice" problems for each lesson. We choose problems that are closely aligned with the Learning Objectives of the lesson. It is our belief that "less is more" here. We would rather students spend their Extra Practice time thinking deeply about just a few problems, rather than surface level thinking on many problems. When possible, we provide the answers at the bottom of the page, so they can immediately assess their understanding.

Slightly modified version of: https://www.calc-medic.com/post/experience-first-formalize-later#:~:text=%E2%80%9CExperience%20First%2C%20Formalize%20Later%E2%80%9D,at%20formal%20definitions%20and%20formulas.

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 1 – Reasoning in Geometry			
Day	Date	Lesson	Lesson Title
There are 2 flexible Success Days that you can use anywhere in the unit. • Consider using 1 day between Lessons 3 and 4 to give optional Topic Quiz 1. • Consider using 1 day before the Cumulative Review or after the Unit 1 Exam. • If you don't need to use both success days, you can/should save them for later.			
1		1	Creating Definitions
2		2	Inductive Reasoning
3		3	Conditional Statements
4			Success Day (consider administering Unit 1 Topic Quiz)
5		4	What Is Deductive Reasoning?
6		5	Using Deductive Reasoning
7		6	Visual Reasoning
9		CR	Cumulative Review | Success Day
10			Unit 1 Exam

Lesson 1: Creating Definitions | Date: _____

Standard(s)

- **G.4(C)** verify that a conjecture is false using a counterexample
- **G.5(A)** investigate patterns to make conjectures about geometric relationships, ~~including angles formed by parallel lines cut by a transversal, criteria required for triangle congruence, special segments of triangles, diagonals of quadrilaterals, interior and exterior angles of polygons, and special segments and angles of circles choosing from a variety of tools.~~

Important Vocabulary

- **conjecture**
- **counterexample**
- **definition**

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- various pairs of "shoes" in a bag
- Class set of red pens
- Unit 1 Student Edition

Lesson Structure:

- Do Now (5 min)
- INM (15 min)
- Debrief (10 min)
- Student Practice (15 min)
- Exit Ticket (10 min)

Mathematical Goal of this Lesson

By the end of this lesson, students should be able to define basic geometric terms by looking at examples and nonexamples. Additionally, students should be able to write an accurate definition by classifying, differentiating, and testing their definition by looking for counterexamples.

Opportunities to CFU

✓ INM: 3, 4 ✓ Student Practice: 1, 2

Other Notes to Inform Your Planning

For **DEBRIEF:** This is students' first MathMedic Debrief of the year! Please make sure you have read and internalized pp. 4-5 of this addendum, and please read this important introductory note from MathMedic:

When we transition from small group work to whole class debrief, we tell students to switch to a red pen. This allows students to clearly see their original thinking and what they learned in the whole class debrief. The margin notes help formalize the learning, adding precise vocabulary, notation, or important connections to the work they've already done during the activity. We encourage students not to erase previous answers, even if they've changed their minds or no longer think their answers are correct. *Revising, changing one's mind, and uncertainty are crucial aspects of learning math, and we want to dispel the common notion that all mistakes are to be either avoided or quickly obliterated.* **We value the thinking process over just the correct answer.** (Source: MathMedic)

Focus on Disciplinary Literacy

Debrief

Lesson Look Fors

Look for teachers to…

- ❑ take advantage of pulling "shoes" out of a bag to generate interest and joy, while setting students up for a discussion that will likely turn into a debate.
- ❑ stamp that good definitions classify and differentiate.
- ❑ debrief in red ink; explain that the red pens are ONLY to be used when debriefing so that students can clearly see their original thinking vs what they learned throughout the debrief.

Look for students to…

- ❑ (during Debrief) NOT erase or change their answers, but to write over them in red.
- ❑ generate definitions and explain how and why their definition is strong.

Student Know/Do Chart

Do: Students can define a term given examples and non-examples.

Know: A counterexample is an example that shows a conjecture is false.

Know: Accurate definitions both classify and differentiate; also, they prevent counterexamples from being generated.

Lesson 2: Inductive Reasoning | Date: _____

Standard(s)

- **G.4(C)** verify that a conjecture is false using a counterexample
- **G.5(A)** investigate patterns to make conjectures about geometric relationships, ~~including angles formed by parallel lines cut by a transversal, criteria required for triangle congruence, special segments of triangles, diagonals of quadrilaterals, interior and exterior angles of polygons, and special segments and angles of circles choosing from a variety of tools.~~

Important Vocabulary

- conjecture
- counterexample
- **inductive reasoning**

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Unit 1 Student Edition
- Class set of red pens

Lesson Structure:

- Do Now (7 min)
- INM (18 min)
- Debrief (8 min)
- Student Practice (12 min)
- Exit Ticket (10 min)

Mathematical Goal of this Lesson

By the end of this lesson, students should be able to define inductive reasoning as the process of making conjectures based on patterns and examples. Additionally, students should be able to apply inductive reasoning to find a general rule for a given pattern or sequence and/or to determine an unknown term in a sequence.

Opportunities to CFU

✓ INM: 2, 3 ✓ Student Practice: 1, 2

Other Notes to Inform Your Planning

For **INM**: When discussing **Q3**, share that different people can generate different conjectures based on the same set of evidence. This is important because we will revisit this idea in an upcoming lesson when we contrast the inherent uncertainty of inductive reasoning with the logical certainty of deductive reasoning.

For **Student Practice**: There are more practice opportunities in the SP than most students can reasonably complete in the time allotted. These extra problems are provided for your convenience, but **Q1-Q4** should be prioritized. Students will need Google to help them with Q4 (see pink TE box on p17). **Q13** includes spiraled Algebra 1 practice that focuses on solving two-step equations. Students don't need to apply algebra skills until Unit 2, but these problems are included so you can gauge which students may need help closing these gaps before they are asked to apply algebra skills to geometry problems.

Focus on Disciplinary Literacy

INM #3

Lesson Look Fors

Look for teachers to…

- ❑ allow students to work together during the INM, pulling them aside periodically to discuss their findings after INM #2, #3, and #4.
- ❑ when discussing INM #3, stamp that two people can generate different conjectures based on the same evidence (this is why people sometimes get 2nd opinions in healthcare, finance, etc.)

Look for students to…

- ❑ justify every single answer they supply.
- ❑ engage in multiple rounds of discussion throughout the INM; students should be bouncing ideas off each other and respectfully agreeing and disagreeing.

Student Know/Do Chart

Students can apply inductive reasoning to determine an unknown term or figure in a sequence.

Lesson 3: Conditional Statements | Date: _____

Standard(s)

- **G.4(C)** verify that a conjecture is false using a counterexample
- **G.4(B)** identify and determine the validity of the converse, ~~inverse, and contrapositive~~ of a conditional statement and recognize the connection between a biconditional statement and a true conditional statement with a true converse

Important Vocabulary

- **biconditional statement**
- **conditional statement**
- **converse**

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Unit 1 Student Edition
- Class set of red pens

Lesson Structure:

- Do Now (7 min)
- INM (15 min)
- Debrief (10 min)
- Student Practice (13 min)
- Exit Ticket (10 min)

Mathematical Goal of this Lesson

By the end of this lesson, students should be able to identify the condition and conclusion of a conditional statement; and write the converse of a conditional statement and determine if it's true.

Opportunities to CFU

- ✓ INM: 2, 3
- ✓ Student Practice: 1, 2

Other Notes to Inform Your Planning

In previous years, students have also encountered inverse and contrapositive statements. Those are not discussed in this lesson, but you could consider building them in to challenge high-performing students. Conditional, biconditional, and converse statements are the focus of this lesson because students will encounter them more frequently.

In General: Students have a lot to read in this lesson. Do your best to ensure EB students have a partner they work well with to talk about what they read and/or help translate when needed.

Focus on Disciplinary Literacy

Debrief

For **Student Practice**: There are more practice opportunities in the SP than most students can reasonably complete in the time allotted. These extra problems are provided for your convenience, but **Q1-Q2** should be prioritized. **Q8** includes spiraled Algebra 1 practices that focuses on solving equations. Students don't need to apply algebra skills until Unit 2, but these problems are included so you can gauge which students may need help closing these gaps before they are asked to apply algebra skills to geometry problems.

Lesson Look Fors

Look for teachers to…

- ❑ facilitate a think/pair/share during INM #3
- ❑ allow students to work together during the INM, pulling them aside periodically to discuss their findings after INM #2 and #4.

Look for students to…

- ❑ explain the difference between a conditional and a biconditional statement.

Student Know/Do Chart

Do	Students can determine if a statement is biconditional and explain why.
Do	Students can determine if the converse of a given statement is true or false and explain why.
Know	For an "If – then" statement to be biconditional, it must be true in both directions.
Know	A "converse" is a statement generated by flipping "If A, then B" so that it reads "If B, then A."

Lesson 4: What Is Deductive Reasoning? Date: _____

Standard(s)

- **G.4(C)** verify that a conjecture is false using a counterexample

Important Vocabulary

- counterexample
- **deductive reasoning**

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Unit 1 Student Edition
- Class set of red pens

Lesson Structure:

- Do Now (7 min)
- INM (15 min)
- Debrief (8 min)
- Student Practice (15 min)
- Exit Ticket (10 min)

Mathematical Goal of this Lesson

By the end of this lesson, students should be able to justify a claim using informal arguments; and define deductive reasoning as the process of proving a claim with a sequence of logical statements.

Opportunities to CFU

- ✓ INM: 3
- ✓ Student Practice: 1a-d, 2, 3

Other Notes to Inform Your Planning

For **struggling students**: As you circulate and monitor, you may find that some teams are thriving and others are struggling. For struggling teams, remind them that sometimes they have more information than they realize. For example, once you find a "yes," both the vertical column it is in (in that section) and the horizontal row it is in (in that section) automatically become NOs, which can often be used to help with other rows and columns.

For **students who need a challenge:** Select an additional Einstein puzzle for students or teams who move through the INM with time to spare. You can find several of varying levels of difficulty here.

Focus on Disciplinary Literacy

Debrief

For **Student Practice**: There are more practice opportunities in the SP than most students can reasonably complete in the time allotted. These extra problems are provided for your convenience, but **Q1-Q3** should be prioritized. **Q7** includes spiraled Algebra 1 practices that focuses on **solving equations that include the distributive property**. Students don't need to apply algebra skills until Unit 2, but these problems are included so you can gauge which students may need help closing these gaps before they are asked to apply algebra skills to geometry problems.

Lesson Look Fors

Look for teachers to…

- ❑ give students the opportunity to read over the directions and questions for the logic puzzle during Do Now time.
- ❑ for student groups that are struggling and running out of time, help students find a "yes" or a "no" box on the puzzle by connecting it to a fact given on the page.

Look for students to…

- ❑ use process of elimination to solve the puzzle.
- ❑ Justify their puzzle responses using the bulleted clues.
- ❑ Explain how deductive reasoning differs from inductive reasoning (from Lesson 2)

Student Know/Do Chart

Do — Students can apply deductive reasoning skills to draw a valid conclusion based on the information presented to them.

Do — Students can justify their response.

Lesson 5: Using Deductive Reasoning Date: _____

Standard(s)

- **G.4(C)** verify that a conjecture is false using a counterexample

Important Vocabulary

- counterexample
- deductive reasoning
- **mathematical proof**

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Unit 1 Student Edition
- Class set of red pens

Lesson Structure:

- Do Now (7 min)
- INM (18 min)
- Debrief (5 min)
- Student Practice (15 min)
- Exit Ticket (10 min)

Mathematical Goal of this Lesson

By the end of this lesson, students should be able to disprove a claim using a counterexample. Students should also be able to understand the difference between supporting a claim with examples and providing a claim.

Opportunities to CFU

- ✓ INM: 2, 3, 4c
- ✓ Student Practice: 1, 2

Other Notes to Inform Your Planning

For **INM**: At the end of the INM, students will attempt to construct a convincing argument about multiples of 3. This will challenge most students, because they are trying to show that a pattern works for all numbers (and multiple examples do not suffice to prove that this is ALWAYS true). Students can use colors, diagrams, or any other representation they can think of to make their argument. Teachers should not require students to produce a formal paragraph proof (or even a perfectly correct one) at this point, although some students may be able to. Note that the value in this exercise is not that students actually end up with a correct proof, but that they get to experience the challenge of proving something and realize that many examples are just not enough. (For more information on how to prove that multiples of 3 always fluctuate between odd and even, you can read this proof. This hinges on defining evens as all integers that can be written as $2n$ where n is an integer, and all odds as those that can be written as $2n + 1$.)

Focus on Disciplinary Literacy

Debrief

For **Student Practice**: **Q5** spirals in very basic square root expressions. Students will eventually need to simplify radical expressions like $\sqrt{8}$, so if you see that students struggle with Q5, please carve out time (possibly on a flexible Success Day) to review radical expressions. Consider using this Algebra 1 lesson (SWITE) on radical expressions.

Lesson Look Fors

Look for teachers to…

- ❑ facilitate multiple turn-and-talks throughout the INM so that all students get the opportunity to share their responses to INM #s 2, 3 and 4.4.
- ❑ emphasize that examples are not enough to prove a statement is ALWAYS true,

Look for students to…

- ❑ notice that when statements start with words like “all,” “always,” or “every,” they are hard to prove but easy to disprove.
- ❑ realize that it is a lot easier to disprove a conjecture than to prove it.
- ❑ try their best to create their own proof during INM 4c.

Student Know/Do Chart

Do — Students can determine if a statement is true or false.

Do — Students can prove or disprove a given statement.

Know — To disprove a statement, you must find a counterexample.

Lesson 6: Visual Reasoning Date: _____

Standard(s)

- **G.5(A)** investigate patterns to make conjectures about geometric relationships, ~~including angles formed by parallel lines cut by a transversal, criteria required for triangle congruence, special segments of triangles, diagonals of quadrilaterals, interior and exterior angles of polygons, and special segments and angles of circles choosing from a variety of tools.~~

Important Vocabulary

- **visual reasoning**
- auxiliary
- auxiliary line

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Unit 1 Student Edition
- Class set of red pens

Lesson Structure:

- Do Now (7 min)
- INM (18 min)
- Debrief (8 min)
- Student Practice (12 min)
- Exit Ticket (10 min)

Mathematical Goal of this Lesson

By the end of this lesson, students should be able to use visuals to justify algebraic, numeric, and geometric results.

Opportunities to CFU

- ✓ INM: 2, 3
- ✓ Student Practice: 1, 2

Other Notes to Inform Your Planning

For **Do Now**: Know that students have worked with this model since at least 6th grade when they learned how to multiply rational numbers. They also used the tabular method extensively in Algebra 1 to multiply and factor polynomials.

For **Student Practice:** In general, students should always have access to the Geometry Reference Sheet which will have the area formulas students may need to reference. If students feel stuck, you can ask question like, "Look at the formula we are given. What does each part represent? Where could it have come from?"

Focus on Disciplinary Literacy

Debrief

Lesson Look Fors

Look for teachers to…

- ❑ facilitate turn and talks for INM #2 and #3, calling students back together after each one, to discuss their findings.
- ❑ emphasize that "auxiliary lines" are lines you can add to a diagram to help make sense of it.

Look for students to…

- ❑ draw auxiliary lines to help them reason visually.
- ❑ build upon their prior knowledge of circles, triangles, and quadrilaterals from 6th and 7th grade.

Student Know/Do Chart

Students can explain how visual reasoning can be used to solve a given problem (when provided with a specific context).

Recommended Unit 1 Success Day Material and Resources

Date: _____

To review or practice conditional statements, use…

- Texas Gateway: Writing the Converse, Inverse, and Contrapositive
- Conditional Statements Packet (accompanying video)

To review or practice using inductive and deductive reasoning, use…

- Khan Academy Inductive and Deductive Reasoning
- 2022-2023 Lesson 1.11: Logic (Day 1)
- Kahoot (skip Q2)

To review or practice visual reasoning, use…

- Visual Patterns

For general unit 1 practice, consider using applicable parts of Carnegie Learning's Texas Math Solution lesson on Formal Reasoning

- Skills Practice
- Lesson: Teacher Edition
- Lesson: Student Workbook

Cumulative Review | Success Day Date: _____

Standard(s)	Notes for Intellectual Preparation & Lesson Planning	Lesson Look Fors
◆ **G.4(C)** verify that a conjecture is false using a counterexample ◆ **G.5(A)** investigate patterns to make conjectures about geometric relationships, ~~including angles formed by parallel lines cut by a transversal, criteria required for triangle congruence, special segments of triangles, diagonals of quadrilaterals, interior and exterior angles of polygons, and special segments and angles of circles choosing from a variety of tools.~~ ◆ **G.4(B)** identify and determine the validity of the converse, inverse, and contrapositive of a conditional statement and recognize the connection between a biconditional statement and a true conditional statement with a true converse	**Necessary Materials and Pre-Lesson Prep** ▪ Review students' exit ticket data from lessons 1-6 to determine what to prioritize during review ▪ Internalize Review Lesson 1.7 if you choose to use it. Lesson Structure: Do Now (7 min) INM (32 min) Debrief (18 min) Student Practice (0 min) Exit Ticket (0 min)  **Mathematical Goal of this Lesson** By the end of this class period, students should get the opportunity to review major concepts from Unit 1. **Other Notes to Inform Your Planning** You should use this day to review however you see fit. An optional review activity has been provided in the Teacher Edition called "The Xbox Problem." It is a group task in which students will work on a visual pattern task. They will identify and make sense of the pattern, draw subsequent figures, write a general rule, and justify their pattern with clear representations. **Why This Review Activity:** This unit is designed to introduce students to habits of mind and mathematical practices that are especially important in Geometry. Our goal is not for students to precisely define inductive and deductive reasoning or to analyze hundreds of conditional statements and write their converse. Instead we want students to be pattern-finders, conjecture-makers, and logical reasoners. Most importantly, we want students to construct viable arguments and critique the reasoning of others (MP3).	Look for teachers to… ❑ facilitate a review session that prioritizes what students need based on previous exit ticket and/or quiz data. Look for students to… ❑ review unit 1 topics in preparation for the Unit 1 exam. **Student Know/Do Chart** Students can prepare for the Unit 1 Exam by reviewing Unit 1 content.

Unit 1 Exam	Date: _____
Standard(s)	Notes for Intellectual Preparation & Lesson Planning
◆ **G.4(C)** verify that a conjecture is false using a counterexample ◆ **G.5(A)** investigate patterns to make conjectures about geometric relationships, ~~including angles formed by parallel lines cut by a transversal, criteria required for triangle congruence, special segments of triangles, diagonals of quadrilaterals, interior and exterior angles of polygons, and special segments and angles of circles choosing from a variety of tools.~~ ◆ **G.4(B)** identify and determine the validity of the converse, inverse, and contrapositive of a conditional statement and recognize the connection between a biconditional statement and a true conditional statement with a true converse	**Necessary Materials and Pre-Lesson Prep** ▪ Ensure you can access UE1 on EdCite. **Notes to Inform Your Planning** Review the Unit 1 Exam on Curriculum Corner. Internalize and create an exemplar for the assessment prior to teaching the unit as part of unpacking the unit. Use your exemplar to spar with the solutions provided in the Assessment Companion on Curriculum Corner. The scanning deadline for the Unit 1 Exam is **September 11, 2025**. Consider administering the exam 1-3 school days BEFORE September 11th to allow sufficient time for grading the FRQ. Refer to the scoring guide to score the FRQ.

UNPACKED STANDARDS

Focus standards for this unit.

Standards Clarification		
Standards	**Specificity**	**Notes/Explanations/Examples**
G.4(C) verify that a conjecture is false using a counterexample	<u>Content</u>: • Students verify conjectures are false using counterexamples. • Students determine if conditional statements are biconditional. • Students distinguish between examples and counterexamples. <u>Academic Vocabulary</u>: • Conditional statement • Conjecture • Counterexample • Deductive reasoning	**2.** Lindsey said, "If I run 5 miles every day I will get at least get 3rd place at the track meet in October. Which of the following is a counterexample for this statement? **A.** Lindsey runs 5 miles every day and gets 2nd place at the track meet in October. **B.** Lindsey runs 5 miles on most days and gets 5th place at the track meet in October. **C.** Lindsey runs 5 miles every day and gets 4th place at the track meet in October. **D.** Lindsey runs 6 miles every day and gets 3rd place at the track meet in October.
G.4(B) identify and determine the validity of the converse~~, inverse, and contrapositive~~ of a conditional statement and recognize the connection between a biconditional statement and a true conditional statement with a true converse	<u>Content</u>: • Students understand the logic of conditional statements is essential to making, verifying, and proving conjectures. <u>Specificity</u>: • Students are not asked about inverse or contrapositive statements, only converse. <u>Academic Vocabulary</u>: • Conditional statement • Conjecture • Counterexample • Deductive reasoning	**3.** Which of the following is a biconditional statement? **A.** If Mauricio goes to school every single day, then Mauricio has perfect attendance. **B.** If Samantha has a puppy, then Samantha has a dog. **C.** If it is 20 °F, then the town lake is frozen. **D.** If Chris is at home, then Chris is not at school.

VERTICAL STANDARDS

This section details the **progression** of key student expectations/standards** 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.

6th and 7th Grade	Geometry	Algebra II
7.11(C) write and solve equations using geometry concepts, including the sum of the angles in a triangle, and angle relationships **8.6(C)** use models and diagrams to explain the Pythagorean theorem	**G.4(B)** identify and determine the validity of the converse, inverse, and contrapositive of a conditional statement and recognize the connection between a biconditional statement and a true conditional statement with a true converse **G.4(C)** verify that a conjecture is false using a counterexample **G.5(A)** investigate patterns to make conjectures about geometric relationships, ~~including angles formed by parallel lines cut by a transversal, criteria required for triangle congruence, special segments of triangles, diagonals of quadrilaterals, interior and exterior angles of polygons, and special segments and angles of circles choosing from a variety of tools.~~	**A2.6(L)** formulate and solve equations involving inverse variation
Algebra I		**Pre-Calculus**
A.2(C) write linear equations in two variables given a table of values, a graph, and a verbal description		**P.3(F)** determine the conic section formed when a plane intersects a double-napped cone