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How to Use This Addendum

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

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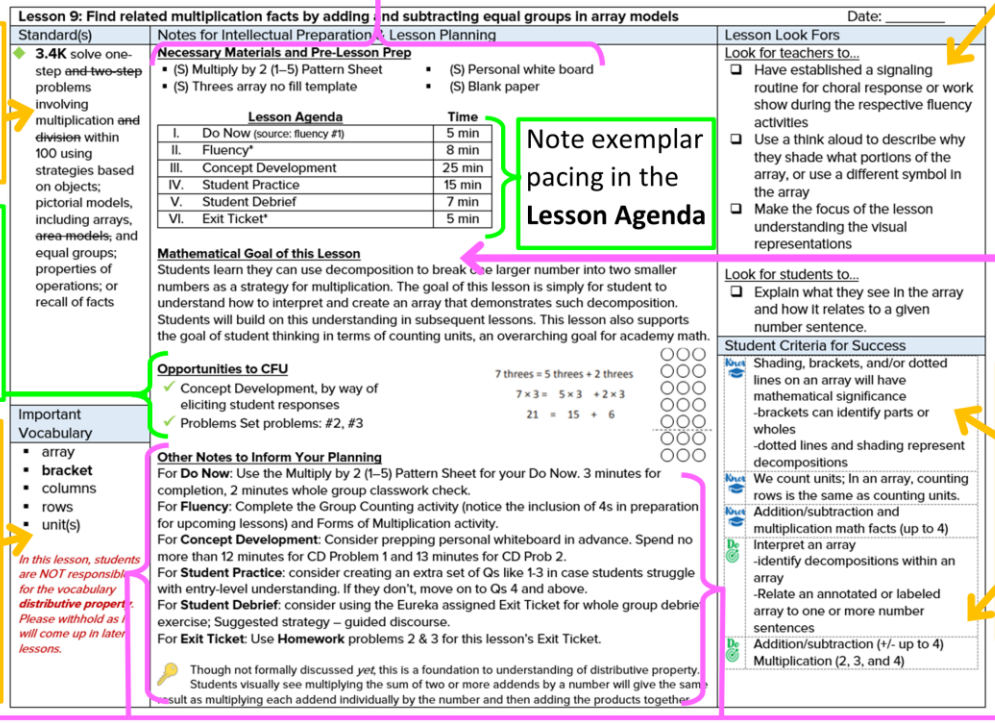
Use the **Mathematical Goal of the Lesson** to keep you focused on the appropriate student outcome

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

Students begin this unit by reviewing basic triangle properties! During Lessons 1-4, students determine when three side lengths will form a triangle, review how to classify triangles by angles and by sides, and review the Triangle Angle Sum Theorem, all of which they saw in 6th grade. In Geometry, we add the exterior angle theorem and more deeply explore the relationship between a triangle's side lengths and angle measures. In Lessons 5-6, students learn about the Pythagorean Theorem and then derive the Distance Formula from the Pythagorean Theorem. Rather than memorize the Distance Formula, these lessons encourage students to use the Pythagorean Theorem as much as possible, as it is more intuitive and students are less likely to make computational errors.

Lessons 8-13 are all about ways to prove triangles congruent (SSS, SAS, AAS, ASA) and using triangle congruence to find missing angles or side lengths using CPCTC. Students use everything they've learned so far to generate flow chart proofs involving congruent triangles.

CONTENT STANDARDS

Below are the standards addressed in this unit.

Readiness Standards	Supporting Standards
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.2(B)** Derive and use the distance~~, slope, and midpoint~~ formulas to verify geometric relationships, including congruence of segments ~~and parallelism or perpendicularity of pairs of lines.~~ **G.6(B)** prove two triangles are congruent by applying the Side-Angle-Side, Angle-Side-Angle, Side-Side-Side, Angle-Angle-Side, and Hypotenuse-Leg congruence conditions.	**G.5(D)** verify the Triangle Inequality Theorem using constructions and apply the theorem to solve problems. **G.6(D)** verify theorems about the relationships in triangles, including proof of the Pythagorean Theorem, the sum of interior angles, base angles of isosceles triangles, midsegments, and medians, and apply these relationships to solve problems.

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	L8	L9	L10	L11	L12	L13	L14
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

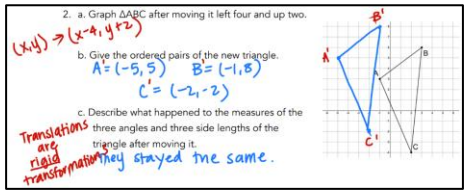
For every new lesson, the teacher begins by making the goals of the lesson crystal clear. The teacher does more than simply read the objective to the class. They make connections to previous learning, share how this learning fits into a bigger picture, or explain why this learning is important for future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

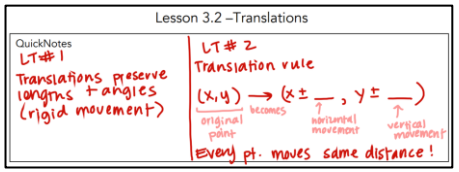
Debrief Activity

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 4 – Triangles and Proof			
Day	Date	Lesson	Lesson Title
There are 5 flexible Success Days that you can use anywhere in the unit. • Consider using 1 day between Lessons 6 and 8 and another between Lesson 13 and the Unit Exam to administer optional topic quizzes. • Consider using 1 day to review before Unit 4 Topic Quiz A (see provided review Lesson 7) • Consider using 1 day to review before the Unit 4 Exam (see provided Cumulative Review). • If you don't need to use all 5 success days, you can/should save them for later.			
1		1	What Makes a Triangle?
2		2	Triangle Properties
3		3	Proving the Exterior Angle Conjecture
4		4	Angle Side Relationships in Triangles
5		5	Right Triangles & Pythagorean Theorem
6		6	Coordinate Connection: Distance
7		7	Mid-Unit Review A (Lessons 1-6)
8			Success Day (Ideal time to administer **optional** Unit 4A Topic Quiz)
9		8	Establishing Congruent Parts in Triangles
10		9	Triangle Congruence Shortcuts
11		10	More Triangle Congruence Shortcuts (Day 2)
12		11	Triangle Congruence Project
13		12	Triangle Congruence Proofs (Day 1)
14		13	Triangle Congruence Proofs (Day 2)
15			Success Day (Ideal time to administer **optional** Unit 4B Topic Quiz)
16		CR	Cumulative Review | Success Day
17			Unit 4 Exam
18			Success Day

Lesson 1: What Makes a Triangle? Date: _____

Standard(s)

- **G.5(D)** verify the Triangle Inequality Theorem using constructions and apply the theorem to solve problems.

Important Vocabulary

- acute
- **equilateral**
- **isosceles**
- obtuse
- right
- **scalene**
- **Triangle Inequality Theorem**

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Unit 4 Student Edition
- sets of pre-cut pipe-cleaners or straws (1 per table team)
- 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 determine when three side lengths will form a triangle. They should also be able to classify a triangle by its sides and angles. Students learned these concepts in 6th grade and 7th grade – this lesson revisits these triangle fundamentals so that they are prepared to engage with the rest of the unit.

Opportunities to CFU

- ✓ INM: 4, 5
- ✓ Student Practice: 1, 2

Other Notes to Inform Your Planning

For the **Do Now:** The Do Now has students silently read the directions for the INM. This gives you time to distribute the pre-cut pipe-cleaners and set yourself up for the class period.

For the **Debrief**: Note that the QuickNotes casually mentions how to classify triangles by sides (equilateral, isosceles, scalene) and by angle (acute, obtuse, right). Most students are already familiar with these words from 6th grade, and students are more likely to struggle with understanding the Triangle Inequality Theorem, so building an understanding of the Triangle Inequality Theorem should be prioritized.

Focus on Disciplinary Literacy

INM 2 & 3

Lesson Look Fors

Look for teachers to…

- ❑ actively circulate and monitor while students are completing exploration in INM #1.
- ❑ emphasize during the Debrief that when two side lengths added together are equal to the third side length, a triangle CANNOT be formed.

Look for students to…

- ❑ work together to arrange pipe cleaners for INM #1, looking for patterns that indicate when three side lengths will form a triangle (or when they WON'T)
- ❑ recall what they learned in middle school about classifying triangles by side lengths and angle measures.

Student Know/Do Chart

Students can determine whether three side lengths form a triangle or not.

Three side lengths can form a triangle if and only if the sum of the two shorter sides is greater than the length of the longest side.

Lesson 2: Triangle Properties Date: _____

Standard(s)

- **G.6(D)** verify theorems about the relationships in triangles, including ~~proof of the Pythagorean Theorem,~~ the sum of interior angles, ~~base angles of isosceles triangles~~, ~~midsegments, and medians,~~ and apply these relationships to solve problems.

- **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

- **exterior angles**
- **remote interior angles**
- **Triangle Angle Sum Theorem**

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Unit 4 Student Edition
- Class set of protractors, rulers, scissors, tape, and patty papper
- Class set of red pens

Lesson Structure:

- Do Now (7 min)
- INM (15 min)
- Debrief (7 min)
- Student Practice (16 min)
- Exit Ticket (10 min)

Mathematical Goal of this Lesson

By the end of this lesson, students should be able to explain why the sum of angles in a triangle is always 180°. They should also be able to describe the relationship between the exterior angle of a triangle and the sum of the non-adjacent interior angles. In general, students should be able to solve for missing angles in triangles.

Opportunities to CFU

✓ INM: 3, 5, 7

✓ Student Practice: 1, 2, 3

Other Notes to Inform Your Planning

For the **Do Now:** Q1 tells students to "assign each member of your group to draw either an acute or obtuse." For this Do Now to be entirely silent, when giving directions, decide who will draw each triangle. For example, depending on how seats are arranged, you can say "if you're facing THIS wall, draw an acute triangle. If you're facing THAT wall, draw an obtuse triangle."

Focus on Disciplinary Literacy

INM 3 & 7

Lesson Look Fors

Look for teachers to…

- ❑ distribute INM materials (patty paper, scissors) while students are working on their Do Now.
- ❑ allow students to demonstrate WHY there are 180° in a triangle (as opposed to just telling them why)
- ❑ allow students to encounter the Exterior Angle Conjecture during INM #s 6-7 (as opposed to just TELLING them the definition.

Look for students to…

- ❑ compare their findings during INM #3, talking with their table mates.
- ❑ be able to explain the relationship between an exterior angle and two non-adjacent interior angles and why it makes sense.

Student Know/Do Chart

Do — Students can find missing values related to angle measures in a triangle.

Do — Students can set up and solve an equation that involves combining like terms.

Know — The three interior angles of a triangle always sum to 180°.

Lesson 3: Proving the Exterior Angle Conjecture Date: _____

Standard(s)

- **G.6** use the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as ~~two-column, paragraph, and~~ flow chart.

Important Vocabulary

- conjecture
- **flowchart proof**
- **theorem**
- **Transitive Property**

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Unit 4 Student Edition
- Class set of red pens

Lesson Structure:

- Do Now (7 min)
- INM (15 min)
- Debrief (15 min)
- Student Practice (18 min)
- Exit Ticket (0 min)

Mathematical Goal of this Lesson

By the end of this lesson, students should be able to generalize an argument for the exterior angle conjecture and describe the structure of a flow chart proof. This is students' first flow chart proof of the year, and they're using it to prove the conjecture they explored in the previous lesson.

Opportunities to CFU

- ✓ INM: 5
- ✓ Student Practice: 1, 2

Other Notes to Inform Your Planning

For the **Do Now:** Please do not skip/replace this Do Now. It sets students up for the INM.

For the **INM**: Circulate and listen in as students discuss INM #s 2-5. This will help you facilitate your debrief.

Focus on Disciplinary Literacy

Debrief

For the **Exit Ticket**: The time normally reserved for the ET has been redistributed so that students have time to practice writing proofs, giving/receiving feedback, and updating proofs. In lieu of collecting a traditional ET, consider collecting Student Practice #1 or #2 (with partner feedback implemented) as the ET. Know that an OPTIONAL exit ticket has been provided in the Unit 4 Exit Ticket bundle, but it asks students to apply the exterior angle conjecture to find a missing angle, which is not as challenging as the Student Practice proofs.

Lesson Look Fors

Look for teachers to…

- ❑ (when debriefing) emphasize that the process students followed in the Do Now and INM #s 2-5 was setting them up for a flow chart proof.
- ❑ emphasize that multiple arrows in a flow chart proof can "flow" to one statement, as shown in INM #s 2-4.
- ❑ emphasize that each statement MUST have a reason/justification.

Look for students to…

- ❑ provide feedback to each other on their proofs.
- ❑ implement strong feedback received from their classmates.

Student Know/Do Chart

Students can generate a flow chart proof and/or a paragraph proof.

A flow chart proof uses arrows to show the flow of an argument.

A triangle's exterior angle and adjacent interior angle always sum to 180° because they form a linear pair.

A triangles three interior angles always sum to 180°.

Lesson 4: Angle-Side Relationships in Triangles | Date: _____

Standard(s)

◆ **G.6(D)** verify theorems about the relationships in triangles, including ~~proof of the Pythagorean Theorem~~, the sum of interior angles, base angles of isosceles triangles, ~~midsegments, and medians~~, and apply these relationships to solve problems.

Important Vocabulary

- equilateral triangle
- isosceles triangle

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Unit 4 Student Edition
- Class set of rulers and protractors
- Class set of red pens

Lesson Structure:

- Do Now (7 min)
- INM (16 min)
- Debrief (5 min)
- Student Practice (17 min)
- Exit Ticket (10 min)

Mathematical Goal of this Lesson

By the end of this lesson, students should be able to determine the relationship between the largest angle and longest side of a triangle. They should also be able to describe and apply properties of isosceles and equilateral triangles. Students explored both of these concepts in 6th grade but probably have not seen them in awhile.

Opportunities to CFU

✓ INM: 4, 5

✓ Student Practice: 1, 2, 3

Other Notes to Inform Your Planning

For the **Do Now:** This Do Now can't be skipped/replaced. It sets up the INM.

For the **Debrief**: Students reviewed "isosceles" in Lesson 4.1. In this lesson, they should make the connection that two congruent sides in a triangle mean there must also be two congruent angles.

Focus on Disciplinary Literacy

INM #4

In general: many students benefit from color-coding angles and their opposite sides.

Lesson Look Fors

Look for teachers to…

- ❑ facilitate a Think-Pair-Share for INM#4
- ❑ distribute rulers and protractors near the end of the Do Now (so students can successfully complete INM #3)
- ❑ allow students to explore and discuss before debriefing and potentially "giving away" big ideas too soon.

Look for students to…

- ❑ be able to explain WHY the angle measures of an equilateral triangle are ALWAYS 60°-60°-60°
- ❑ use their previous knowledge of isosceles triangles ("they have two congruent sides!") to justify why they must also have two congruent angles ("the angles are each across a congruent side length")

Student Know/Do Chart

Do — Students can list a triangle's angle measures in order from smallest to largest given all three side lengths.

Do — Students can use angle notation appropriately (e.g. $\angle E$).

Know — A triangle's largest angle is opposite its longest side; a triangle's smallest angle is opposite its shortest side.

Lesson 5: Right Triangles and the Pythagorean Theorem Date: _____

Standard(s)

◆ **G.6(D)** verify theorems about the relationships in triangles, including proof of the Pythagorean Theorem, ~~the sum of interior angles, base angles of isosceles triangles, midsegments, and medians,~~ and apply these relationships to solve problems.

Important Vocabulary

- **hypotenuse**
- **leg**
- **Pythagorean Theorem**

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Unit 4 Student Edition
- Class set of scissors
- Class set of red pens

Lesson Structure:

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

Mathematical Goal of this Lesson

By the end of this lesson, students should be able to apply the Pythagorean Theorem to find a missing hypotenuse or leg length when given the other two side lengths. They should also be able to use the Pythagorean Theorem to determine if a triangle is acute (when $a^2 + b^2 > c^2$) or obtuse (when $a^2 + b^2 < c^2$).

Opportunities to CFU

✓ INM: 6, 7, 8

✓ Student Practice: 1, 2, 3

Other Notes to Inform Your Planning

For the **Do Now:** Some students might struggle to complete all the cutting in the Do Now in 7 minutes. If you anticipate this to be the case, consider providing them a sheet with pre-drawn shapes to cut OR providing with some or all of the pre-cut materials. The dimensions matter for the exploration, so be careful if you are preparing the shapes for them. Also, if students are cutting, have a plan for trash pick up so you don't wind up with scraps of paper all over the floor.

For the **INM**: Circulate, *circulate*, *circulate*!!! Students are doing a lot of thinking, discussing, and moving little shapes around. Help them stay on track.

Focus on Disciplinary Literacy

INM #6

Lesson Look Fors

Look for teachers to…

- ❑ actively monitor and circulate, especially for INM #s 1-6, to build a sense of urgency.
- ❑ (when debriefing #s 1-6) carefully take away one triangle from each configuration to show that $a^2 + b^2 = c^2$(see pink TE note on p 51)
- ❑ (when debriefing #s 7-8) connect previous lesson on angle-side relationships to why it makes sense that obtuse triangles would follow $a^2 + b^2 < c^2$ while acute triangles would follow the pattern $a^2 + b^2 > c^2$ (where c is longest side).

Look for students to…

- ❑ rearrange their cut shapes to form the two configurations shown here INM #6.
- ❑ Apply the Pythagorean Theorem to non-right triangles to be able to say if those triangles are acute or obtuse.

Student Know/Do Chart

Do — Students can apply the Pythagorean Theorem to find a missing side length of a right triangle given the other two side lengths.

Do — Students can distinguish between a right triangle's hypotenuse and its other legs.

Know — For right triangles, $a^2 + b^2 = c^2$, where a and b represent leg lengths and c represents the length of the hypotenuse.

Lesson 6: Coordinate Connection: Distance Date: _____

Standard(s)

G.2(B) Derive and use the distance~~,~~ ~~slope, and midpoint~~ formulas to verify geometric relationships, ~~including congruence of segments and parallelism or perpendicularity of pairs of lines.~~

Important Vocabulary

- **Distance Formula**
- Pythagorean Theorem

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Unit 4 Student Edition
- Class set of red pens

Lesson Structure:

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

Mathematical Goal of this Lesson

By the end of this lesson, students should be able to find the distance between two points using either the Distance Formula or the Pythagorean Theorem. They should also be able to explain the connection between the Distance Formula and the Pythagorean Theorem.

Opportunities to CFU

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

Other Notes to Inform Your Planning

For the **Do Now:** This Do Now can't be skipped. It sets up the INM.

For the **INM**: When monitoring, ask groups to justify how they found the vertical and horizontal distances in Q3. Challenge them to come up with a method that does not require counting units on the grid. Some Geometry students struggle to see distance as a subtraction problem, so it's important to get students to articulate how they can find these lengths.

Focus on Disciplinary Literacy

INM #3

For **Debrief**: Highlight that the horizontal distance is the difference between the two x-values and the vertical distance is the difference between the two y-values. The result is always positive, even if the coordinates are negative.

Lesson Look Fors

Look for teachers to…

- ❑ when appropriate, stamp that distance is ALWAYS positive, even if you're moving in the negative direction.
- ❑ avoid coaching students to memorize the Distance Formula. It's on the reference sheet they can use ALL year on every test, but more importantly, it's almost always easier to use the Pythagorean Theorem.

Look for students to…

- ❑ explain where the Distance Formula comes from (the Pythagorean Theorem!)
- ❑ apply the Pythagorean formula to find the distance between two points.

Student Know/Do Chart

Do — Students can find the distance between two points on the coordinate plane.

Know — You can use the Pythagorean Theorem to find the distance between two points.

Know — You can use the Distance Formula to find the distance between two points, but the Pythagorean Theorem is often easier.

Lesson 7: Mid-Unit Review A (Lessons 1-6) – **SPEED DATING!!!**		Date: _____
Standard(s)	Notes for Intellectual Preparation & Lesson Planning	Lesson Look Fors
All TEKS from Lessons 1 – 6.	**Necessary Materials and Pre-Lesson Prep** ▪ Unit 4 Student Edition ▪ Speed Dating Cards (class set) ▪ Recording Sheet (in Student Workbook) ▪ Class set of red pens ▪ Decide how to direct students to set up desks for Speed Dating (concentric circles? Rows?) ▪ timer Lesson Structure: Do Now (7 min) INM (40 min) Debrief (8 min) Student Practice (0 min) Exit Ticket (0 min)  **Mathematical Goal of this Lesson** This lesson provides a review of Lesson 1-6 and gives students the opportunity to work with 12 different partners. Students should be having many different math conversations and supporting each other when stuck. **Opportunities to CFU** ✓ when giving Speed Dating directions (before you release students to participate in the activity) ✓ during the Debrief when you go over most-missed questions **Other Notes to Inform Your Planning** For the **Do Now:** The provided Do Now is helpful for activating prior knowledge, but it is not married to the INM and can be replaced with a spiraled review question of your choice. For the **INM**: Arrange the desks so two desks are always facing each other. Print the problems and cut them up, placing one problem on each pair of desks. Students can record their work on the recording sheet. You will need a timer as well. For **Debrief:** Go over cards students struggled with the most. For the **Exit Ticket**: No SP is provided because this review lesson is essentially a LOT of student practice. No ET is provided because the next day should be a Topic Quiz day that will give you a great data point.	Look for teachers to… ❑ give clear directions on "Speed Dating" protocol so the activity can flow smoothly. ❑ keep up with the timer so students know when to switch. ❑ circulate and monitor, listening in for problems that stump students, and go over these questions before students leave so they get a sense of closure. Look for students to… ❑ talk with their partners about the math problem they're working on at the time. ❑ persevere through challenge. If the problem isn't solved when time is up, that's okay! Make a note on the Recording Sheet and ask for teacher to go over it during Debrief time.
Important Vocabulary All vocabulary from Lessons 1 – 6.	**Focus on Disciplinary Literacy**  Speed Dating	Student Know/Do Chart Do Students can apply all "Dos" from Lessons 1-6. Know Students know all "Knows" from Lessons 1-6.

Lesson 8: Establishing Congruent Parts in Triangles 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

- **CPCTC**
- **Reflexive Property**

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Unit 4 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

Now that students know all relevant properties about sides and angles of triangles, we can build toward establishing triangle congruence! By the end of this lesson, students should be able to determine whether two triangles are congruent. On the flipside, if given two congruent triangles, students should be able to use CPCTC to find missing measures.

Opportunities to CFU

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

Other Notes to Inform Your Planning

For the **Do Now:** Do not skip this Do Now; it leads up to the INM.

For the **INM**: Students do not yet know the shortcuts (SSS, SAS, AAS, ASA), so #s 3 and 4 will feel tedious. That's somewhat intentional – we want scholars to appreciate these shortcuts!

Focus on Disciplinary Literacy

Debrief

Lesson Look Fors

Look for teachers to…

- ❑ give students time to think through #s 1-4 before debriefing anything.
- ❑ circulate and monitor while students are working to keep them on task, on pace, and prevent "UNproductive" struggle

Look for students to…

- ❑ be able to identify and mark congruent parts in a diagram
- ❑ be able to write a congruence statement
- ❑ find missing angle measures and side lengths when given congruent triangles and corresponding measurements

Student Know/Do Chart

Do	Students can find a triangle's missing angles and side lengths given corresponding measures from a congruent triangle.
Do	Students can interpret a congruence statement.
Know	Order matters in a congruency statement.
Know	The little square in the corner of an angle means that angle is 90°.

Lesson 9: Triangle Congruence Shortcuts Date: _____

Standard(s)

- **G.6(B)** prove two triangles are congruent by applying the Side-Angle-Side, ~~Angle-Side-Angle,~~ Side-Side-Side, ~~Angle-Angle-Side, and Hypotenuse-Leg~~ congruence conditions.

Important Vocabulary

- **included angle**
- Reflexive Property
- **SAS Congruence**
- **SSS Congruence**

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Unit 4 Student Edition
- Class set of red pens
- Class set of rulers, patty paper, protractors, skewers or other supplies (see TE p72 "Builders for Hire" box)

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 prove two triangles are congruent using either SSS or SAS. They'll learn about ASA and AAS in the next lesson. This is the first of three lessons in which students are working with congruence conditions.

Opportunities to CFU

✓ INM: 4

✓ Student Practice: 1, 2

Other Notes to Inform Your Planning

For the **Do Now:** This is the first (probably only) Do Now of the year that is not entirely silent and independent. If this is not feasible logistically (e.g. your campus mandates this time is silent), start with another Do Now and adjust pacing down the line. This Do Now activity cannot be skipped because it sets up the INM. **For this Do Now, you are only giving away the criteria for Building Project #1.**

For the **INM**: The point of the Building Projects and the Gallery Walk is for students to experience SSS and SAS in action! It also reveals that SSA does NOT guarantee congruence, as Building Project 3 shows us.

Focus on Disciplinary Literacy

INM #4

Lesson Look Fors

Look for teachers to…

- ❑ actively circulate and monitor, checking in on student groups. This allows teachers to decide when to move on to the next "Building Project."
- ❑ facilitate a gallery walk after building projects are complete so students can see each others' work

Look for students to…

- ❑ work together to get their building projects built, helping each other out along the way.
- ❑ look for trends during the gallery walk. In particular, they should notice that all groups came up with the same triangle for projects 1 and 2, but that triangles vary for project 3.

Student Know/Do Chart

Students can determine whether two triangles are congruent (by SSS or SAS) or not.

Students can write a congruence statement.

Two triangles are congruent by SSS if their three pairs of corresponding sides are congruent.

When writing a congruence statement, order matters.

Lesson 10: Triangle Congruence Shortcuts (Day 2) Date: _____

Standard(s)

- **G.6(B)** prove two triangles are congruent by applying the ~~Side-Angle-Side~~, Angle-Side-Angle, ~~Side-Side-Side,~~ Angle-Angle-Side, and ~~Hypotenuse-Leg~~ congruence conditions.

Important Vocabulary

- **AAS Congruence**
- **ASA Congruence**
- **included side**
- **non-included sides**

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Unit 4 Student Edition
- Class set of red pens

Lesson Structure:

- Do Now (7 min)
- INM (12 min)
- Debrief (10 min)
- Student Practice (16 min)
- Exit Ticket (10 min)

Mathematical Goal of this Lesson

By the end of this lesson, students should be able to determine if two triangles are congruent by the ASA and AAS criteria. They should also be able to use ASA and AAS criteria to find missing sides or angles. This lesson builds on what students learned about SAS and SSS in Lesson 9.

Opportunities to CFU

- ✓ INM: 4, 5
- ✓ Student Practice: 1, 3

Other Notes to Inform Your Planning

For the **Do Now:** Do NOT skip the Do Now; it sets up the INM.

In General: This lesson goes through two INM/DB cycles.

For the **Debrief:** Pause for an initial debrief after #3. The goal is to establish that if two triangles are similar AND have a scale factor of 1, the triangles are congruent. Then, allow students to move on. Pause to debrief after #8. The goal is for students to notice that knowing two angles is as good as knowing all three. When you have two angles, even just one pair of corresponding sides is enough to establish congruence through AAS or ASA.

Focus on Disciplinary Literacy

Debrief

Lesson Look Fors

Look for teachers to…

- ❑ engage in two cycles of INM/DB for this lesson.
- ❑ by the end of the second debrief, emphasize that knowing two angles is enough to determine similarity, and having one pair of corresponding side lengths (in addition to two pairs of corresponding angle measures) is enough to establish congruency

Look for students to…

- ❑ build on what they learned about similarity and scale factor from previous courses.
- ❑ explain whether enough information is given about two triangles to determine if they are congruent or not.

Student Know/Do Chart

Students can determine what additional information is necessary to be able to prove two triangles are congruent.

Two triangles can be proved congruent if they have two sets of corresponding congruent angles and one set of corresponding side lengths.

When given two angle measures of a triangle, you can apply the Triangle Angle Sum theorem to find the third angle.

Lesson 11: Triangle Congruence Project Date: _____

Standard(s)

- **G.6(B)** prove two triangles are congruent by applying the Side-Angle-Side, Angle-Side-Angle, Side-Side-Side, Angle-Angle-Side~~, and Hypotenuse-Leg~~ congruence conditions.

Important Vocabulary

- SSS congruence
- SAS congruence
- AAS congruence
- ASA congruence
- included angle
- included side
- non-included side

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Unit 4 Student Edition
- Poster paper/board
- Construction paper
- Class set of red pens
- Class set of scissors, glue, coloring utensils
- Project Cut Outs

Lesson Structure:

- Do Now (7 min)
- INM (0 min)
- Debrief (0 min)
- Project (48 min)
- Exit Ticket (0 min)

Mathematical Goal of this Lesson

By the end of this lesson, students should be able to combine what they have learned about triangle congruence over the last few lessons to determine whether triangles are or are not congruent and if so, how.

Other Notes to Inform Your Planning

For the **Do Now:** The Do Now is silent reading time. Students should read all instructions for the activity. For EBs who cannot yet read well in English, plan to have a kind student translate where necessary.

For the **Project**: Circulate, *circulate*, ***circulate***!!! Students are doing a lot of thinking, discussing, and moving little shapes around. Help them stay on track. Carefully read all directions in the pink box on p91 of the Unit 4 TE.

Focus on Disciplinary Literacy

Congruence Project

For **Student Practice** and **Exit Ticket**: No Student Practice problem set provided because the project takes the place of the traditional problem set. No Exit Ticket is provided because it would cut into project time. Consider using completed project as an ET grade.

Lesson Look Fors

Look for teachers to…

- ❑ ensure students know what to do before releasing them to do it.
- ❑ actively circulate and monitor to support when necessary.

Look for students to…

- ❑ work with their group to determine whether sets of triangles are congruent and if so, how (AAS, ASA, SSS, SAS).
- ❑ generate accurate congruence statements when applicable.

Student Know/Do Chart

Do	Students can determine whether two triangles are congruent by SSS, SAS, ASA or AAS.
Do	Students can determine when two triangles AREN'T congruent.
Know	Two triangles are congruent by SSS if their three pairs of corresponding sides are congruent, by SAS if two pairs of congruent sides and their included angle are congruent, by AAS if two corresponding angles and a non-included side are congruent, and by ASA if two corresponding angles and their included side are congruent.

Lesson 12: Triangle Congruence Proofs (Day 1) Date: _____

Standard(s)

◆ **G.6(B)** prove two triangles are congruent by applying the Side-Angle-Side, Angle-Side-Angle, Side-Side-Side, Angle-Angle-Side, ~~and Hypotenuse-Leg~~ congruence conditions.

Important Vocabulary

- flowchart proof
- **givens**

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Unit 4 Student Edition
- Class set of red pens

Lesson Structure:

- Do Now (7 min)
- INM (10 min)
- Debrief (20 min)
- Student Practice (18 min)
- Exit Ticket (0 min)

Mathematical Goal of this Lesson

By the end of this lesson, students should be able to write triangle congruence proofs using a flow chart structure. They should be able to identify statements and reasons that will help them generate these proofs. Students have worked with flow chart proofs before, but this is the first time they're using them to prove triangles are congruent.

Opportunities to CFU

✓ INM: 6 ✓ Student Practice: 1, 2

Other Notes to Inform Your Planning

For the **Do Now:** This Do Now cannot be skipped; it sets up the INM.

For the **INM**: On proof days like today, one scaffold is to provide students a list of definitions they can use in their proof. A good practice is to always have these available for easy reference.

Focus on Disciplinary Literacy

SP 1 & 2

For the **Exit Ticket**: No ET is provided because students need time to complete flowchart proofs, give/receive feedback, and implement feedback. In lieu of collecting a traditional exit ticket, consider collecting one of students' revised flowchart proofs.

Lesson Look Fors

Look for teachers to…

- ❑ facilitate a think/pair/share for INM #3.
- ❑ provide a list of definitions students can use in their proof as a scaffold for students who may need it (example)
- ❑ emphasize that proofs must ALWAYS start with what is given.

Look for students to…

- ❑ persevere through the flow chart proofs and ask themselves "what information would help me get from the given to the statement I am trying to prove?"
- ❑ give each other feedback on their proofs and implement that feedback if it's actionable.

Student Know/Do Chart

Do — Students can generate a flowchart proof using what they've already learned about triangle congruency when given "givens."

Know — A flow chart proof must start with what is given and end with what should be proved.

Know — Every statement in a flowchart proof must have a reason.

Lesson 13: Triangle Congruence Proofs (Day 2) Date: _____

Standard(s)

- **G.6(B)** prove two triangles are congruent by applying the Side-Angle-Side, Angle-Side-Angle, Side-Side-Side, Angle-Angle-Side, ~~and Hypotenuse-Leg~~ congruence conditions.

Important Vocabulary

- AAS
- ASA
- flowchart proof
- givens
- included angle
- included side
- non-included side
- reason
- Statement
- SAS
- SSS

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Unit 4 Student Edition
- Student recording sheet (SW pp 155-156)
- Class set of red pens
- Class set of task cards

Lesson Structure:

- Do Now (7 min)
- INM (0 min)
- Debrief (0 min)
- Student Practice (48 min)
- Exit Ticket (0 min)

Mathematical Goal of this Lesson

This lesson gives students more opportunities to practice proof skills in isolation. It combines everything students have learned in Unit 4.

Other Notes to Inform Your Planning

For the **Do Now:** The Do Now helps to activate prior knowledge, but it is not required for INM success and can be replaced if you prefer.

For the **INM**: In lieu of a traditional INM, students have a stations activity for today. Before releasing students to work on their stations, ensure you have set clear expectations for how they will work and how much time they'll have at each station. While circulating, listen in and see how students are doing. You might find you need to adjust how much time you're giving students at each station. Quality discussion is worth preserving, so if you find most or all groups need more time than you initially gave them, it's okay to extend the time a bit. Doing a few problems well is better than making it through ALL the problems poorly.

Focus on Disciplinary Literacy

Station #8

For the **Exit Ticket**: No official ET is provided, but if you need an ET, you can select a station from the activity, have students complete the work for that station on a slip of paper, and turn that in instead.

Lesson Look Fors

Look for teachers to…

- ❑ set clear expectations for station work.
- ❑ circulate and actively monitor, listening in and debriefing with student groups as necessary.

Look for students to…

- ❑ visit each station with their group and engage in the provided activity.
- ❑ practice marking up diagrams
- ❑ identify congruent parts
- ❑ identify appropriate triangle congruence conjectures
- ❑ justify each statement in a proof with a reason

Student Know/Do Chart

Students can determine what information is needed to prove triangles are congruent by ASA or SAS.

Triangles can be proved congruent by ASA if two pairs of corresponding angles and their included sides are congruent.

Triangles can be proved congruent by SAS if two corresponding sides and their included angle are congruent.

Recommended Unit 4 Success Day Material and Resources

Date: _____

For more practice with the Triangle Inequality Theorem and/or Classifying Triangles (Lesson 1), try…

- 22-23 MCR Lesson 3.1: Classifying Triangles: SW | TE
- 22-23 MCR Lesson 3.4: Triangle Inequality Theorem: SW | TE

For more practice with Triangle Properties and the Exterior Angle Conjecture (Lessons 2-3), try…

- 22-23 MCR Lesson 3.2: Triangle Angle Sum Theorem: SW | TE
- Imagine Math: Triangle Angle Theorems: SW | TE

For more practice with Angle-Side relationships in triangles (Lesson 4), try…

- 22-23 MCR Lesson 3.3: Equilateral and Isosceles Triangles: SW | TE
- 22-23 MCR Lesson 3.5: Angle Side Relationships in Triangles: SW | TE

For more practice with the Pythagorean Theorem (Lesson 5), try…

- 22-23 MCR Lesson 1.3: Pythagorean Theorem SW | TE
- Kahoot: The Pythagorean Theorem
- Kahoot: The Converse of the Pythagorean Theorem
- Imagine Math: Explore the Pythagorean Theorem: SW | TE

For more practice with the Distance Formula (Lesson 6), try…

- 22-23 MCR Lesson 1.4: Distance Formula: SW | TE
- Imagine Math: Distance Formula: SW | TE

For more practice with triangle congruence (Lessons 8-13), try…

- Carnegie Learning: Skills Practice | Lesson TE | Lesson SW
- 22-23 MCR Lesson 3.6: Congruent Triangles: SW | TE
- 22-23 MCR Lesson 3.7: SSS and SAS: SW | TE
- 22-23 MCR Lesson 3.8: AAA ASA ~~and HL~~: SW | TE
- Kahoot: Triangle Congruence – SSS and SAS – Part 1
- Kahoot: Triangle Congruence - SSS and SAS – Part 2
- Kahoot: Triangle Congruence – ASA and AAS Part 1
- Kahoot: Triangle Congruence – ASA and AAS Part 2
- Imagine Math: AAS or ASA Congruence: SW | TE
- Imagine Math: SAS Congruence: SW | TE
- Imagine Math: SSS and HL: SW | TE
- Imagine Math: Use Triangle Congruence Theorems: SW | TE

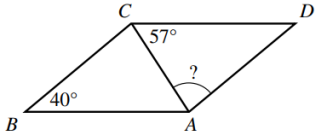
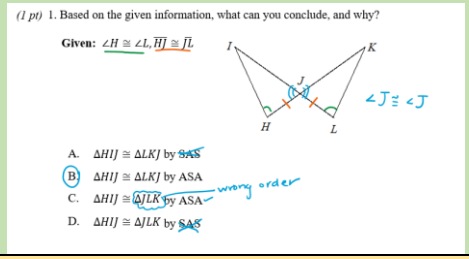
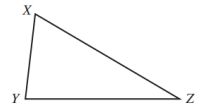
Cumulative Review | Success Day Date: _____

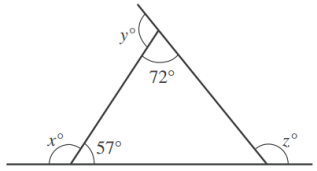
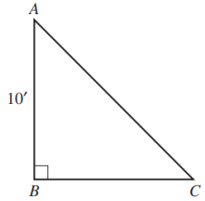
Standard(s)	Notes for Intellectual Preparation & Lesson Planning	Lesson Look Fors
◆ **G.5(A)** investigate patterns to make conjectures about geometric relationships, including angles formed by parallel lines cut by a transversal, criteria required for triangle congruence, special segments of triangles, ~~diagonals of quadrilaterals~~, interior and exterior angles of polygons, ~~and special segments and angles of circles~~ choosing from a variety of tools. ◆ **G.2(B)** derive and use the distance~~, slope, and midpoint~~ formulas to verify geometric relationships, including congruence of segments ~~and parallelism or perpendicularity of pairs of lines.~~ ◆ **G.6(B)** prove two triangles are congruent by applying the Side-Angle-Side, Angle-Side-Angle, Side-Side-Side, Angle-Angle-Side, ~~and Hypotenuse-Leg~~ congruence conditions. ◆ **G.6(D)** verify theorems about the relationships in triangles, including proof of the Pythagorean Theorem, the sum of interior angles, base angles of isosceles triangles, ~~midsegments, and medians,~~ and apply these relationships to solve problems.	**Necessary Materials and Pre-Lesson Prep** ▪ Review students' Unit 4 exit ticket data to determine what to prioritize during review ▪ Internalize Review Lesson 4.14 if you choose to use it Lesson Structure: Do Now (7 min) INM (0 min) Debrief (0 min) Student Practice (48 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 4. **Other Notes to Inform Your Planning** You should use this Success Day to review however you see fit. An optional review activity has been provided in the Teacher Edition called "Target Practice" (Review Lesson 4.14). This lesson includes three activities students can choose from depending on their needs. Activity 1 focuses on finding missing angles in diagrams, Activity 2 focuses on the Pythagorean Theorem, and Activity 3 focuses on Proof Practice. See pp 157-160 for more detailed directions.	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 4 topics in preparation for the Unit 4 exam. **Student Know/Do Chart** Students can prepare for the Unit 4 Exam by reviewing Unit 4 content.

Unit 4 Exam	Date: _____
Standard(s)	Notes for Intellectual Preparation & Lesson Planning
◆ **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.2(B)** derive and use the distance~~, slope, and midpoint~~ formulas to verify geometric relationships, including congruence of segments ~~and parallelism or perpendicularity of pairs of lines.~~ ◆ **G.6(B)** prove two triangles are congruent by applying the Side-Angle-Side, Angle-Side-Angle, Side-Side-Side, Angle-Angle-Side, ~~and Hypotenuse-Leg~~ congruence conditions. ◆ **G.6(D)** verify theorems about the relationships in triangles, including proof of the Pythagorean Theorem, the sum of interior angles, base angles of isosceles triangles, ~~midsegments, and medians,~~ and apply these relationships to solve problems.	**Necessary Materials and Pre-Lesson Prep** ▪ Ensure you can access UE4 on EdCite. **Notes to Inform Your Planning** Review the Unit 4 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 4 Exam is **November 13, 2025**. Consider administering the exam 1-3 school days BEFORE November 13th 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.5A 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	Content: • Triangle classification • Congruent polygons • Third Angles Theorem • Reflexive, Symmetric, and Transitive properties of triangle congruence • Midsegment theorem • Triangle Midsegment Theorem Including but not limited to: • Naming and using corresponding parts of congruent triangles • Proving triangles congruent using the definition of congruence	**ACT: Click on image to access source.** **7.** In parallelogram $ABCD$ below, $\overline{AC}$ is a diagonal, the measure of $\angle ABC$ is 40°, and the measure of $\angle ACD$ is 57°. What is the measure of $\angle CAD$? **A.** 40° **B.** 57° **C.** 77° **D.** 83° **E.** 97° 
G.6B prove two triangles are congruent by applying the Side-Angle-Side, Angle-Side-Angle, Side-Side-Side, Angle-Angle-Side, and Hypotenuse-Leg congruence conditions	Content • SSS Postulate • SAS Postulate • AAS Postulate • ASA Postulate Including but not limited to • Proving triangles congruent	
G.5D verify the Triangle Inequality theorem using constructions and apply the theorem to solve problems	Content • Triangle Inequality Theorem • Angle-Side Relationship Theorem Including but not limited to • Prove triangle relationships using the Triangle Inequality theorem • Verify the Triangle Inequality Theorem using constructions and apply the theorem to solve problems	ACT **20.** For all triangles $\triangle XYZ$ where side $\overline{XZ}$ is longer than side $\overline{YZ}$, such as the triangle shown below, which of the following statements is true?  **F.** The measure of $\angle X$ is always less than the measure of $\angle Y$. **G.** The measure of $\angle X$ is always equal to the measure of $\angle Y$. **H.** The measure of $\angle X$ is always greater than the measure of $\angle Y$. **J.** The measure of $\angle X$ is sometimes less than the measure of $\angle Y$ and sometimes equal to the measure of $\angle Y$. **K.** The measure of $\angle X$ is sometimes greater than the measure of $\angle Y$ and sometimes equal to the measure of $\angle Y$.

Standards Clarification		
Standards	**Specificity**	**Notes/Explanations/Examples**
G.6D verify theorems about the relationships in triangles, including proof of the Pythagorean Theorem, the sum of interior angles, base angles of isosceles triangles, midsegments, and medians, and apply these relationships to solve problems	Content • Triangle Angle-Sum Theorem • Exterior Angle Theorem • Triangle Angle-Sum Corollaries • Properties of isosceles triangles • Properties of equilateral triangles • Isosceles Triangle Theorem • Converse of Isosceles Triangle Theorem • A triangle is equilateral if and only if it is equiangular. • Each angle of an equilateral triangle measures 60. Including but not limited to • Applying the Triangle Angle-Sum Theorem to find missing values • Proving the Triangle Angle-Sum Theorem • Using properties of isosceles and equilateral triangles to solve problems • Using midsegments of triangles to find distances	ACT **12.** Given the triangle shown below with exterior angles that measure $x°$, $y°$, and $z°$ as shown, what is the sum of x, y, and z ? **F.** 180 **G.** 231 **H.** 309 **J.** 360 **K.** Cannot be determined from the given information  **13.** In the isosceles right triangle below, $AB = 10$ feet. What is the length, in feet, of $\overline{AC}$? **A.** 5 **B.** 10 **C.** 20 **D.** $\sqrt{20}$ **E.** $10\sqrt{2}$ 

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.

7th Grade	Geometry	Algebra II
7.11C write and solve equations using geometry concepts, including the sum of the angles in a triangle, and angle relationships	**G.2B** derive and use the ~~distance, slope, and~~ midpoint formulas to verify geometric relationships, including congruence of segments and parallelism ~~or perpendicularity~~ of pairs of lines **G.5A** 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.5D** verify the Triangle Inequality theorem using constructions and apply the theorem to solve problems **G.6B** prove two triangles are congruent by applying the Side-Angle-Side, Angle-Side-Angle, Side-Side-Side, Angle-Angle-Side, and Hypotenuse-Leg congruence conditions **G.6D** verify theorems about the relationships in triangles, including proof of the Pythagorean Theorem, the sum of interior angles, base angles of isosceles triangles, midsegments, and medians, and apply these relationships to solve problems	**A2.6E** solve absolute value linear equations **A2.8C** predict and make decisions and critical judgments from a given set of data using linear, quadratic, and exponential models **A2.4F** solve quadratic and square root equations
Algebra I		**Pre-Calculus**
A.2F write the equation of a line that contains a given point and is perpendicular to a given line **A.4C** write, with and without technology, linear functions that provide a reasonable fit to data to estimate solutions and make predictions for real-world problems **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.8A** solve quadratic equations having real solutions by factoring, taking square roots, completing the square, and applying the quadratic formula		**P.2P** the student is expected to determine the values of the trigonometric functions at the special angles and relate them in mathematical and real-world problems **P.4E** the student is expected to determine the value of trigonometric ratios of angles and solve problems involving trigonometric ratios in mathematical and real-world problems **P.5M** the student is expected to use trigonometric identities such as reciprocal, quotient, Pythagorean, cofunctions, even/odd, and sum and difference identities for cosine and sine to simplify trigonometric expressions