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How to Use This Addendum

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**

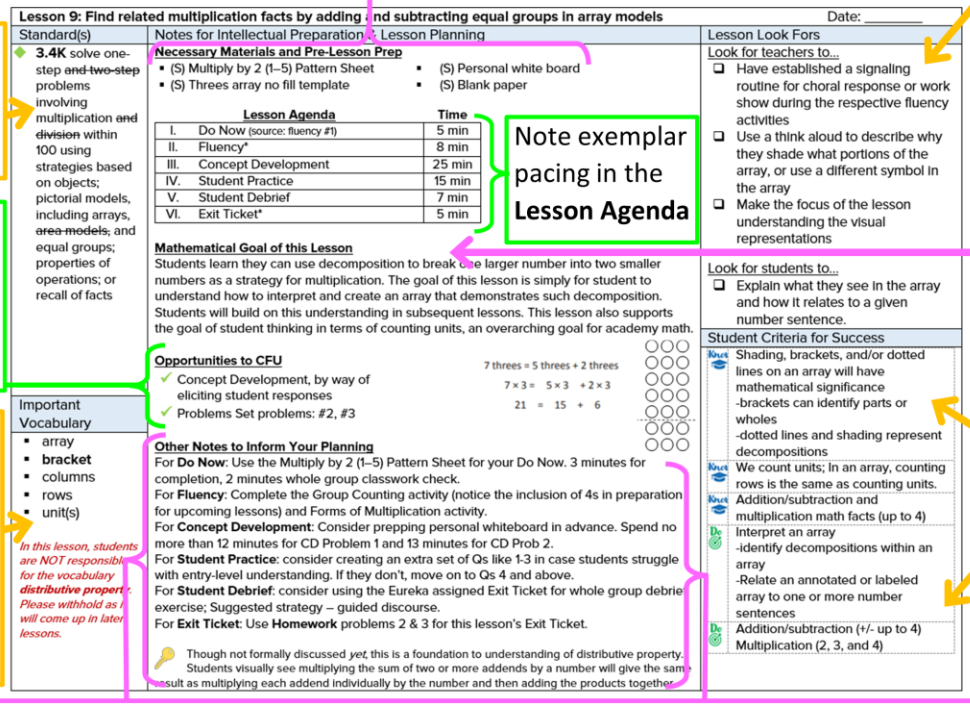
Note exemplar pacing in the **Lesson Agenda**

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

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

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

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep
- (S) Multiply by 2 (1–5) Pattern Sheet
- (S) Threes array no fill template
- (S) Personal white board
- (S) Blank paper

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

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

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

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

Other Notes to Inform Your Planning
For **Do Now**: Use the Multiply by 2 (1–5) Pattern Sheet for your Do Now. 3 minutes for completion, 2 minutes whole group classwork check.
For **Fluency**: Complete the Group Counting activity (notice the inclusion of 4s in preparation for upcoming lessons) and Forms of Multiplication activity.
For **Concept Development**: Consider prepping personal whiteboard in advance. Spend no more than 12 minutes for CD Problem 1 and 13 minutes for CD Prob 2.
For **Student Practice**: consider creating an extra set of Qs like 1-3 in case students struggle with entry-level understanding. If they don't, move on to Qs 4 and above.
For **Student Debrief**: consider using the Eureka assigned Exit Ticket for whole group debrie 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 sam result as multiplying each addend individually by the number and then adding the products together.

Lesson Look Fors

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

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

Student Criteria for Success
- Know: Shading, brackets, and/or dotted lines on an array will have mathematical significance -brackets can identify parts or wholes -dotted lines and shading represent decompositions
- Know: We count units; In an array, counting rows is the same as counting units.
- Know: Addition/subtraction and multiplication math facts (up to 4)
- Do: Interpret an array -identify decompositions within an array -Relate an annotated or labeled array to one or more number sentences
- Do: Addition/subtraction (+/- up to 4) Multiplication (2, 3, and 4)

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

UNIT SYNOPSIS

This unit focuses on quadrilaterals and the properties of different special quadrilaterals. Students have worked with quadrilaterals informally since preschool; this unit focuses heavily on the definitions of the different classifications of quadrilaterals. Students will focus on identifying the characteristics (sides, angles, and diagonal relationships) of parallelograms, rectangles, rhombi, squares, trapezoids, and kites. Students will look at quadrilaterals in the coordinate plane and use the characteristics of the quadrilateral to prove quadrilaterals are parallelograms, rectangles, rhombi, or squares. This unit also includes finding the area of quadrilaterals and regular polygons, in addition to solving problems involving interior and exterior angles.

CONTENT STANDARDS

Below are the standards addressed in this unit.

Readiness Standards	Supporting Standards
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.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.11(B)** determine the area of composite two-dimensional figures comprised of a combination of triangles, parallelograms, trapezoids, kites, regular polygons, or ~~sectors of circles~~ to solve problems using appropriate units of measure.	**G.6(E)** prove a quadrilateral is a parallelogram, rectangle, square, or rhombus using opposite sides, opposite angles, or diagonals 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
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

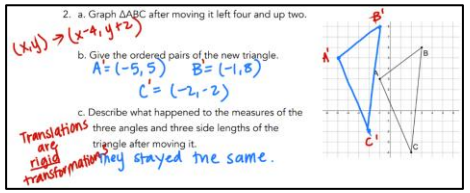
For every new lesson, the teacher begins by making the goals of the lesson crystal clear. The teacher does more than simply read the objective to the class. They make connections to previous learning, share how this learning fits into a bigger picture, or explain why this learning is important for future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

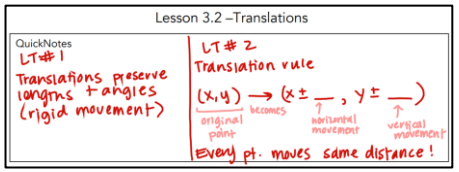
Debrief Activity

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 5 – Quadrilaterals and Other Polygons			
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 5 and 6 to administer an optional topic quiz. • Consider using 1 day after Lesson 8 to administer another optional topic quiz. • Consider using 1 day to review before the Unit 5 Exam (see provided Cumulative Review). • If you don't need to use all 5 success days, you can/should save unused days for a later unit.			
1		1	Quadrilateral Hierarchy
2		2	Proving Parallelogram Properties
3		3	Properties of Special Parallelograms
4		4	Coordinate Connection: Quadrilaterals on the Plane
5		5	Mid-Unit Review: A Windy Day in Chicago
6			Unit 5 Topic Quiz A | Success Day
7		6	Areas of Quadrilaterals
8		7	Polygon Interior and Exterior Angle Sums
9		8	Regular Polygons and Their Areas
10			Unit 5 Topic Quiz B | Success Day
11		CR	Cumulative Review | Success Day
12			Unit 5 Exam
13			Success Day

Lesson 1: Quadrilateral Hierarchy Date: _____

Standard(s)

- **G.6(E)** prove a quadrilateral is a parallelogram, rectangle, square, or rhombus using opposite sides, opposite angles, or diagonals ~~and apply these relationships to solve problems.~~

Important Vocabulary

- **isosceles trapezoid**
- **kite**
- **parallelogram**
- **quadrilateral**
- **rectangle**
- **rhombus**
- **square**
- **trapezoid**

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Unit 5 Student Edition
- Class set of red pens

Lesson Structure:

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

Mathematical Goal of this Lesson

By the end of this lesson, students should be able to classify quadrilaterals based on their subgroups and distinguish between concave and convex polygons.

Opportunities to CFU

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

Other Notes to Inform Your Planning

For the **Do Now:** The Do Now is actually a game in which students must form groups based on whatever their card says (see pink TE box on p6). This will likely be chaotic, louder than usual, and joyful! If classroom culture is an issue, consider starting with a silent Do Now (like a problem from a previous exit ticket) before engaging in this community-building game. This game is also an exercise in the use of mathematical vocabulary, logic, and process of elimination.

For the **INM**: Students have worked with various quadrilaterals since elementary. Parts of the INM will probably be very obvious to them, but some parts will be new. As always, ensure you circulate and monitor throughout the INM to maximize the effectiveness of the Debrief. Additionally, consider putting the grouped-together cards from the Do Now under the doc cam as students work on the INM so they can refer to it.

Focus on Disciplinary Literacy

Do Now

Lesson Look Fors

Look for teachers to…

- ❑ joyfully set expectations and hold students accountable to meet them during the Do Now game.
- ❑ encourage students to access their prior knowledge of quadrilaterals and apply it to the INM.
- ❑ Emphasize (during the Debrief) that the quadrilateral hierarchy moves from general to specific.

Look for students to…

- ❑ recall what they already know about quadrilaterals
- ❑ use the quadrilateral hierarchy to help them answer questions about quadrilaterals

Student Know/Do Chart

Do: Students can classify quadrilaterals based on their side lengths, angle measures, and whether side lengths are parallel.

Know: For quadrilateral to be a parallelogram, it must have two pairs of parallel sides.

Know: For quadrilateral to be a rhombus, it must have four congruent side lengths.

Know: For quadrilateral to be a rectangle, it must have two pairs of parallel sides and four right angles.

Know: For a quadrilateral to be a square, it must have four equal side lengths and four congruent angles that measure 90°.

Lesson 2: Proving Parallelogram Properties Date: _____

Standard(s)

◆ **G.6(E)** prove a quadrilateral is a parallelogram, rectangle, square, or rhombus using opposite sides, opposite angles, or diagonals ~~and apply these relationships to solve problems.~~

Important Vocabulary

- bisect
- **consecutive angles**
- **diagonal**
- **opposite angles**
- **opposite sides**
- parallelogram
- quadrilateral
- supplementary angles

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Unit 5 Student Edition
- Class set of red pens

Lesson Structure:

- Do Now (7 min)
- INM (18 min)
- Debrief (13 min)
- Student Practice (17 min)
- Exit Ticket (0 min)

Mathematical Goal of this Lesson

By the end of this lesson, students should be able to apply properties of congruent triangles and angles on a transversal to prove properties of parallelograms.

Opportunities to CFU

✓ INM: 3, 6 ✓ Student Practice: 1

Other Notes to Inform Your Planning

For the **Do Now:** The Do Now cannot be replaced; it sets up the INM.

For the **INM**: #8 can be skipped if you are short on time.

For **INM/Debrief**: Throughout the Debrief, take advantage of the color-coded angle measures to illustrate each red annotation. In this lesson, students should be able to really SEE the properties of quadrilaterals.

Focus on Disciplinary Literacy

Debrief

No **Exit Ticket** is provided in this lesson, as the time stamps do not allow for it. If you need an exit ticket grade each day, consider collecting Student Practice #2.

Lesson Look Fors

Look for teachers to…

- ❑ model the use of colored pencils to indicate congruent angles that illuminate important properties of parallelograms.
- ❑ stamp that the diagonals of a parallelogram form congruent sets of triangles that justify parallelogram properties.

Look for students to…

- ❑ be able to explain why a quadrilateral's angles must add up to 360°.
- ❑ build on what they previously learned about triangles and parallel lines cut by transversals to support properties of quadrilaterals (succinctly captured in QuickNotes notes).

Student Know/Do Chart

Do: Students can determine whether a quadrilateral is a parallelogram or not given two consecutive angle measures.

Know: Parallelograms have consecutive angles that are supplementary and opposite angles that are congruent.

Lesson 3: Properties of Special Parallelograms Date: _____

Standard(s)

- **G.6(E)** prove a quadrilateral is a parallelogram, rectangle, square, or rhombus using opposite sides, opposite angles, or diagonals ~~and apply these relationships to solve problems.~~

Important Vocabulary

- isosceles trapezoid
- kite
- parallelogram
- quadrilateral
- rectangle
- rhombus
- square
- trapezoid

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Unit 5 Student Edition
- Chart paper for each group
- Class set of red pens
- Class set of straightedges

Lesson Structure:

- Do Now (7 min)
- INM (25 min)
- Debrief (5 min)
- Student Practice (8 min)
- Exit Ticket (10 min)

Mathematical Goal of this Lesson

By the end of this lesson, students should be able to prove properties about the diagonals of rectangles, rhombi, and squares using congruent triangles, and solve for missing lengths and angle measures in special parallelograms.

Opportunities to CFU

✓ INM:

✓ Student Practice:

Other Notes to Inform Your Planning

For the **Do Now:** The Do Now sets up the INM and cannot be skipped.

For **INM#6**: Writing a proof is a great way to practice displaying, explaining, and justifying mathematical ideas and arguments (Mathematical Process Standard G)

Focus on Disciplinary Literacy

INM #6

For **QuickNotes**: Consider adding a sketch of each figure with properties marked (e.g. a square with congruent side lengths and right angle measures marked).

Lesson Look Fors

Look for teachers to…

- ❑ accept all of students' "noticings" and "wonderings" when debriefing INM #3, even if they seem too obvious (this is one way to honor student voice and lower the floor of the activity).
- ❑ debrief after INM #3, release stuents to work again, and Debrief/QuickNotes after INM #6.

Look for students to…

- ❑ notice that squares must have all the properties of a rectangle and a rhombus by the end of INM Q5.
- ❑ work on a proof with their teammates during INM #6.

Student Know/Do Chart

Students can find a rhombus' missing angle measures given one angle measure created by a diagonal of a rhombus.

A rhombus' diagonals are perpendicular to each other.

A rhombus' diagonals bisect the interior angles of the rhombus.

Lesson 4: Coordinate Connection: Quadrilaterals on the Plane 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

- parallelogram
- rectangle
- rhombus
- square
- trapezoid

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Unit 5 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 use slope and distance on the coordinate plane to classify quadrilaterals given by ordered pairs.

Opportunities to CFU

✓ INM: ✓ Student Practice:

Other Notes to Inform Your Planning

For the **Do Now:** The Do Now cannot be skipped; it leads into the INM.

For the **INM**: As you circulate and monitor, check in with student groups using the Five Practices shown on TE p32. Use the "keep thinking" questions provided in the pink box on TE p41.

Focus on Disciplinary Literacy

INM #2

Lesson Look Fors

Look for teachers to…

- ❑ engage in the Five Practices (see TE p32) while circulating and actively monitoring.
- ❑ while Debriefing, make explicit the idea that finding the distance between points can help determine if any side lengths are congruent, and finding the slope of each segment helps determine if there are any sets of parallel sides.

Look for students to…

- ❑ build upon their understanding of slope, distance, and the properties of quadrilaterals to be able to classify quadrilaterals on the coordinate plane.
- ❑ persevere and remain positive throughout their struggles (this lesson is NOT easy).

Student Know/Do Chart

Do — Students can classify a quadrilateral graphed on the coordinate plane.

Do — Students can find the slope and distance of line segments .

Know — A quadrilateral can be classified as a square when it has four congruent sides and two sets of parallel sides that are perpendicular to each other.

Lesson 5: Mid-Unit Review: Make a Kite (A Windy Day in Chicago)		Date: _____
Standard(s)	Notes for Intellectual Preparation & Lesson Planning	Lesson Look Fors

◆ **G.6(E)** prove a quadrilateral is a parallelogram, rectangle, square, or rhombus using opposite sides, opposite angles, or diagonals and apply these relationships to solve problems.

Necessary Materials and Pre-Lesson Prep

- Unit 5 Student Edition
- Pair of shish kabob stickers per student team (and extra for breaking them apart)
- Class set of red pens
- Extra graph paper

Lesson Structure:

- Do Now (7 min)
- INM (20 min)
- Debrief (8 min)
- Student Practice (20 min)
- Exit Ticket (0 min)

Mathematical Goal of this Lesson

By the end of this lesson, students should be able to identify properties of various quadrilaterals and apply these properties to find missing values. This lesson builds on everything students have learned so far in Lessons 1 – 4. (Note: There is no ET for this review lesson.)

Opportunities to CFU

✓ INM: all of it!

✓ Student Practice: 1

Other Notes to Inform Your Planning

For the **Do Now:** The Do Now can be skipped or replaced if necessary, although it does activate prior knowledge.

For the **INM**: Students use shish kabob sticks as diagonals to create quadrilaterals which allows students to review important properties of diagonals of parallelograms without just memorizing them as facts. (Some quadrilaterals have diagonals of different sizes (like kites!) so consider pre-cutting some of the shish kabob sticks and passing those out. Students can snap them too, but the snapped ends may hurt students that aren't careful.

Focus on Disciplinary Literacy

INM

Before students leave, ensure they have correctly completed p221 in their Student Workbook (the graphic organizer).

Look for teachers to…

- ❑ clearly set expectations for use of shish kabob sticks (and how to break them if the teacher hasn't already cut some)
- ❑ circulate to promote on-task behavior and to ask questions to keep students thinking and moving on

Look for students to…

- ❑ manipulate the shish kabob sticks to form different types of quadrilateral and note what quadrilateral they get and the properties of its diagonals (e.g. "we get a square when the diagonals are congruent and perpendicular)
- ❑ apply their understanding of diagonals of quadrilaterals to find missing values (during the Student Practice)

Student Know/Do Chart

Do — Students can apply all "Dos" from Lessons 1-4.

Know — Students know all "Knows" from Lessons 1-4.

Important Vocabulary

- diagonal
- isosceles trapezoid
- kite
- parallelogram
- rectangle
- rhombus
- square

Lesson 6: Areas of Quadrilaterals | Date: _____

Standard(s)

◆ **G.11(B)** determine the area of composite two-dimensional figures comprised of a combination of triangles, parallelograms, trapezoids, kites, regular polygons, or sectors of circles to solve problems using appropriate units of measure.

Important Vocabulary

- diagonal
- isosceles trapezoid
- kite
- parallelogram
- rectangle
- rhombus
- square

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Unit 5 Student Edition
- Four of each shape for students to cut (in case they make mistakes). These shapes can be found in the TE pp. 54-56).
- Class set of red pens
- Class set of scissors and rulers

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 apply the properties of special quadrilaterals to decompose their shapes into rectangles and find their area. Additionally, students should be able to connect the dimensions of the original shape to the base and height of a rectangle to generate an area formula for parallelograms, trapezoids, and rhombi.

Opportunities to CFU

✓ INM: 3, 4

✓ Student Practice: 1, 2

Other Notes to Inform Your Planning

For the **Do Now:** The Do Now CAN'T be skipped; it sets up the INM.

For the **INM**: Students learned how to find the area of most of these figures in 6th/7th grade. The emphasis is not on memorizing formulas, but on reasoning through why they make sense. This will prevent students from making senseless mistakes (like trying to find the area of a rhombus by multiplying d_1 and d_2, which after this lesson they KNOW would not make sense because it would result in too large of an area).

Focus on Disciplinary Literacy

Debrief #5

Lesson Look Fors

Look for teachers to…

- ❑ emphasize that "base" and "height" of any shape must be perpendicular to each other.
- ❑ emphasize that parallelograms, rhombi, and trapezoids can be decomposed and rearranged to form rectangles and that is what reveals their "base" and "height"

Look for students to…

- ❑ only make 1 or 2 cuts to decompose and rearrange a shape.
- ❑ explain what the newly formed dimensions to what they originally were (e.g. for a rhombus, the new b and h are half of what was d_1 and d_2).

Student Know/Do Chart

Do: Students can find the area of a kite and a trapezoid.

Know: To find the area of a kite, use the formula $A = \frac{1}{2}pq$, where p and q each represent one of the diagonals.

Know: To find the area of a trapezoid, use the formula $A = \frac{1}{2}(b_1 + b_2)h$.

Lesson 7: Polygon Interior and Exterior Angle Sums 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 choosing from a variety of tools.

Important Vocabulary

- **exterior angles**
- **interior angles**

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Unit 5 Student Edition
- Class set of red pens
- Access to GeoGebra

Lesson Structure:

- Do Now (8 min)
- INM (16 min)
- Debrief (5 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 generalize a formula for finding the interior angle sum of any polygon by decomposing the shape into triangles, determine the angle sum and solve for missing angles given the number of sides of a polygon and vice versa, and apply the exterior angle sum theorem to find missing values.

Opportunities to CFU

✓ INM: 2, 4, 9

✓ Student Practice: 2, 3

Other Notes to Inform Your Planning

For the **Do Now:** The Do Not cannot be skipped or replaced. Students can do this independently using GeoGebra, but if you need silent time to pass out laptops first, consider assigning a "pre-do-now" while students wait for the laptops. Note that this will cut into Do Now/INM time.

For the **INM**: When internalizing this lesson, try out the GeoGebra activities students use for the Do Now and the INM to ensure you are able to support if needed.

Focus on Disciplinary Literacy

Debrief

Lesson Look Fors

Look for teachers to…

- ❑ avoid coaching to memorize the formula $(n-2)*180$ and promote the sensemaking that comes from seeing how many triangles are created by diagonals in a polygon.
- ❑ build on what students know about linear pairs (namely, that they're supplementary) to help them make sense of why the sum of a polygon's exterior angles is always 360°.

Look for students to…

- ❑ use diagonals to "break" a polygon into triangles and build on their understanding that triangles have a total of 180° degrees to figure out how many total degrees must be in an n-sided polygon.
- ❑ explain why exterior angles of any polygon add up to 360°.

Student Know/Do Chart

Do — Students can find a polygon's missing interior or exterior angle measures.

Know — A polygon's exterior angles add up to 360°.

Know — The sum of a polygon's interior angles can be found using $(n-2)(180°)$, where n represents the number of sides.

Lesson 8: Regular Polygons and Their Areas Date: _____

Standard(s)

◆ **G.11(B)** determine the area of composite two-dimensional figures comprised of a combination of triangles, parallelograms, trapezoids, kites, regular polygons, ~~or sectors of circles~~ to solve problems using appropriate units of measure.

Important Vocabulary

- **apothem**
- **regular polygon**

Notes for Intellectual Preparation & Lesson Planning

Necessary Materials and Pre-Lesson Prep

- Unit 5 Student Edition
- Class set of red pens and **rulers**
- Printable "pies" (see TE pp 75-80)

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 solve for side lengths and apothems using properties of regular polygons, and decompose regular polygons into congruent triangles in order to find their areas.

Opportunities to CFU

✓ INM: 1, 4, 5

✓ Student Practice: 1-3

Other Notes to Inform Your Planning

For the **Do Now:** This Do Now spirals in previous content. It can be skipped or replaced if necessary.

For the **INM**: Each group gets a different shaped "pie" to work with. They'll gather data to contribute to the class table so that the class can make generalizations during the Debrief.

Focus on Disciplinary Literacy

Debrief

For **Debrief**: Plan for how you will collect the data for each class. Consider using a chart paper for each class period, or a regular sheet of paper that you can project under the doc cam. However you do it, ensure students can see the data from all groups collected in one place so they can make generalizations from it.

Lesson Look Fors

Look for teachers to…

- ❑ plan for what to do if some tables start breaking their regular polygon into right triangles (winding up with $2n$ triangles instead of n). This is another valid method – it's just different from what's shown in the TE. (Teachers can take advantage of this as a learning opportunity, OR as they circulate and monitor they can encourage students to only cut isosceles triangles.)

Look for students to…

- ❑ recall how to find the area of a triangle
- ❑ generalize a formula to find the area of a regular polygon using the class-generated table.

Student Know/Do Chart

Do: Students can find the apothem of a regular polygon given its area, number of sides, and side length.

Know: To find the area of a regular polygon, use $\frac{1}{2}san$, where s represents the side length, a represents the apothem, and n represents the number of sides.

Cumulative Review | Success Day Date: _____

Standard(s)	Notes for Intellectual Preparation & Lesson Planning	Lesson Look Fors
◆ **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.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.11(B)** determine the area of composite two-dimensional figures comprised of a combination of triangles, parallelograms, trapezoids, kites, regular polygons, or sectors of circles to solve problems using appropriate units of measure. ◆ **G.6(E)** prove a quadrilateral is a parallelogram, rectangle, square, or rhombus using opposite sides, opposite angles, or diagonals and apply these relationships to solve problems.	**Necessary Materials and Pre-Lesson Prep** ▪ Review students' Unit 5 exit ticket data to determine what to prioritize during review ▪ Internalize Review Lesson 5.9 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 5. **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 "Twinning" (Review Lesson 5.9). Students will work in pairs on today's "Twinning" activity. Have each pair decide who will be Partner A and who will be Partner B. Students will work on the problem in their respective column on the handout and check their answer with each other--they should match! If they don't match, students will know that one or both of them made a mistake and they should work together to find it. Make sure students are checking their work with each other after each problem and not working individually through the whole activity before comparing answers. The activity is designed so each partner sees a variety of problem types with varying difficulty levels. They will also get to try some of their partner's problems if they are troubleshooting mismatched answers. Be prepared to hear good discussions among partners!	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 5 topics in preparation for the Unit 5 exam. **Student Know/Do Chart** Do Students can prepare for the Unit 5 Exam by reviewing Unit 5 content.

Recommended Unit 5 Success Day Material and Resources

Date: _____

For more practice with Classifying Quadrilaterals (Lessons 1-4), try…

- 22-23 MCR Lesson 5.3: Properties of Parallelograms SW | TE
- 22-23 MCR Lesson 5.4: Properties of Rhombi, Rectangles, and Squares SW | TE
- 22-23 MCR Lesson 5.5: Proving that a Quadrilateral is a Parallelogram SW | TE
- 22-23 MCR Lesson 5.6: Properties of Trapezoids and Kites SW | TE
- 22-23 MCR Lesson 5.7: Quadrilaterals on the Coordinate Plane SW | TE
- 22-23 MCR Unit 5 Cumulative Review (a mix of classifying quadrilaterals and exterior/interior angles): SW | TE
- Kahoot: Introduction to Quadrilaterals – Part 1
- Kahoot: Introduction to Quadrilaterals – Part 2
- Kahoot: Introduction to Quadrilaterals – Part 3
- Kahoot: Parallelograms – Part 1
- Kahoot: Parallelograms – Part 2
- Kahoot: Rectangles
- Kahoot: Rhombi
- Kahoot: Squares
- Kahoot: Kites
- Kahoot: Trapezoids
- Kahoot: Quadrilaterals in Coordinate Geometry – Part 1
- Kahoot: Quadrilaterals in Coordinate Geometry – Part 2
- Imagine Math: Apply Parallelogram Theorems: SW | TE
- Imagine Math: Prove a Quadrilateral is a Parallelogram: SW | TE
- Imagine Math: Theorems about Rhombi, Rectangles, and Squares: SW | TE

For more practice with interior and exterior angle sums (Lesson 7), try…

- 22-23 MCR Lesson 5.1: Exterior Angles of Polygons: SW | TE
- 22-23 MCR Lesson 5.2: Interior Angles of Polygons: SW | TE
- Imagine Math: Angle Measures of Polygons: SW | TE

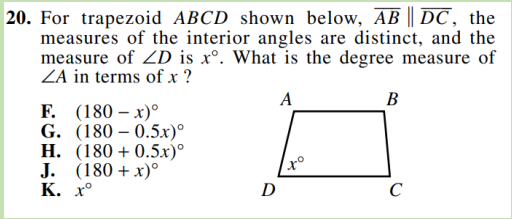
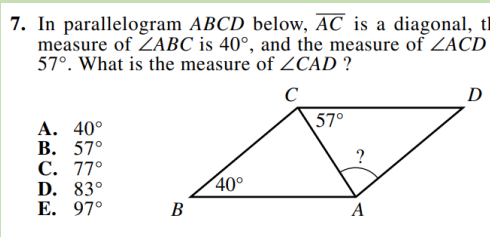
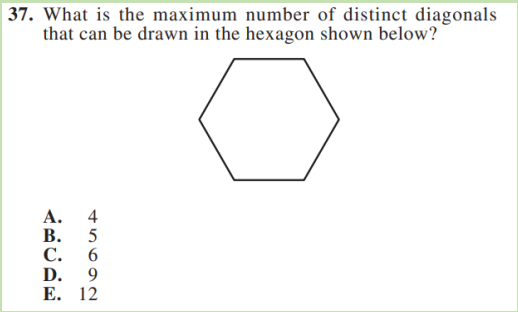
For more practice with area of quadrilaterals and/or polygons (Lessons 6 and 8), try…

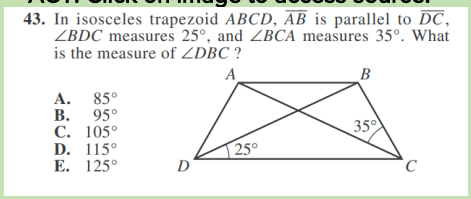
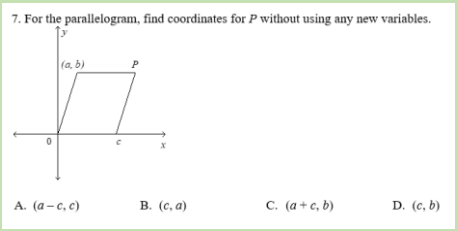
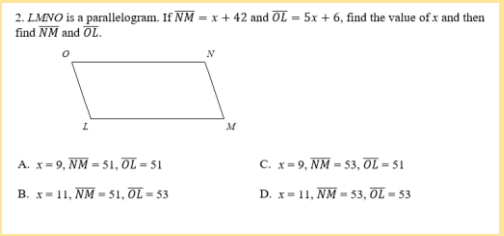
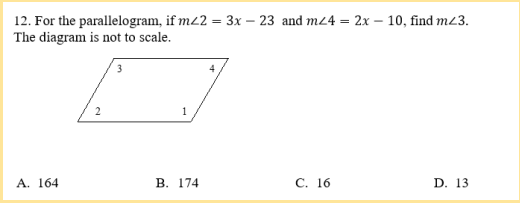
- 22-23 MCR Lesson 9.1: Area of Rectangles, Squares, Parallelograms, and Triangles: SW | TE
- 22-23 MCR Lesson 9.2: Area of Trapezoids, Rhombi, and Kites: SW | TE
- 22-23 MCR Lesson 9.3: Area of Regular Polygons: SW | TE
- Imagine Math: Area of Triangles and Parallelograms: SW | TE
- Imagine Math: Area of Regular Polygons: SW | TE

Unit 5 Exam	Date: _____
Standard(s)	Notes for Intellectual Preparation & Lesson Planning
◆ **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.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.11(B)** determine the area of composite two-dimensional figures comprised of a combination of triangles, parallelograms, trapezoids, kites, regular polygons, or sectors of circles to solve problems using appropriate units of measure. ◆ **G.6(E)** prove a quadrilateral is a parallelogram, rectangle, square, or rhombus using opposite sides, opposite angles, or diagonals and apply these relationships to solve problems.	**Necessary Materials and Pre-Lesson Prep** ▪ Ensure you can access UE5 on EdCite. **Notes to Inform Your Planning** Review the Unit 5 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 5 Exam is **December 11, 2025**. Consider administering the exam 1-3 school days BEFORE December 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.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: • Ratios • Exterior angles of a polygon always sum up to 360. • Diagonals • Properties of rectangles, parallelograms, rhombi, and squares • Distance formula • Midpoint formula • Slope formula • Coordinate plane Including but not limited to: • Finding missing values when given exterior and/or interior angles of a polygon • Finding a pattern and generalizing to find the sum of the interior angle measures for any convex polygon • Proving a polygon is a rectangle and/or rhombus and/or square by using its diagonals, sides, or angles. • Using properties of a rectangle, rhombus, or square to find missing values. • Using the Slope, Distance, and/or Midpoint formulas to prove a quadrilateral is a rhombus, square, parallelogram, or rectangle. • Using the coordinate plane to classify quadrilaterals	**ACT: Click on image to access source.**  **20.** For trapezoid $ABCD$ shown below, $\overline{AB} \parallel \overline{DC}$, the measures of the interior angles are distinct, and the measure of $\angle D$ is $x°$. What is the degree measure of $\angle A$ in terms of x ? **F.** $(180 - x)°$ **G.** $(180 - 0.5x)°$ **H.** $(180 + 0.5x)°$ **J.** $(180 + x)°$ **K.** $x°$  **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°  **37.** What is the maximum number of distinct diagonals that can be drawn in the hexagon shown below? **A.** 4 **B.** 5 **C.** 6 **D.** 9 **E.** 12

Standards Clarification		
Standards	**Specificity**	**Notes/Explanations/Examples**
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	Content: • Properties of trapezoids • Properties of isosceles trapezoids • Diagonals • Midsegment • Properties of kites Including but not limited to: • Distinguishing between trapezoids and isosceles trapezoids • Proving whether a quadrilateral is a trapezoid or not using its sides, angles, midsegment, and/or diagonals • Proving whether a quadrilateral is a kite or not using its sides, angles, and/or diagonals. • Find missing coordinates on a coordinate plane to "complete" a named quadrilateral	**ACT: Click on image to access source.**  **43.** In isosceles trapezoid $ABCD$, $\overline{AB}$ is parallel to $\overline{DC}$, $\angle BDC$ measures 25°, and $\angle BCA$ measures 35°. What is the measure of $\angle DBC$? **A.** 85° **B.** 95° **C.** 105° **D.** 115° **E.** 125° A, B, 35°, 25°, D, C **From a previous UE5**  7. For the parallelogram, find coordinates for P without using any new variables. y, (a, b), P, 0, c, x A. $(a-c, c)$ B. (c, a) C. $(a+c, b)$ D. (c, b)
G.6E prove a quadrilateral is a parallelogram, rectangle, square, or rhombus using opposite sides, opposite angles, or diagonals and apply these relationships to solve problems	Content: • Properties of parallelograms, rectangles, squares, and rhombi Including but not limited to: • Using the Slope, Distance, and/or Midpoint Formulas to prove whether a quadrilateral is a parallelogram, rectangle, square, and/or rhombus. • Using properties of quadrilaterals to set up and solve equations to find missing values.	**From a previous UE5**  2. $LMNO$ is a parallelogram. If $\overline{NM} = x + 42$ and $\overline{OL} = 5x + 6$, find the value of x and then find $\overline{NM}$ and $\overline{OL}$. O, N, L, M A. $x = 9, \overline{NM} = 51, \overline{OL} = 51$ B. $x = 11, \overline{NM} = 51, \overline{OL} = 53$ C. $x = 9, \overline{NM} = 53, \overline{OL} = 51$ D. $x = 11, \overline{NM} = 53, \overline{OL} = 53$  12. For the parallelogram, if $m\angle 2 = 3x - 23$ and $m\angle 4 = 2x - 10$, find $m\angle 3$. The diagram is not to scale. 3, 4, 2, 1 A. 164 B. 174 C. 16 D. 13

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
7.4B calculate unit rates from rates in mathematical and real-world problems. **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.6E** prove a quadrilateral is a parallelogram, rectangle, square, or rhombus using opposite sides, opposite angles, or diagonals and apply these relationships to solve problems. **G.11B** determine the area of composite two-dimensional figures comprised of a combination of triangles, parallelograms, trapezoids, kites, regular polygons, or sectors of circles to solve problems using appropriate units of measure.	**2A.2A** graph the functions f(x)=, f(x)=1/x, f(x)=x3, f(x)=, f(x)=bx, f(x)=|x|, and f(x)=logb (x) where b is 2, 10, and e, and, when applicable, analyze the key attributes such as domain, range, intercepts, symmetries, asymptotic behavior, and maximum and minimum given an interval.
Algebra I		**Pre-Calculus**
A.3A determine the slope of a line given a table of values, a graph, two points on the line, and an equation written in various forms, including y = mx + b, Ax + By = C, and y – y1 = m(x – x1). **A.3B** calculate the rate of change of a linear function represented tabularly, graphically, or algebraically in context of mathematical and real-world problems. **A.3C** graph linear functions on the coordinate plane and identify key features, including x-intercept, y-intercept, zeros, and slope, in mathematical and real-world problems.		**P.3D** the student is expected to graph points in the polar coordinate system and convert between rectangular coordinates and polar coordinates. **P.3I** the student is expected to use the characteristics of a hyperbola to write the equation of a hyperbola with center (h, k). **P.4C** the student is expected to represent angles in radians or degrees based on the concept of rotation and find the measure of reference angles and angles in standard position.