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GREAT MINDS™

EUREKA MATH²®

Getting Started Guide

Level 8 Module 2

Getting *Started*

This Getting Started Guide provides contextual information as you review *Eureka Math²®*. Follow along as we explore the contents of the *Teach, Learn,* and *Apply* books. The guide also highlights some **key components of the digital experience** that are seamlessly integrated into *Eureka Math²*.

Exponentially *More*

Eureka Math® revolutionized math teaching in the United States. The curriculum has helped students understand the *why* behind the math, not just the *how.* It has become the most widely used K–5 math curriculum in the country—so why would we change it? Because we listened to feedback from our dedicated team of *Eureka Math* teachers throughout the country and studied the findings of current educational research. Armed with this knowledge, we decided to expand the accessibility and efficacy of our materials so that even more students can achieve greatness in math.

Eureka Math² is exponentially more efficient. Exponentially more engaging. Exponentially more accessible. And this adds up to exponentially more knowledge and joy for students and teachers alike.

Teachability² + Engagement² + Accessibility² = Joy²

Thinking and Talking *About Math*

The teacher–writers who crafted *Eureka Math²* realize the value of student discourse. Starting in kindergarten, *Eureka Math²* students engage with the teacher and with one another to make their thinking visible. Students work in pairs and in groups as they engage in a variety of instructional routines and participate in whole class discussions to explore mathematical ideas. The Talking Tool, detailed on the inside cover of every *Learn* book, provides sentence frames and sentence starters to help guide student discourse.

Similar to the Talking Tool, the Thinking Tool, on the inside back cover of the *Learn* book, is a scaffold to support students in developing and applying metacognitive skills. It provides a set of questions students can ask themselves before, during, and after engaging in a task.

Thinking and talking about math helps students develop a deeper understanding of the topics they learn. These activities are key factors in creating an equitable classroom culture—and in helping students find the joy in mathematics.

How Students *Build Knowledge*

Eureka Math² is organized into three coherent stories that build from year to year: *A Story of Units*® for Grade Levels K–5, *A Story of Ratios*® for Grade Levels 6–8, and *A Story of Functions*® for Grade Levels 9–12.

Each grade level is organized into six modules. Within each module, related lessons are organized into topics.

A close look at the module map reveals that the major work of the grade level is delivered earlier in the school year. This allows students to have ample opportunities to establish strong foundational knowledge. *Eureka Math²* reinforces this knowledge later in the year by connecting supporting content to major grade-level work and providing students with real-world context.

Implement with Fidelity and *Confidence*

The same team of teacher–writers who crafted *Eureka Math²* also developed an Implementation Guide to help educators bring the curriculum into their classrooms. The guide provides a detailed map of the resources built into the curriculum and offers advice on preparing to teach each module. **Access the full Grade Level 6–Algebra I/Mathematics I Implementation Guide**.

Below we'll highlight some of the information covered in the Implementation Guide to help you explore *Eureka Math²* Level 8 Module 2.

An Intentional and Meaningful Integration *of Digital Learning*

The *Eureka Math²* writers strategically integrated digital components within Grade Levels 6–Algebra I/Mathematics I lessons so that technology enhances instruction and facilitates powerful mathematical conversations. The curriculum's digital platform includes teacher facilitation slides that display lesson visuals such as mathematical representations, images, videos, or digital interactives. Context videos that show an application of the module's math in real-life scenarios are integrated into the curriculum.

In addition to the wordless context videos and animations, Level 8 incorporates dynamic digital lessons with the *Learn* content about once per topic. These lessons allow students to explore further on their own devices by building mathematical models, documenting their thinking, and sharing within the mathematical community. Digital lessons are meant to be semi-synchronous, meaning students can experiment and reflect on their own and with peers before discussing as a class. As students are documenting their thinking on the presentation slides, teachers can preview student responses on their own devices. Teachers can then display chosen student screens to help facilitate class discussion.

Eureka Math² Equip™, a companion product to *Eureka Math²*, is a digital diagnostic tool that offers a Pre-Module Assessment for every student. It identifies learning gaps and provides grade-level content.

Access the Great Minds Digital Platform to review *Eureka Math²* assessments, digital interactives, context videos, and more.

Bringing Fine Art *into Math*

Among all math curricula, *Eureka Math²* is unique in its integration of fine art. The cover of each module features an impressive work of fine art that is visually or conceptually connected to the math. Level 8 features the painting *Pan North IV* by Al Held, and a note on the inside cover helps students understand how the artwork is connected to the math they will learn.

A Map to the *Learning*

Every *Teach* book begins with an Overview. In Level 8 Module 2 , the Overview begins on page 2. The Overview notes any previous knowledge students use and build upon in the module, summarizes the student learning taking place in each topic in the module, and shows where in the curriculum students will next access the module's learning to build new layers of understanding and more complex knowledge.

Following the Overview is the Why section. The Why section gives insight into the decisions made during the writing of the module, helping you understand the underlying structure of the module, the flow of the content, and the coherence of the different parts of the curriculum.

What Does Understanding *Look Like?*

Beginning on page 8, the *Teach* book highlights the Achievement Descriptors addressed in the module. Achievement Descriptors are clear, concise, standards-aligned descriptions that detail what students should know and be able to do based on the instruction. The first page of each lesson identifies the Achievement Descriptors aligned with that lesson. Proficiency Indicators for each Achievement Descriptor support teachers with interpreting student work in the module. The Proficiency Indicators begin on page 414 in the Level 8 Module 2 *Teach* book.

History *of the Math*

Math Past is another way that *Eureka Math²* helps students build knowledge—by telling the history of some of the big ideas that shape the mathematics in the module. Math Past frames mathematics as a human endeavor by telling the story of the discipline through artifacts, discoveries, and other contributions from cultures around the world. Math Past provides material that can inform your teaching and offers lesson-specific ideas about how to engage students in the history of mathematics. The Math Past summary for Level 8 Module 2 begins on page 428 of the *Teach* book.

Math Past

Reflections on Navajo Weaving

When did the Navajo begin weaving?
How are Navajo weavings produced?
What geometric shapes are in Navajo weavings?

Ask your students what geometric shapes they see in the natural world. Responses might include pyramids (mountains), circles or ovals (lakes), cones (evergreen trees), spheres (pebbles), or just straight lines (rivers). An artist who wishes to capture the geometry in nature has only to look around for inspiration.

The American Indians known as the Navajo are such artists. The Navajo people, or Diné, see beauty, harmony, and order in the geometry around them and weave those designs into clothing, blankets, and rugs. Navajo weavers, who are almost all women, must have a keen eye and a good sense of mathematics to execute the intricate designs that exist only in their minds. There are no drawings or written blueprints.

The Navajo have been weaving since the 1700s. Sadly, very few of their earliest textiles have been preserved.

The image shows a folded Chief Blanket, made in about 1840. These blankets are so named because they were quite expensive. Only a chief could afford one!

First phase Chief Blankets (1700–1840s) such as the one pictured feature wool from a type of sheep called a Churro. The stripes on the blankets come in the natural white of the wool as well as stripes dyed brown, indigo, or red.

The Chief Blanket, when unfolded, reveals much symmetry. Ask your students how they could fold the blanket so identical patterns are placed on top of one another. For example, the top edge can be folded down in two different ways. How might students describe those folds in terms of rigid motions?

What about folding the blanket right to left? Ask students how many ways the right edge can fold over such that the patterns coincide. Is there just one way? Suggest that there are infinitely many ways!

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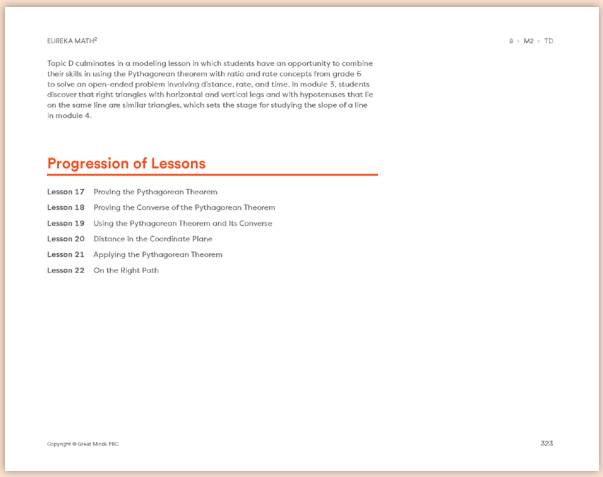
Dive into a *Topic*

It's time to dive into a topic to better understand the *Eureka Math²* learning design. On page 322 in Level 8 Module 2, we begin Topic D: Congruent Figures and the Pythagorean Theorem. Every topic begins with an overview that summarizes the development expected as students engage with the upcoming content. In the Topic D overview, the teacher can see that students use rigid motions and congruence as a basis to explore and explain a formal proof of the Pythagorean theorem. Throughout the topic, students use the Pythagorean theorem to find any unknown side lengths of right triangles in a variety of situations and problem types. There is also a brief Progression of Lessons list on page 323.

Students begin each new topic in the *Learn* book with a Topic Opener, an illustration created in collaboration with Ben Orlin of Math with Bad Drawings. The Topic Opener is designed to build anticipation for the upcoming math by piquing curiosity in a humorous context. In Level 8 Module 2, the Topic Opener starts on page 267 of the *Learn* book.



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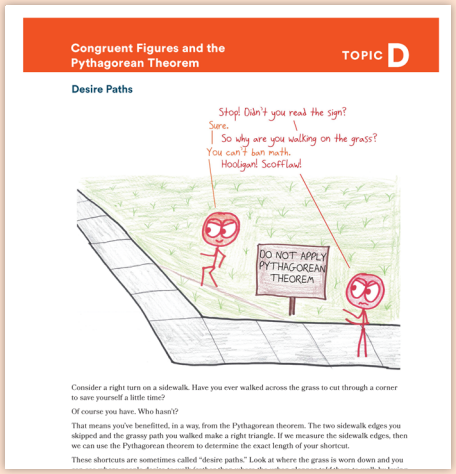
Topic D culminates in a modeling lesson in which students have an opportunity to combine their skills in using the Pythagorean theorem with ratio and rate concepts from grade 6 to solve an open-ended problem involving distance, rate, and time. In module 3, students discover that right triangles with horizontal and vertical legs and with hypotenuses that lie on the same line are similar triangles, which sets the stage for studying the slope of a line in module 4.

Progression of Lessons

Lesson 17 Proving the Pythagorean Theorem
Lesson 18 Proving the Converse of the Pythagorean Theorem
Lesson 19 Using the Pythagorean Theorem and Its Converse
Lesson 20 Distance in the Coordinate Plane
Lesson 21 Applying the Pythagorean Theorem
Lesson 22 On the Right Path



Congruent Figures and the Pythagorean Theorem

TOPIC D

Desire Paths

Consider a right turn on a sidewalk. Have you ever walked across the grass to cut through a corner to save yourself a little time?

Of course you have. Who hasn't?

That means you've benefitted, in a way, from the Pythagorean theorem. The two sidewalk edges you skipped and the grassy path you walked make a right triangle. If we measure the sidewalk edges, then we can use the Pythagorean theorem to determine the exact length of your shortcut.

These shortcuts are sometimes called "desire paths." Look at where the grass is worn down and you

Lesson Structure *and Support*

Every lesson in Grade Levels 6–Algebra I/Mathematics I is organized into four sections, providing the teacher with a clear lesson plan for the day's learning.

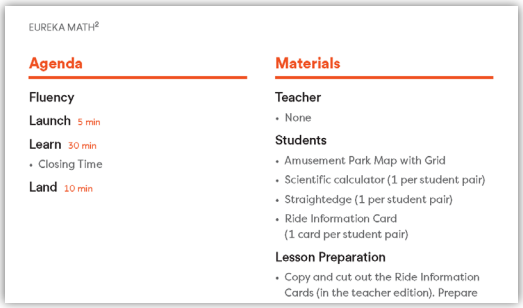
- **Fluency** opens each lesson and provides distributed practice with previously learned material. This practice prepares students for new learning by activating prior knowledge and bridging small learning gaps.
- **Launch** creates an accessible entry point to the day's learning with activities that build context and create productive struggle, which helps build new knowledge.
- **Learn** presents new math concepts related to the lesson objective, usually through a series of instructional segments.
- **Land** provides time for teachers to facilitate a brief closing discussion and for students to complete the Exit Ticket.

Throughout the lesson, margin notes provide information about facilitation, differentiation, and coherence. The curriculum has six types of margin notes: Teacher Notes, Universal Design for Learning, Language Support, Differentiation, Promoting the Standards for Mathematical Practice, and Math Past.

Dive into a *Lesson*

The lesson overview on page 398 helps teachers prepare to teach Grade Level 8 Module 2 Lesson 22.

- The **Lesson at a Glance** is a snapshot of the lesson framed through what students should know, understand, and do while engaging with the lesson.
- The **Key Question** helps focus instruction and classroom discourse.
- The **Achievement Descriptors** appear again, this time mapping what students should know and be able to do based on the instruction of the specific lesson to the standards covered.
- An image of the **Exit Ticket** from the end of the lesson shows what this formative assessment includes.



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Agenda

Fluency

Launch 5 min

Learn 30 min

- Closing Time

Land 10 min

Materials

Teacher

- None

Students

- Amusement Park Map with Grid
- Scientific calculator (1 per student pair)
- Straightedge (1 per student pair)
- Ride Information Card (1 card per student pair)

Lesson Preparation

- Copy and cut out the Ride Information Cards (in the teacher edition). Prepare

Page 399 lays out the learning agenda as well as the materials list and lesson preparation notes. These are all shared up front to help teachers feel organized and ready for the lesson from the start.

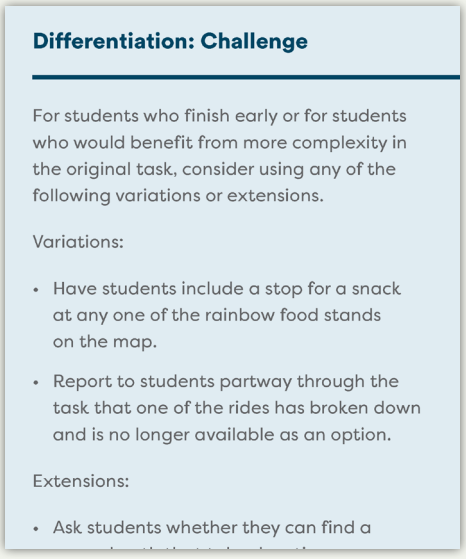
During the Lesson 22 Fluency exercise on page 400, students convert units to prepare for modeling a situation involving distance, rate, and time.

In Launch, students analyze a map in preparation for a modeling task.

In Learn, students watch the Closing Time video to introduce the task. Each video in our *Eureka Math²* digital experience has been crafted with special care to ensure representation of students from different backgrounds and with different abilities. These videos do not include spoken words because we want to make them accessible to multilingual learners and striving readers and keep the focus on the math story instead of the dialogue.

Students engage in an open-ended modeling exploration. Students work in pairs to relate the distance between two points on a grid, rate, and time to determine how many rides they can ride at an amusement park in a specified time frame.

Students explore with a partner to find a path that optimizes their time and ride choices. Before students begin this work, teachers should note the teacher margin note provided on page 404 that offers differentiation ideas for students who need additional challenge.



Differentiation: Challenge

For students who finish early or for students who would benefit from more complexity in the original task, consider using any of the following variations or extensions.

Variations:

- Have students include a stop for a snack at any one of the rainbow food stands on the map.
- Report to students partway through the task that one of the rides has broken down and is no longer available as an option.

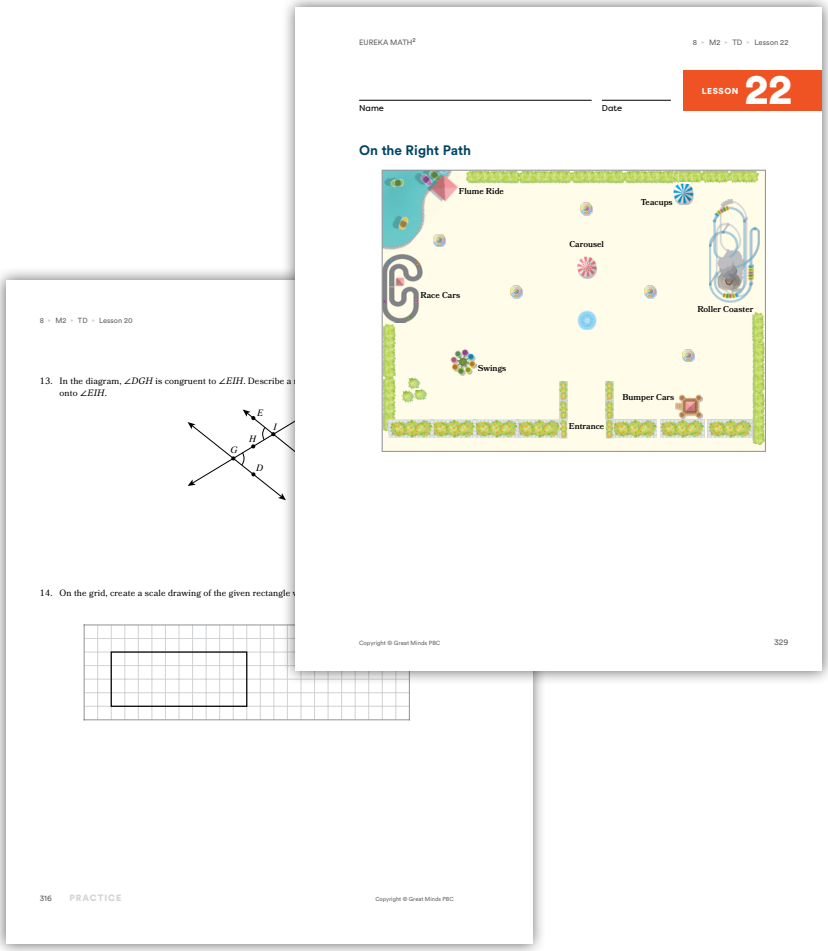
Extensions:

- Ask students whether they can find a

The Student Experience: *Learn*

On page 329 of the *Learn* book, students begin the Launch portion of the lesson. Notice the Lesson 22 heading in the top corner of the page that indicates the beginning of a lesson.

Let's look at readability. You will notice that the student materials are intentionally designed to be readable while maintaining the rigor that you've come to expect from Great Minds curricula. We have reduced wordiness—eliminating unnecessary wording entirely—and we have been intentional in our language choices and sentence length.



EUREKA MATH² 8 • M2 • TD • Lesson 22

Name _____ Date _____

LESSON 22

On the Right Path

 329

8 • M2 • TD • Lesson 20

13. In the diagram, $\angle DGH$ is congruent to $\angle EIH$. Describe a
onto $\angle EIH$.

14. On the grid, create a scale drawing of the given rectangle

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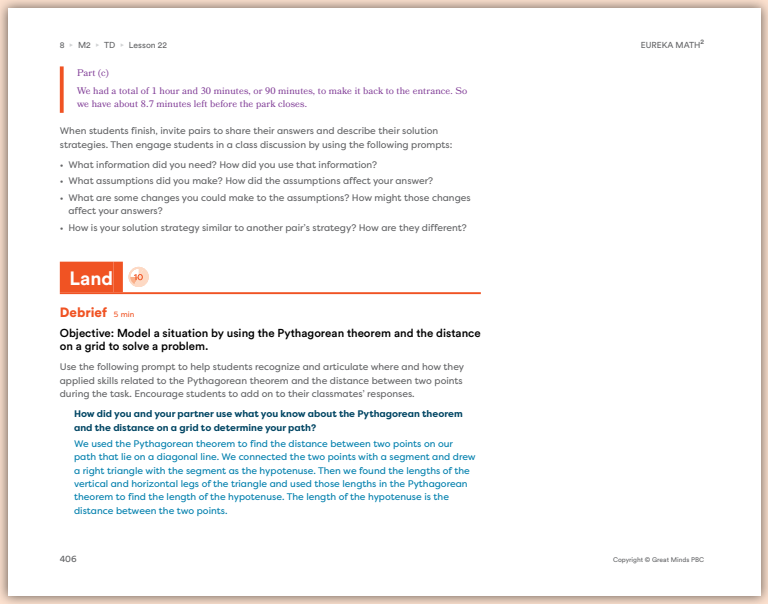

8 • M2 • TD • Lesson 22 EUREKA MATH²

Part (c)

We had a total of 1 hour and 30 minutes, or 90 minutes, to make it back to the entrance. So we have about 8.7 minutes left before the park closes.

When students finish, invite pairs to share their answers and describe their solution strategies. Then engage students in a class discussion by using the following prompts:

- What information did you need? How did you use that information?
- What assumptions did you make? How did the assumptions affect your answer?
- What are some changes you could make to the assumptions? How might those changes affect your answers?
- How is your solution strategy similar to another pair's strategy? How are they different?

Land 10

Debrief 5 min

Objective: Model a situation by using the Pythagorean theorem and the distance on a grid to solve a problem.

Use the following prompt to help students recognize and articulate where and how they applied skills related to the Pythagorean theorem and the distance between two points during the task. Encourage students to add on to their classmates' responses.

How did you and your partner use what you know about the Pythagorean theorem and the distance on a grid to determine your path?

We used the Pythagorean theorem to find the distance between two points on our path that lie on a diagonal line. We connected the two points with a segment and drew a right triangle with the segment as the hypotenuse. Then we found the lengths of the vertical and horizontal legs of the triangle and used those lengths in the Pythagorean theorem to find the length of the hypotenuse. The length of the hypotenuse is the distance between the two points.

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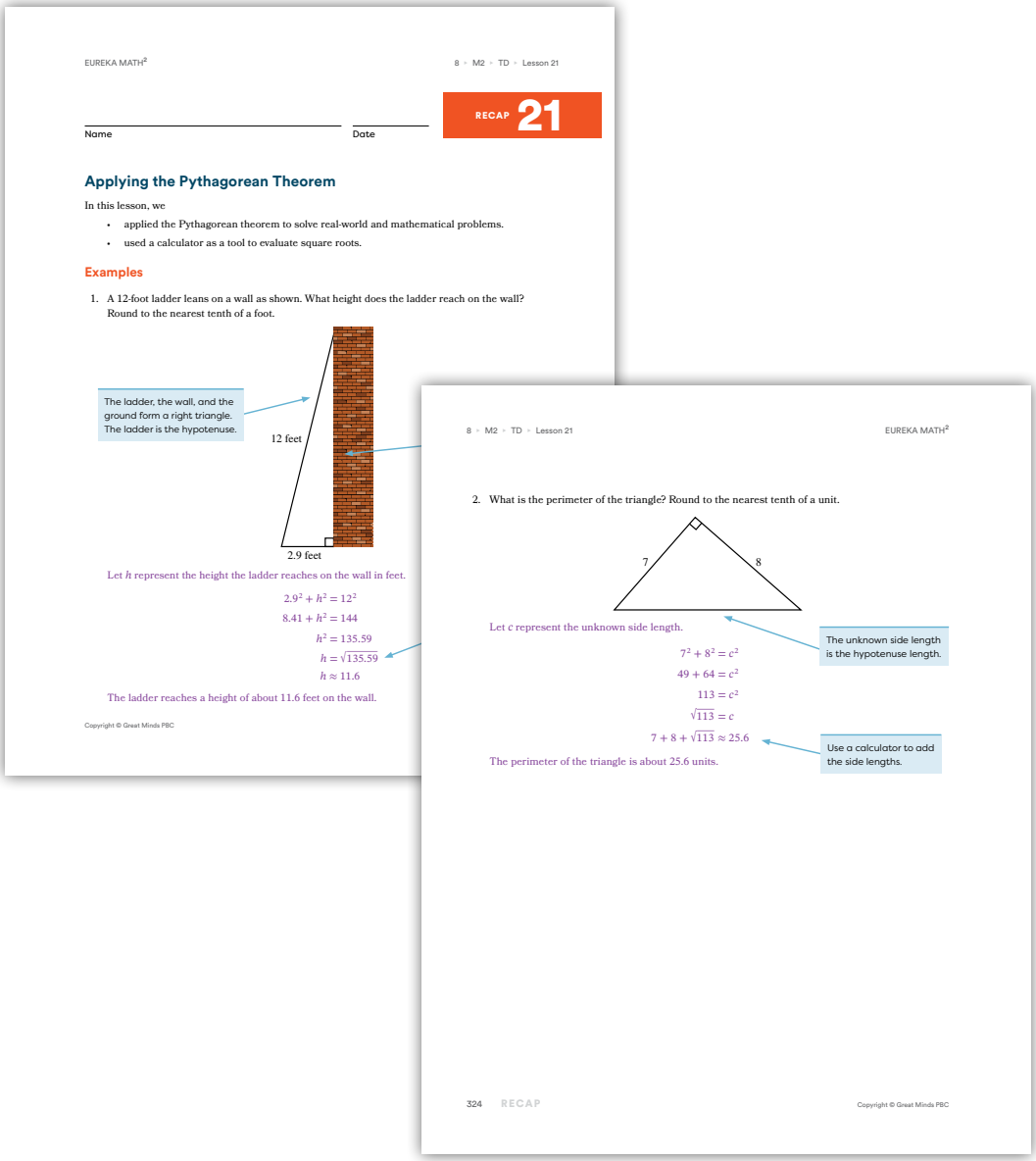
After students complete the problem-solving task with their partners, the class comes back together for the Land portion of the lesson. For Lesson 22, this section begins on page 406 of the *Teach* book. In this portion of the lesson, the teacher facilitates a discussion by using suggested questions related to the lesson's objectives and guides students to synthesize the day's learning. Following the discussion, students complete the Exit Ticket on page 335 of their *Learn* book. This gives teachers a sense of what students understand so they can help make instructional decisions for the next lesson.

Continued Practice *at Home*

Included at the end of each lesson in the *Learn* book is a lesson Recap and more Practice problems with the concepts learned in class.

- **Recaps** summarize the main learning in the lesson. Definitions of any terms introduced in the lesson are included. Each Recap also shows problems like those completed in class and examples of the thinking that helps students solve the problems. Recaps are useful for anyone supporting the student's learning outside of the classroom.
- **Practice** problems provide an additional set of problems organized from simple to complex. These problems interleave and distribute practice, providing students with opportunities to discern and recall which knowledge, concepts, and strategies are appropriate for solving different problems. Practice problems can be completed in the classroom or assigned outside of the classroom.



EUREKA MATH²

8 ▸ M2 ▸ TD ▸ Lesson 21

Name _____ Date _____

RECAP 21

Applying the Pythagorean Theorem

In this lesson, we

- applied the Pythagorean theorem to solve real-world and mathematical problems.
- used a calculator as a tool to evaluate square roots.

Examples

1. A 12-foot ladder leans on a wall as shown. What height does the ladder reach on the wall? Round to the nearest tenth of a foot.

The ladder, the wall, and the ground form a right triangle. The ladder is the hypotenuse.

12 feet

2.9 feet

Let h represent the height the ladder reaches on the wall in feet.

$2.9^2 + h^2 = 12^2$

$8.41 + h^2 = 144$

$h^2 = 135.59$

$h = \sqrt{135.59}$

$h \approx 11.6$

The ladder reaches a height of about 11.6 feet on the wall.

8 ▸ M2 ▸ TD ▸ Lesson 21 EUREKA MATH²

2. What is the perimeter of the triangle? Round to the nearest tenth of a unit.

7

8

Let c represent the unknown side length.

The unknown side length is the hypotenuse length.

$7^2 + 8^2 = c^2$

$49 + 64 = c^2$

$113 = c^2$

$\sqrt{113} = c$

$7 + 8 + \sqrt{113} \approx 25.6$

Use a calculator to add the side lengths.

The perimeter of the triangle is about 25.6 units.

Assessment with *Eureka Math²*

The assessment system for Grade Levels 6–Algebra I/Mathematics I helps teachers understand student learning by generating data from many perspectives. The system includes three components.

- **Exit Tickets** are formative assessment opportunities that use at least one problem or question to assess whether a student has learned the basic skills and concepts needed for success in upcoming lessons. Items reflect the minimum that students must demonstrate to meet the lesson objective.

  Students complete Exit Tickets independently on paper, with directions or problems read aloud as necessary, and they are not graded. Most students with a basic understanding of the math can finish within 3–5 minutes. Generally, teachers should strictly observe this time frame because a student's inability to finish within 5 minutes can be valuable proficiency information.

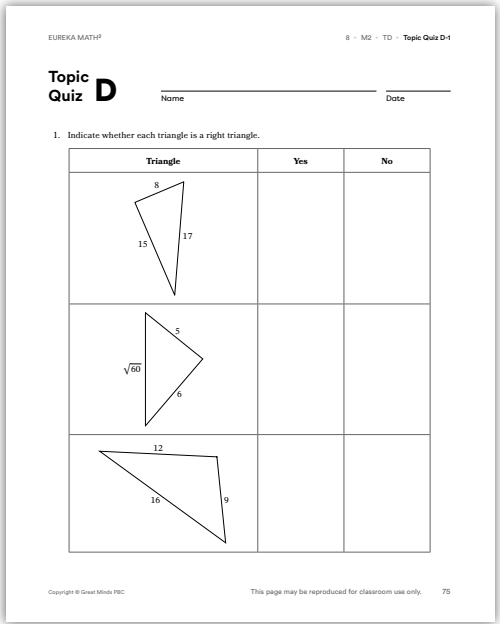
- **Topic Quizzes** are short sets of items that assess proficiency with the major concepts and skills from the topic. These include Depth of Knowledge (DOK) 1 and 2 items. Topic Quizzes are intended for digital administration, with a paper-based option.

  There are three analogous versions of each Topic Quiz available digitally. Analogous versions target the same material at the same level of cognitive complexity. Use the analogous versions as additional practice or retakes after targeted reteaching.

- **Module Assessments** consist of 6–10 items that assess proficiency in the major concepts, skills, and applications taught in the module. Module Assessments represent the most important content, but they may not assess all the strategies and standards taught in the module.

In addition to the assessments above, *Eureka Math² Equip* diagnostic assessments are available for print and digital administration.

Click to review the *Eureka Math²* assessments on the Great Minds Digital Platform.



EUREKA MATH² 8 › M2 › TD › Topic Quiz D-1

Topic Quiz **D**

Name _____ Date _____

1. Indicate whether each triangle is a right triangle.

Triangle	Yes	No
8, 15, 17		
$\sqrt{60}$, 5, 6		
12, 16, 9		

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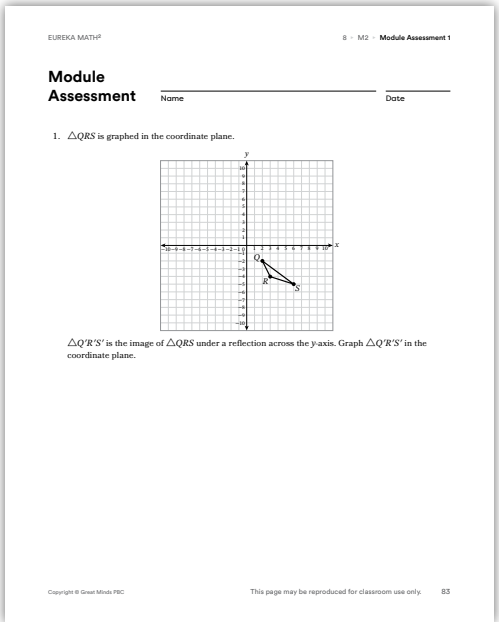

EUREKA MATH² 8 › M2 › Module Assessment 1

Module Assessment

Name _____ Date _____

1. $\triangle QRS$ is graphed in the coordinate plane.

$\triangle Q'R'S'$ is the image of $\triangle QRS$ under a reflection across the y-axis. Graph $\triangle Q'R'S'$ in the coordinate plane.

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Raising the Bar to the *Second Power*

In the world of math curricula, *Eureka Math²* stands alone. Our curriculum invites student discourse, provides accessibility, and advances equity. Its combination of digital and print resources helps *all* students build a strong foundation of mathematical knowledge that they will build upon, module after module and year after year.

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