

# Preparation Notes

Please review and customize this deck to prepare it for use. Some notes:

- These professional learning (PL) materials (slide deck and accompanying handout) are being offered in editable forms so that you may make adjustments to better support the specific work happening in your school or district.
- For the 2024–25 school year, student work samples are not provided for most sessions. The facilitator will need to collect or create student work samples when implementing these materials during 2024–25.
- These PL materials are designed to easily accommodate remote delivery:
  - A [Jamboard template](#) is provided to facilitate discussion of student work; the facilitator will need to make a copy of this and be ready to share the link with participants as noted in the deck.
  - Text that can be readily pasted (marked with “—”) into a video call chat feature is included when participants need to reference the handout.
  - There are placeholders for handout links to be shared with participants in the notes field of selected slides; the facilitator will need to add a link to the handout where indicated by “[insert link].”

# M155 Overview

**XQ Badge Project PL Series Baseline Session**

Month XX, XXXX

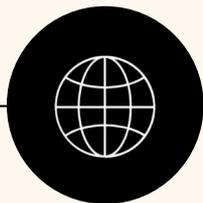


Welcome!

**Community Builder:**

Write a “tweet” in 140 characters or less to describe a moment/interaction that pushed your teaching practice. Get ready to share!

# Outcomes and Agenda



## Participants will be able to:

- Explain the content and practice expectations for the M155 badge
- Analyze tasks through the lenses of (1) content and practice expectations and (2) learning principles
- Analyze student work for evidence of learning

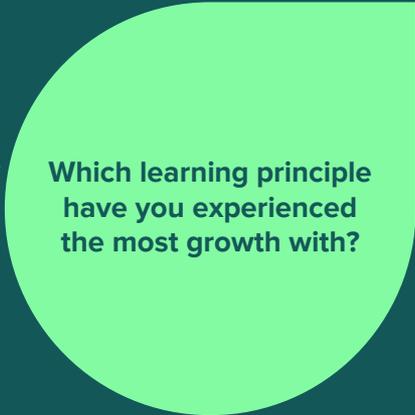


## Agenda:

- Task 1: Expectations and Learning Principles
- Task 1: Student Work
- Task 2: Expectations and Learning Principles
- Task 2: Student Work
- Closing

# Learning Principles

1. Engage with cognitively demanding tasks in heterogeneous settings.
2. Engage in social activities.
3. Build conceptual understanding through reasoning.
4. Have agency in their learning.
5. View mathematics as a human endeavor across centuries.
6. See mathematics as relevant.
7. Employ technology as a tool for problem-solving and understanding.



**Which learning principle  
have you experienced  
the most growth with?**

01

# Exploring the Content

## M155 Right Triangle Trigonometry

What comes to mind?  
What knowledge and skills  
should students learn to  
earn this badge?



Come off mute  
or put your  
thoughts in the  
chat!

# What's the Story of these Standards?

## Selected Common Core Standards for Mathematics High School - Geometry

### Define trigonometric ratios and solve problems involving right triangles

6. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
7. Explain and use the relationship between the sine and cosine of complementary angles.
8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. ★

**How would you synthesize these?  
What are the key takeaways  
for students?**

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**Share your thinking!**

# M155 Content and Practice Expectations (CPE)

155.a	Use similarity to explain the meaning of trigonometric ratios.
155.b	Explain and use the relationship between the sine and cosine of complementary angles.
155.c	Use trigonometric ratios to solve right triangles in applied problems.

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**What  
resonates with  
you?**

# M155 Content and Practice Expectations and Indicators

Content and Practice Expectations	Indicators Choose an artifact where you...
155.a: Use similarity to explain the meaning of trigonometric ratios.	i. measure side lengths and angles of multiple triangles and describe patterns you see
	ii. explain why trigonometric ratios remain the same for different-sized right triangles
155.b: Explain and use the relationship between the sine and cosine of complementary angles.	i. illustrate the relationship between the sine and cosine of complementary angles
	ii. use the relationship between the sine and cosine of complementary angles to solve problems

**What new  
insights do you  
have?**

# Let's Investigate

Choose at least one task to explore:

- Ask the Pilot
- Sine and Cosine of Complementary Angles

Which content and practice expectations are evident in each one?

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Choose at least one task to explore:

- Ask the Pilot
- Sine and Cosine of Complementary Angles

Which content and practice expectations are evident in each one?

Come off mute or put your thoughts in the chat! What did you find?

# What's the Same?

# What's Different?

1. How do these content and practice expectations align to ways you've taught this topic before?
2. How are they different?

**Come off mute  
or put your  
thoughts in the  
chat!**

# Inequity Is our Reality

“And by 2018, problems with the pipeline through math courses and tests were persisting. Despite the implementation of new state standards and tests, just 31 percent of students were meeting or exceeding standards in math, compared with 56 percent in English.” (Daro & Asturias, 2019)

Source: <https://justequations.org/resource/branching-out-designing-high-school-math-pathways-for-equity>

# We Must Lead the Movement

How can this approach give space for what math can be?

## Is math...?

- About getting one right answer, the teacher's way
- Irrelevant
- About doing procedures
- Independent work
- Something my teacher made up
- Formulaic

## Or could math be...?

- About using multiple strategies flexibly
- Connected to the real-world in ways that make sense
- About understanding and applying
- Collaborative work
- Lived across continents and centuries
- Novel, challenging problems

02

# Task 1: Expectations and Learning Principles

# Let's Do Some Math!

Right triangles have surfaced in previous work: slope, finding areas of complex shapes, and indirect measurement. In this task we will explore ratios of sides of right triangles in order to expand ways we can work with right triangles.

Use measurement tools or dynamic geometry software such as [GeoGebra](#) or [Desmos](#) to construct a right triangle  $ABC$ , with a right angle at B and a  $35^\circ$  angle at A.

Do the task as a student would. Jot down any reflections that you have as you do the math!

# Content and Practice Expectations

Right triangles have surfaced in previous work: slope, finding areas of complex shapes, and indirect measurement. In this task we will explore ratios of sides of right triangles in order to expand ways we can work with right triangles.

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Choose 1–2 Content and Practice Expectations that student work could give evidence of.

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**155.a:** Use similarity to explain the meaning of trigonometric ratios.

# Learning Principles

**In M155 Badge Title, students will employ the following learning principles:**

- Engage with cognitively demanding tasks in heterogeneous settings (LP 1).
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- View mathematics as a human endeavor across centuries (LP 5).
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**Which of these principles does this task lend itself to? Which ones can the task be easily adapted to accommodate?**

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**Share what  
you came up  
with!**

03

# Task 1: Student Work

# What is the impact of our labels?

“Undoing the harms of ability labeling is not just an issue of changing our language or implementing a standardized set of “best practices” or policies. It requires sustained action and ongoing learning at every level of our educational system, from individual classrooms to schools, school districts, universities, regions, states/provinces, and the nation. Many curricula, assessments, and instructional practices reproduce stratification—labeling students, their problem-solving strategies, and the learning opportunities they should receive on a scale from “remedial” to “sophisticated” (e.g., test score categories, systems for grouping students based on perceived ability, and strategies for sequencing student work for mathematical discussions).”

–National Council of Teachers of Mathematics

# Round 1: What do you notice?

## Jot down

- One thing you notice about each piece of student work.

Insert image of student work here

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**Come off mute  
and share what  
you saw!**

Insert image of student work here

# Criteria for Success

Conference and Provide Revision Support	Accept with Revision	Accept
<p>The student's artifact shows an emerging understanding of the expectations of the indicator(s). After conferencing and additional instruction/learning, the student may provide a revised or different artifact as evidence of the indicator(s).</p>	<p>The student's artifact is approaching a full understanding of the expectations of the indicator(s). The artifact may contain execution errors that should be corrected in revision. The student may revise the selected artifact or submit a different artifact.</p>	<p>The student's artifact demonstrates evidence that they have met the expectations of the indicator(s).</p>

**What resonates with you? What questions surface for you?**

# Humanizing Assessment

Intellect or knowledge is what we learn or understand about various topics, concepts, and paradigms. It is the understanding, enhancement, and exercising of mental powers and capacities that allow one to better understand and critique the world.

Source: Muhammad, Gholdy. *Cultivating Genius: An Equity Framework for Culturally and Historically Responsive Literacy*. Scholastic, 2021.

# Round 2: What evidence of learning is there?

**155.a: Use similarity to explain the meaning of trigonometric ratios**

## Let's examine some work together:

### **Conference and Provide Revision Support**

The student's artifact shows evidence of an emerging understanding of the expectations of the indicator(s). After conferencing and additional instruction/learning, the student may provide a revised or different artifact as evidence of the indicator(s).

### **Accept with Revision**

The student's artifact shows evidence of approaching a full understanding of the expectations of the indicator(s). The artifact may contain execution errors that should be corrected in revision. The student may revise the selected artifact or submit a different artifact.

### **Accept**

The student's artifact demonstrates evidence that they have met the expectations of the indicator(s).

# Examining Student Work

The image shows a digital workspace interface for reviewing student work. At the top, there are three tabs: "Conference and Provide Revision Support", "Accept with Revision", and "Accept". On the left side, there is a vertical toolbar with several icons: a pencil, an eraser, a mouse cursor, a document icon (highlighted with a red circle and a red arrow), a photo icon, a circle icon, a text box icon, and a scissors icon. In the center of the workspace, a large red callout bubble contains the text "Put your thoughts on the Jamboard!". In the bottom right corner, there is a red circular badge with the text "Work Sample 1".

# Example #1

insert image 1 of student work

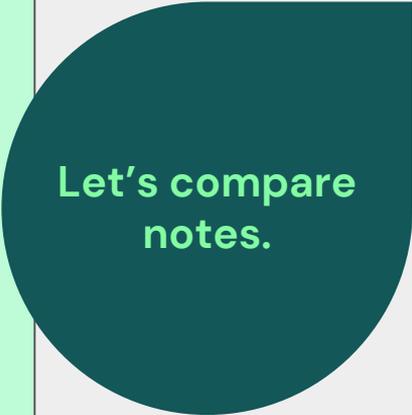
**Let's compare  
notes.**

# Example #2

insert image 2 of student work

**Let's compare  
notes.**

# Example #3

A dark teal rounded shape, resembling a teardrop or a semi-circle with a flat top, containing the text "Let's compare notes." in a light green font.

Let's compare  
notes.

insert image 3 of student work

# Three Key Components of the Math Badging System

- Content and Practice Expectations
- Learning Principles
- Criteria for Success

Which one excites you the most?

What one will have the greatest impact on students?

What questions surface for you?



**Come off  
mute or share in  
the chat!**

04

# Task 2: Expectations and Learning Principles

# Let's Do Some Math!

*Our phones offer tools that we can use to measure things without the use of traditional tools, like measuring tape or yard sticks. Today, you will determine the accuracy of such tools. You will need some classmates to work with, a cell phone, and access to a measuring app. This short article, [10 Best Measurement Apps for Android and iPhone](#), by Beebom offers some options.*

*Your task:*

- 1. Select an object to use for this task, consider a flagpole, bell tower, or basketball basket.*
- 2. Use a smartphone's measurement tool to measure the height of the object from at least three different angles.*
  - a. How do the measurements compare? If there is a difference in the heights, what do you think is causing it? Record your data and reflections for the differences you see?*
- 3. Determine the height of that object using more traditional techniques or research. How do the measurements from using the phone compare to the numbers you got from indirect measurement using traditional methods? How do your research findings compare to your research?*
- 4. Select other objects to go through this process.*
- 5. Based on your findings, how would you describe the accuracy of the smartphone's measurement app?*
- 6. Conduct some additional research to determine how these phone apps work, what recommendations do you have for changes or improvements?*

*Prepare to report your findings.*

**Do the task as a student would. Jot down any reflections that you have as you do the math!**

# Content and Practice Expectations

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**155.c: Use trigonometric ratios to solve right triangles in applied problems**

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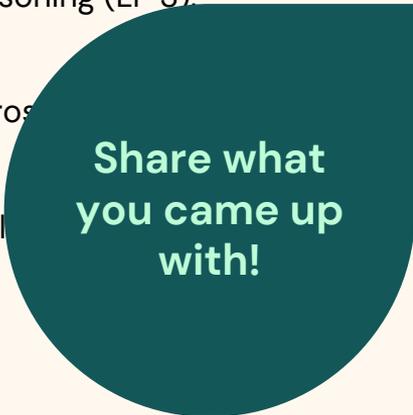
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05

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# Example #2

insert image 2 of student work

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# Example #3

insert image 3 of student work

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# Let's Hear Some Reflections

What kinds of support will students need to demonstrate evidence of learning?

Has your thinking changed at all on how to implement this task? If so, how?

**Come off  
mute or share in  
the chat!**

06

# Closing

# What Are Your Takeaways?

Choose one question to respond to:

1. Which content and practice expectation are you most excited about? Why?
2. Which learning principle are you most excited about connecting to M155 content? Why?
3. What impact do you think using a portfolio system will have on your students? Why?