

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].”

M152 Overview

XQ Badge Project PL Series Baseline Session

Month XX, XXXX

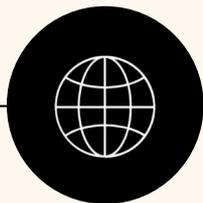


Welcome!

Community Builder:

Write a “tweet” in 140 characters or less to describe your teaching style in your first year. Get ready to share!

Outcomes and Agenda



Participants will be able to:

- Explain the content and practice expectations for the M152 badge
- Analyze tasks through the lenses of (1) content and practice expectations and (2) learning principles
- Analyze student work for evidence of learning

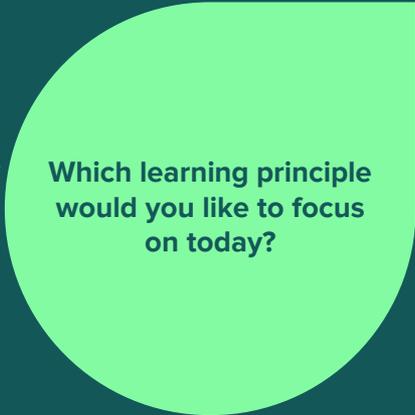


Agenda:

- Exploring the Content
- 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
would you like to focus
on today?**

01

Exploring the Content

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 – Congruence

Experiment with transformations in the plane

1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
2. Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).
3. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.

Understand congruence in terms of rigid motion

6. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
7. Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
8. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.

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

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Share your thinking!

M152 Content and Practice Expectations (CPE)

152.a	Use definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
152.b	Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using graph paper, tracing paper, geometry software, etc.
152.c	Specify a sequence of transformations that will carry a given figure onto another.
152.d	Given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
152.e	Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
152.f	Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.
152.g	Prove theorems about lines and angles.
152.h	Prove theorems about triangles.
152.i	Prove theorems about parallelograms.
152.j	Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.).

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**What
resonates with
you?**

M152 Content and Practice Expectations and Indicators

Content and Practice Expectations	Indicators Choose an artifact where you...
152.a: Use definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.	i. explain what a rotation, reflection, or translation is using appropriate terms: angle, circle, perpendicular line, parallel line, or line segment.
152.b: Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using tools such as graph paper, tracing paper, or geometry software.	i. create a rotated, reflected, and/or translated figure using graph paper, tracing paper, or geometry software.
	ii. explain how you rotated, reflected, and/or translated a figure.
152.c: Specify a sequence of transformations that will carry a given figure onto another.	i. describe a sequence of transformations that would carry a figure onto another figure.



**What new
insights do you
have?**

Let's Investigate

Choose at least one task to explore:

- Identifying Rotations
- Origami Equilateral Triangle

Which content and practice expectations are evident in each one?

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- Origami Equilateral Triangle

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

About

60%

of community college students and 40 percent of four-year students are placed into non-credit bearing developmental mathematics (Ganga et al., 2018)

Only

33%

of community college students complete the developmental math sequence. Only 20 percent complete a college-level math course over three years (Bailey, Jeong, & Cho, 2010).

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!

In the field of marketing, it is crucial to create a brand that stands out from the rest! Think about your favorite brand logos. What about those logos make them memorable?

One of the ways that companies capture their audience is through symmetry. Symmetrical patterns are said to give the human brain a sense of familiarity and order, making it easier to remember products. Take a moment to explore the article [Why Do We Get So Much Pleasure From Symmetry?](#) from the website howstuffworks to learn more.

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

Content and Practice Expectations

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152.a: Use definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.

Learning Principles

In M152 Badge Title, students will employ the following learning principles:

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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

To cultivate student voice, we must first feel a sense of agency as educators. We have to free our minds from the persistent narrative that test scores and even grades tell a legitimate story about our students' success. (Safir and Dugan, 2021, p. 135)

Source: Safir, Shane, and Jamila Dugan. *Street Data: A Next-Generation Model for Equity, Pedagogy, and School Transformation*. Corwin, 2021.

Round 2: What evidence of learning is there?

152.a: Use definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.

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.

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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 buttons: "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

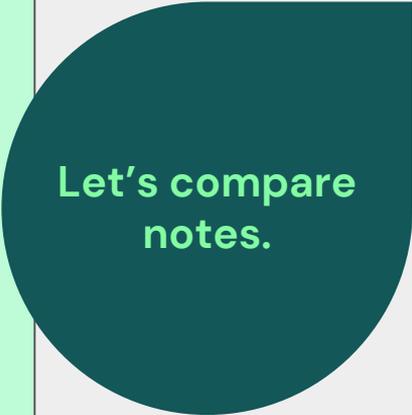
**Let's compare
notes.**

Example #2

insert image 2 of student work

**Let's compare
notes.**

Example #3

A dark teal rounded shape, resembling a semi-circle on the left side and a rounded rectangle on the right, 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!

Part 1: Mathematics in Art

Artists like Kiayani “Kay” Douglas use mathematics as they design their artwork. In this task you will have the opportunity to learn more about Ms. Douglas and her art, as well as time and space to create your own artwork using some of the mathematical ideas she shares with us, and specifically tessellations.

Watch this interview with Ms. Douglas about her Portraits Collection and the use of tessellations: <https://bit.ly/3Rh7tJM>.

1. What intrigued you about what Ms. Douglas shared? What questions did it surface for you?
2. What might you want to learn or explore further in preparation to create your own artwork?
3. What insights from Ms. Douglas’ video do you want to incorporate into your artwork?

Part 2: Create Your Own Artwork

In the video, we learned how Ms. Douglas designed the tessellations present in her portrait collection by working with a square. We also learned that working with tessellates and other tools, like ink and colored pencils, can be used to create images on that piece, much like Ms. Douglas’ outline of Africa and the power fist.

For this task you will explore and design a tessellating piece for your final work of art.

1. Select a polygon to base your template (tessellating piece) on: a square or other polygon (triangle, rectangle, hexagon).
2. Explore ways to modify the polygon to create a piece that tessellates.
3. Iterate your piece to create a sample tessellation using your template. What transformations are in play? What images can you see surfacing? What might you draw on it to create the image you want to share?
4. Repeat Steps 1-3 until you find the shape you will use as the template of the tessellating piece in your artwork.

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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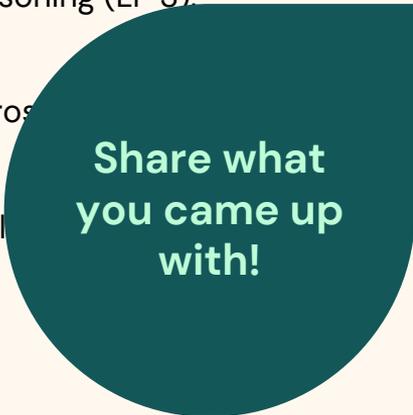
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insert image 1 of student work

**Let's compare
notes.**

Example #2

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notes.**

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 M152 content? Why?
3. What impact do you think using a portfolio system will have on your students? Why?