

# 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].”

# M153 Overview

**XQ Badge Project PL Series Baseline Session**

Month XX, XXXX

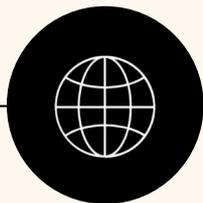


Welcome!

**Community Builder:**

Write a “tweet” in 140 characters or less to describe your school year so far. Get ready to share!

# Outcomes and Agenda



## Participants will be able to:

- Explain the content and practice expectations for the M153 badge
- Analyze tasks through the lenses of (1) content and practice expectations and (2) learning principles
- Analyze student work for evidence of learning

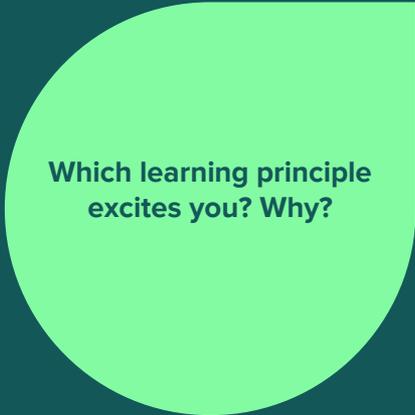


## Agenda:

- 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  
excites you? Why?**

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 – Similarity, Right Triangles, and Trigonometry**

### **Understand similarity in terms of similarity transformations**

1. Verify experimentally the properties of dilations given by a center and a scale factor:
  - a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.
  - b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.

### **Prove theorems involving similarity**

6. Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.
7. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

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

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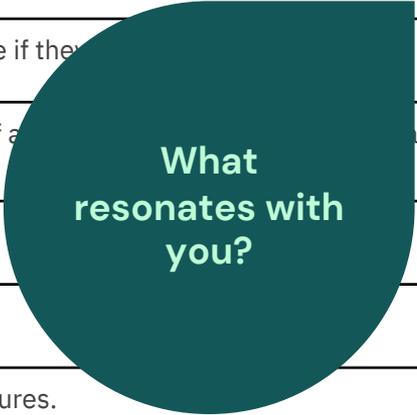
**Share your thinking!**

# M153 Content and Practice Expectations (CPE)

153.a	Given a geometric figure and a dilation, draw the transformed figure using tools such as graph paper, tracing paper, or geometry software.
153.b	Specify a sequence of transformations that will carry a given figure onto a similar figure.
153.c	Verify experimentally the properties of dilations given by a center and a scale factor.
153.d	Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar.
153.e	Explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.
153.f	Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
153.g	Use similarity to prove theorems about triangles.
153.h	Use similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

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What  
resonates with  
you?

# M153 Content and Practice Expectations and Indicators

<b>Content and Practice Expectations</b>	<b>Indicators</b> Choose an artifact where you...
153.a: Given a geometric figure and a dilation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software.	i. create a dilated figure using graph paper, tracing paper, or geometry software.
	ii. explain how you dilated a figure.
153.b: Specify a sequence of transformations that will carry a given figure onto a similar figure.	i. describe a sequence of transformations that would carry a figure onto a similar figure.
153.c: Verify experimentally the properties of dilations given by a center and a scale factor.	i. create a dilated figure using graph paper, tracing paper, or geometry software and describe the effect of dilations on line segments.
	ii. create a dilated figure using graph paper, tracing paper, or geometry software and describe the effect of dilations on angles.



What new insights do you have?

# Let's Investigate

Choose at least one task to explore:

- Bank Shot
- Dilating a Line

Which content and practice expectations are evident in each one?

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Choose at least one task to explore:

- Bank Shot
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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).

# 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...?

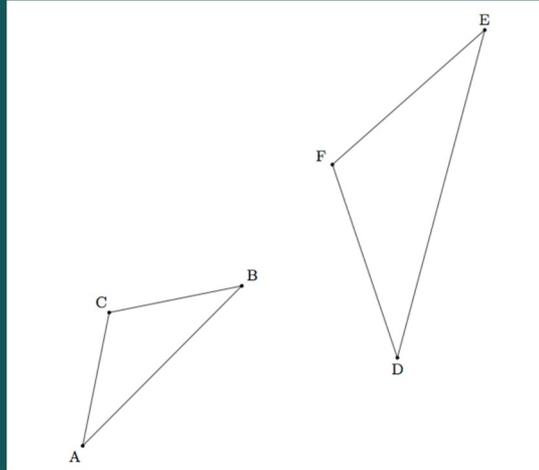
- About using multiple strategies flexibly
- Connected to the real-world in ways that make sense
- About understanding and applying
- Collaborative work
- Lived across continents and centuries
- Novel, challenging problems

02

# Task 1: Expectations and Learning Principles

# Let's Do Some Math!

In the two triangles pictured below,  $m(\angle A) = m(\angle D)$  and  $m(\angle B) = m(\angle E)$ :

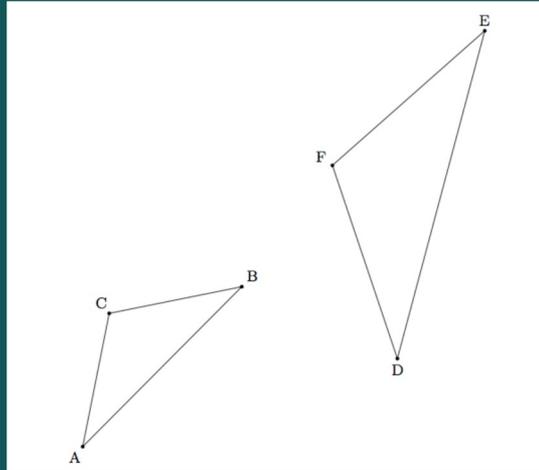


Using a sequence of translations, rotations, reflections, and/or dilations, show that  $\triangle ABC$  is similar to  $\triangle DEF$ .

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

# Content and Practice Expectations

In the two triangles pictured below,  $m(\angle A) = m(\angle D)$  and  $m(\angle B) = m(\angle E)$ :

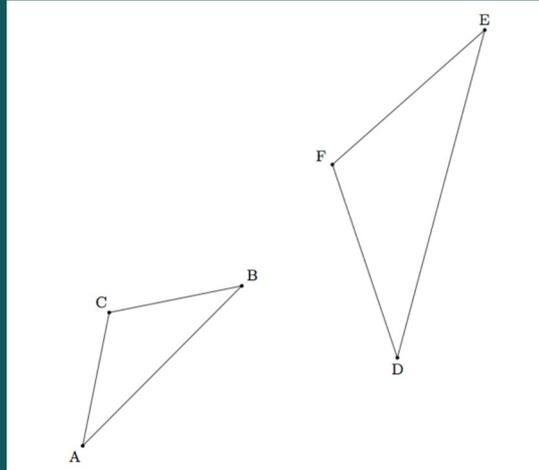


Using a sequence of translations, rotations, reflections, and/or dilations, show that  $\triangle ABC$  is similar to  $\triangle DEF$ .

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

# Content and Practice Expectations

In the two triangles pictured below,  $m(\angle A) = m(\angle D)$  and  $m(\angle B) = m(\angle E)$ :



Using a sequence of translations, rotations, reflections, and/or dilations, show that  $\triangle ABC$  is similar to  $\triangle DEF$ .

**153.b:** Specify a sequence of transformations that will carry a given figure onto a similar figure.

# Learning Principles

**In M153 Badge Title, students will employ the following learning principles:**

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

# Learning Principles

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

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

**Which of these principles does this task lend itself to? Which ones can the task be easily adapted to accommodate?**

# Learning Principles

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

- Engage with cognitively demanding tasks in heterogeneous settings (LP 1).
- Engage in social activities (LP 2).
- Build conceptual understanding through reasoning (LP 3).
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**Share what  
you came up  
with!**

03

# Task 1: Student Work

# What is the impact of our labels?

“Any kind of qualifier can be harmful because who we are is not static. Our abilities are constantly changing...I know if I was raised in this day and age, I would have been labeled a struggling reader. But what I know now is I was actually reading like a writer. I was reading slowly and deliberately and deconstructing language, not in the sense of looking up words in the dictionary, but understanding from context. I was constantly being compared to my sister who excelled, and it made me feel insecure. What gets translated is 'you are not as good,' and that gets translated into our whole bodies. That's where the danger lies.” – Jacqueline Woodson

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

**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

The best learning is driven by students' authentic questions– the kinds of wonderings that keep them up at night and light their cognitive fires. As an educator and instructional leader, you have the power to model relentless curiosity and the power of inquiry (Safir and Dugan, 2021, p. 112)

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?

**153.b: Specify a sequence of transformations that will carry a given figure onto a similar figure.**

## 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. 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, there is a large red callout bubble with the text "Put your thoughts on the Jamboard!". In the bottom right corner, there is a small red circle containing 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  
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# Example #3



**Let's compare  
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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?



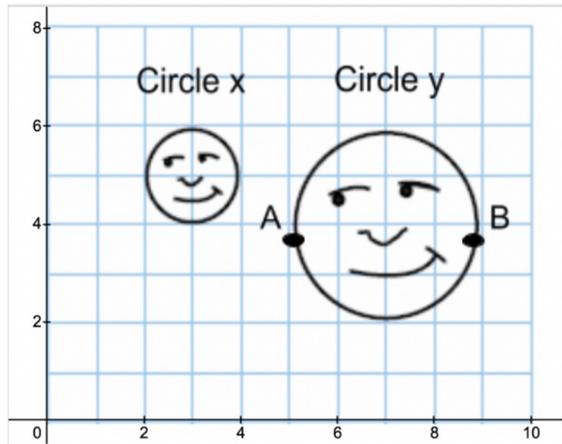
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04

# Task 2: Expectations and Learning Principles

# Let's Do Some Math!

The picture below depicts a dilation between Circle x and Circle y. A dilation is defined as, "A transformation that moves each point along the ray through the point emanating from a fixed center, and multiplies distances from the center by a common scale factor" ([Mathematics Glossary CCSS](#)).

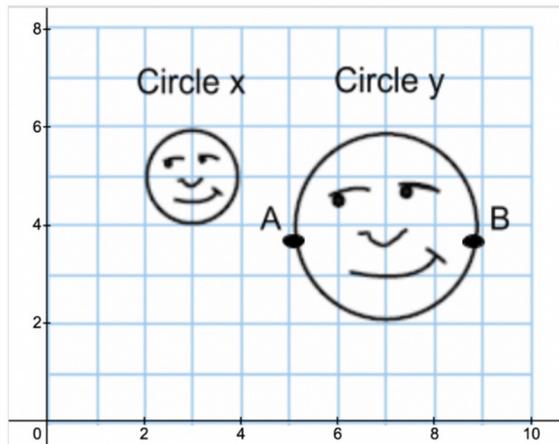


1. Given the position of the images, is Circle y a dilation from inside, on, or outside Circle x?
2. Determine the scale factor of the dilation to produce Circle y.
3. Use Geogebra to recreate the image online. Then, find the center of dilation from Circle x to Circle y.
4. Given a scale factor of 4, what is the set of coordinates of the image of points A and B? What was the center of the dilation that resulted in those coordinates? Would a different center of dilation result in the same coordinates you found? Why or why not?
5. Given a scale factor of  $1/4$ , explain how Circle y would change. Under what conditions would this happen?
6. Revisit the definition of a dilation: "A transformation that moves each point along the ray through the point emanating from a fixed center and multiplies distances from the center by a common scale factor." How did you use parts of the definition to respond to the questions above?

**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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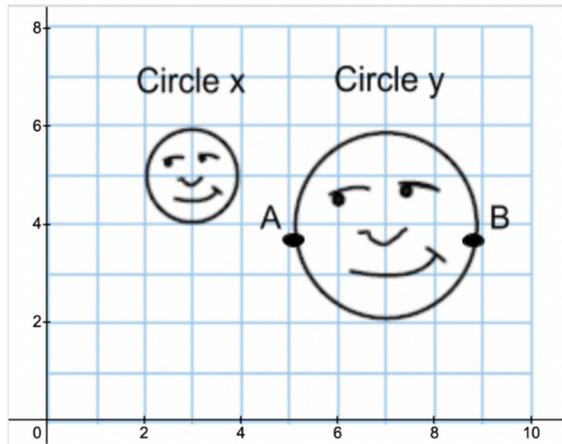
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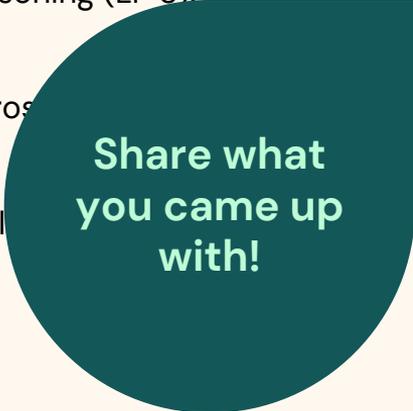
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05

# Task 2: Student Work

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Conference and Provide Revision Support

Accept with Revision

Accept

Put your thoughts on the Jamboard!

Work Sample 1

# Example #1

insert image 1 of student work

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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  
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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?