

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].”

M213 Overview

**XQ Badge Project PL Series Baseline
Session**

Month XX, XXXX

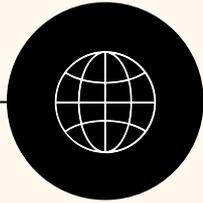


Community Building

In 140 character or less, what is your
“why” behind your work?

Use Google docs or Microsoft Word to check the character count.

Outcomes and Agenda



Participants will be able to:

- Explain the content and practice expectations for the M213 badge
- Analyze tasks through the lenses of (1) content and practice expectations and (2) learning principles
- Analyze student work for evidence of learning

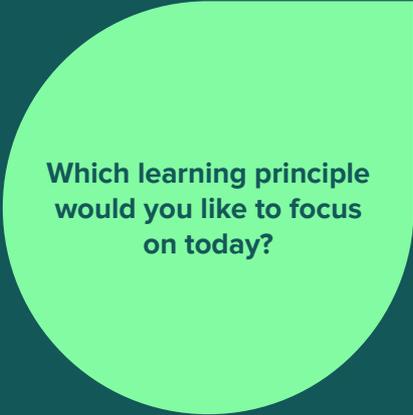


Agenda:

- 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 – Conditional Probability and Rules of Probability

Understand independence and conditional probability and use them to interpret data

1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”).
1. Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.

Use the rules of probability to compute probabilities of compound events in a uniform probability model

1. Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.
1. Apply the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$, and interpret the answer in terms of the model.

**How would you synthesize these?
What are the key takeaways
for students in 2–3 sentences?**

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Share your thinking!

M213 Content and Practice Expectations (CPE)

213.a	Understand that probability is a long run relative frequency.
213.b	Determine probabilities of single and multiple events using Bayesian reasoning.
213.c	Reason about the mathematical consequences of certain prior events.
213.d	Make likelihood predictions for discrete and continuous probability distributions.
213.e	Understand how sampling distributions, developed through simulation, are used to make likelihood predictions.

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**Put in the chat:
Which ideas
connect to
what your
group came up
with?**

M213 Content and Practice Expectations and Indicators

Content and Practice Expectations	Indicators Choose an artifact where you...
213.a: Understand that probability is a long run relative frequency.	i. describe probability contextually as a long run relative frequency and understand probabilistic implications for individual trials.
	ii. demonstrate understanding that probability is needed in the field of Data Science in order to provide guiding principles for obtaining information from data.
213.b: Determine probabilities of single and multiple events using Bayesian reasoning.	i. determine intersection probabilities using the conditional probability formula.
	ii. show and explain the correspondences across representations of compound probabilities (e.g., tree diagrams, two-way tables).

**What new
insights do you
have?**

Let's Investigate

Choose at least one task to explore:

- Cards and Independence
- False Positive Test Results

Which content and practice expectations are evident in each one?

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Choose at least one task to explore:

- Cards and Independence
- False Positive Test Results

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!

Explain to students that they are going to create a class playlist and identify the genre categories they are in. The goal is to represent four–six different genres in the class playlist in order to make the probabilities more meaningful and to create a program that isn't too unruly. Have students and a partner write a list of 10 of their favorite songs, including the title and artist, then identify the genre category for each song.

Once pairs have their lists of songs and genres, bring the class together. Ask them to share the genres in their list. Consider organizing this like a whip around with new ideas only: after the first pair shares their genres, have each pair share only new genres to add to the list. If there are more or less than four–six genres generated by the class, start a conversation with them about needing to consolidate or expand the list. Have pairs input their final 10 song choices into a Google Form (it can look like [this](#)). Generate the spreadsheet from the form and share a copy with the students.

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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213.e: Understand how sampling distributions, developed through simulation, are used to make likelihood predictions.

Learning Principles

In M213 Bayesian Reasoning and Probability Theory, 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).

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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 our impact of our words & actions?

“The way that you react to students’ unfinished, emergent, or inaccurate ideas is like a neon sign to your students indicating whether your classroom is a safe place to take intellectual risks.”

–Elham Kazemi & Allison Hintz

Round 1: What do you notice?

What do you notice?

- Jot down at least one thing you notice about this piece of student work.



**Come off
mute or
share in the
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Humanizing Assessment

To experience mastery, students must be able to show what they know in nontraditional ways. Pencil-and-paper tests not only trigger acute anxiety for many learners, they also lack the nuance and texture of street data. In reality, they are micro-versions of standardized tests that function like satellite data inside the classroom. *Why did the students solve the problem the way they did? How were they feeling when they took the test? What happened earlier that day or morning that may have impacted their performance?* With traditional assessments, we are left guessing (Safir and Dugan, 2021, p. 102)

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

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?

Round 2: What evidence of learning is there?

213.e: Understand how sampling distributions, developed through simulation, are used to make likelihood predictions.

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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Examining Student Work

The image shows a digital workspace for reviewing student work. At the top, there are three tabs: "Conference and Provide Revision Support", "Accept with Revision", and "Accept". On the left is a vertical toolbar with icons for editing, erasing, pointing, Jamboard, image insertion, erasing, and zooming. The "Jamboard" icon, which depicts a document with a pencil, is circled in green, and a large green arrow points from a central callout to it. The callout is a dark green rounded rectangle containing the text "Put your thoughts on the Jamboard!". In the bottom right corner, there is a circular label that reads "Work Sample 1".

Example #1



**Let's compare
notes.**

Example #2



**Let's compare
notes.**

Example #3



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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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the chat!**

04

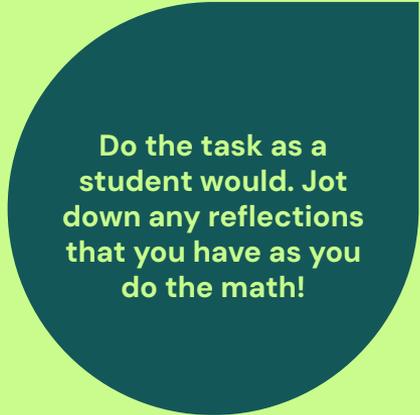
Task 2: Expectations and Learning Principles

Let's Do Some Math!

Invite students to share their noticings, wonderings, and questions. As a class, discuss:

- What do the marks on the weights tell us about gym goers' use of weights?
- If we were to make a histogram of the use of different weights, what do you think it would look like?

This data talk depicts how weight usage (as marked by the wear on the weights created by users missing inserting the pin, indicating higher usage) falls along a normal distribution. It is interesting to note that by looking at the wear and tear based on the number of pin misses, we are able to see a normal distribution curve.



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

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213.d: Make likelihood predictions for discrete and continuous probability distributions.

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

05

Task 2: Student Work

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Our goal: understand student thinking so we can help to move it forward!

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Notes**

Example #2

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Example #3



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06

Closing

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!**