

# 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].”

# M113 Overview

XQ Badge Project PL Series Baseline Session

1

Month XX, XXXX

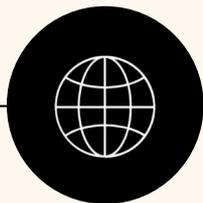


# Welcome!

## Joining Question:

- Please share your name, role, and where you're joining from.
- What do you do to “reset” during breaks from school?

# Outcomes and Agenda



## Participants will be able to:

- Explain the content and practice expectations for the M151 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

01

# Exploring the Content

# 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?**

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



Put your  
thoughts in the  
chat!

# What's the Story of these Standards?

## Selected Common Core Standards for Mathematics – Statistics and Probability

**Understand and evaluate random processes underlying statistical experiments.**

1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?

**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”).
2. 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.
3. Understand the conditional probability of  $A$  given  $B$  as  $P(A \text{ and } B)/P(B)$ , and interpret independence of  $A$  and  $B$  as saying that the conditional probability of  $A$  given  $B$  is the same as the probability of  $A$ , and the conditional probability of  $B$  given  $A$  is the same as the

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

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**Share your thinking!**

# M113 Content and Practice Expectations (CPE)

113.a	Engage in the modeling cycle.
113.b	Understand and evaluate random processes underlying statistical experiments.
113.c	Use a model to determine the probability of an event.
113.d	Use the rules of probability to compute probabilities of compound events.
113.e	Understand independence and conditional probability and use them for modeling.
113.f	Use probability to make decisions.

# M113 Content and Practice Expectations (CPE)

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113.f	Use probability to make decisions.

**What  
resonates with  
you?**

# M113 Content and Practice Expectations and Indicators

<b>Content and Practice Expectations</b>	<b>Indicators</b> <b>Choose an artifact where you...</b>
113.a: Engage in the modeling cycle.	i. engage with the full modeling cycle (problem, formulate, compute, interpret, validate, revise as necessary, report).
113.b: Understand and evaluate random processes underlying statistical experiments.	i. describe or use an experiment or simulation to generate frequencies for compound events.
	ii. decide if a specified model is consistent with results from a given data-generating process, e.g. using simulation.
	iii. make an inference about a population based on a random sample.



**What new insights do you have?**

# Let's Investigate

Choose at least one task to explore:

- Rain and Lightning
- Rolling Dice

Which content and practice expectations are evident in each one?



random.org is a  
good  
replacement  
for physical  
dice

# Let's Investigate

Choose at least one task to explore:

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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)

# 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 be math...?

- 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!

On April 15, 1912, the Titanic struck an iceberg and rapidly sank with only 710 of her 2,204 passengers and crew surviving. Some believe that the rescue procedures favored the wealthier first class passengers. Others believe that the survival rates can be explained by the "women and children first" policy. Data on survival of passengers are summarized in the table below. Investigate what might and might not be concluded from the given data.

	Survived	Did not survive	Total
Children in first class	4	1	5
Women in first class	139	4	143
Men in first class	58	118	176
Children in second class	22	0	22
Women in second class	83	12	95
Men in second class	13	154	167
Children in third class	30	50	80
Women in third class	91	88	179
Men in third class	60	390	450
Total passengers	500	817	1317

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

# Content and Practice Expectations

On April 15, 1912, the Titanic struck an iceberg and rapidly sank with only 710 of her 2,204 passengers and crew surviving. Some believe that the rescue procedures favored the wealthier first class passengers. Others believe that the survival rates can be explained by the "women and children first" policy. Data on survival of passengers are summarized in the table below. Investigate what might and might not be concluded from the given data.

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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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**113.e: Understand independence and conditional probability and use them for modeling.**

# Learning Principles

**In M113 Modeling with Probability, 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

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

**In M113 Modeling with Probability, students will employ the following learning principles:**

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# Learning Principles

Share what  
you came up  
with!

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03

# Task 1: Student Work

# What is the impact of our labels?

“The history of classifying people by intelligence and ability is inextricably intertwined with the eugenics movement and anti-egalitarian ideas, structures, and practices (Oakes et al., 1997). Given these roots, it should not be surprising that ability labels continue to be applied in ways that reflect and reproduce social hierarchies based on race, gender, dis/ability, language, and class (Martin 2009)...

This matters at the level of broad social organization (e.g., representation in STEM fields) and at the scale of individual students and their access to opportunities, resources, and identities as learners and doers of mathematics as valuable and valued members of our society.”

–National Council of Teachers of Mathematics

# Round 1: What do you notice?

## Jot down

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

On April 15, 1912, the Titanic struck an iceberg and rapidly sank with only 710 of her 2,204 passengers and crew surviving. Data on survival of passengers are summarized in the table on the board.

What do you notice?

I notice: More men from 3rd class survived than 1st, more from 1st than 3rd and 2nd, more from 3rd than 2nd, women and children who was definitely at play.

What do you wonder?

Where did the iceberg hit and how did it effect numbers? Did crew packing affect off and leaving people to die affect more than the other?

Do you think there is a relationship between class and survival rate? Justify your answer.

I actually don't think there was a huge relationship between class and survival rates, and I solely believe this based on the numbers and differences shown in that model. While more first class passengers did live compared to 2nd and 3rd class, 3rd class had higher number than 2nd and had more men survive than 1st class.

## Part 2:

What additional questions surface for you as a result of the work above?

Did the crew have incentive to save one class more than the other? What was the real crew to passenger survival rate? What are the survival ratios between the 3 classes? Did passengers fight for spots on the life boats?

What are your thoughts and feelings regarding what you have learned about travel in 1912?

Well my "thoughts" are that they were stupid you can't just claim a ship is "unsinkable" and not build and strengthen it in a way that would actually give it some validity. Along with that, how about we don't let drunk crew steer the boat.

Are there any current events you believe to have similar disparities as those seen in the survival rates of the Titanic? Work to formulate a plan for gathering data about this event and conduct an investigation to see what might or might not be concluded from that data. Record all thoughts and results here.

It's not exactly "current" but it is closer to current history than the sinking of the Titanic, and I think it's a pretty cool way to show how class differences could have effected it. The draft was called by b-day, but many got out of the draft due to "medical injuries" (padding people off and draft dodging). What I would attempted to find is the numbers of higher class citizens, middle class, and poor people who were drafted into the war. I would also try to look at the number of people from each class who were written out of the war.

Based on your analysis, what conclusions have you reached? What would you like to see happen?

Based on the were drafted vs. dodged the draft successfully, I'd like to see if class played a role on who did go and who was supposed to. Along with that, did people of certain classes have a more likely chance of tanking higher at a faster rate?

# Round 1: What do you notice?

## Jot down

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

Come off mute  
and share what  
you saw!

### Part 1:

On April 15, 1912, the Titanic struck an iceberg and rapidly sank with only 710 of her 2,204 passengers and crew surviving. Data on survival of passengers are summarized in the table on the board.

What do you notice?

- lots of men died
- in first class only 1 child survived
- total of 1317 passengers

What do you wonder?

- why doesn't the data match
- is crew included

Do you think there is a relationship between class and survival rate? Justify your answer.

- first class = better chance to survive.
- the lower the class the higher chances of not surviving

### Part 2:

What additional questions surface for you as a result of the work above?

- why did so many men die
- why did so many of third class children die?

What are your thoughts and feelings regarding what you have learned about travel in 1912?

- ships were a common way to travel across the ocean.

Are there any current events you believe to have similar disparities as those seen in the survival rates of the Titanic? Work to formulate a plan for gathering data about this event and conduct an investigation to see what might or might not be concluded from that data. Record all thoughts and results here.

- Natural Disasters
- Pandemics | COV-19
- Ship Accidents
- Work accidents

- Hurricane Ida (2021)
- caused damage + power outages
- lower income neighborhoods (New Orleans)
- up to 4 times more damage to homes compared to wealthier areas.
- poorer areas take longer to electricity restore

Based on your analysis, what conclusions have you reached? What would you like to see happen?

- money does affect survival rates
- being @/in a lower class have higher risks to die but everyone is still at risk to die

# Humanizing Assessment

Grading echoes the economic framework of testing, presuming that we can encapsulate learning in a number or a letter. Street data reminds us that our primary task as educators is to provide regular feedback to students so they can grow, not to evaluate them in order to anoint them academically capable or not.

(Safir and Dugan, 2021, p. 116)

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

# Criteria for Success

<b>Conference and Provide Revision Support</b>	<b>Accept with Revision</b>	<b>Accept</b>
<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?

**113.e: Understand  
independence and  
conditional probability and  
use them for modeling.**

## 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 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

On April 15, 1912, the Titanic struck an iceberg and rapidly sank with only 710 of her 2,204 passengers and crew surviving. Data on survival of passengers are summarized in the table on the board.

What do you notice?

I notice: More men from 3rd class survived than any other class. More from 1st than 3rd and 2nd, more from 3rd than 2nd, Women and children 1st was definitely a plus.

What do you wonder?

Where did the iceberg hit and how did it affect numbers? Did crew packing areas off and leaving people to die affect more than the other?

Do you think there is a relationship between class and survival rate? Justify your answer.

I actually don't think there was a huge relationship between class and survival rates, and I solely believe this based on the numbers and differences shown in that model. While more first class passengers did live compared to 2nd and 3rd class, 3rd class had higher number than 2nd and had more men survive than 1st class.

## Part 2:

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Based on your analysis, what conclusions have you reached? What would you like to see happen?

Based on the war drafted vs. dodged the draft successfully, I'd like to see if class played a role on who did go and who was supposed to. Along with that, did people of certain classes have a more likely chance of ranking higher at a faster rate?

Let's compare notes

# Example #2

## Part 1:

On April 15, 1912, the Titanic struck an iceberg and rapidly sank with only 710 of her 2,204 passengers and crew surviving. Data on survival of passengers are summarized in the table on the board.

<b>What do you notice?</b> There were 317 more people who didn't survive than who did survive. There weren't many kids who rook in first class. Children had the least deaths.	<b>What do you wonder?</b> Where were each of the classes on the ship?
<b>Do you think there is a relationship between class and survival rate? Justify your answer.</b> Yes because the first class women & children had the least deaths, and in every other class the men had the most deaths.	

## Part 2:

<b>What additional questions surface for you as a result of the work above?</b> How many workers survived and how many died?	<b>What are your thoughts and feelings regarding what you have learned about travel in 1912?</b> They didn't have productive ways to keep everyone safe.
<b>Are there any current events you believe to have similar disparities as those seen in the survival rates of the Titanic? Work to formulate a plan for gathering data about this event and conduct an investigation to see what might or might not be concluded from that data. Record all thoughts and results here.</b> 8 workers ← bridge 2 rescued 2 bodies recovered 4 presumed dead/missing Baltimore Bridge Collapse: A freight ship crashed into the Baltimore bridge of the 8 workers on the bridge, 2 survived.	
<b>Based on your analysis, what conclusions have you reached? What would you like to see happen?</b> I think that, based on my analysis, that the women and children were saved first and they did first class first and then went down by class. I think it was smart for them to save the kids first but they could have tried to save more people.	

Let's compare notes

# Example #3

Let's compare notes

## Titanic

### Part 1:

On April 15, 1912, the Titanic struck an iceberg and rapidly sank with only 710 of her 2,204 passengers and crew surviving. Data on survival of passengers are summarized in the table on the board.

What do you notice? - lots of men died - in first class only 1 child survived - total of 1317 passengers	What do you wonder? - why doesn't the data match - is crew included
Do you think there is a relationship between class and survival rate? Justify your answer. - first class = better chance to survive. - the lower the class the higher chances of not surviving	

### Part 2:

What additional questions surface for you as a result of the work above? - why did so many men die - why did so many of third class children die?	What are your thoughts and feelings regarding what you have learned about travel in 1912? - ships were a common way to travel across the ocean.
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Are there any current events you believe to have similar disparities as those seen in the survival rates of the Titanic? Work to formulate a plan for gathering data about this event and conduct an investigation to see what might or might not be concluded from that data. Record all thoughts and results here.

- Natural Disasters
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Based on your analysis, what conclusions have you reached? What would you like to see happen?

- money does affect survival rates
- being @ in a lower class have higher risks to die but everyone is still at risk to die

# 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!**

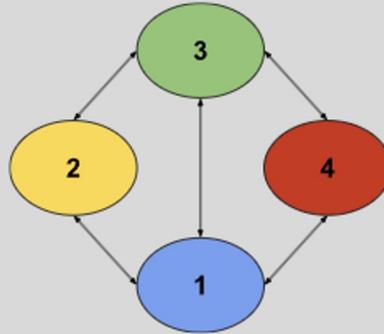
04

# Task 2: Expectations and Learning Principles

# Let's Do Some Math!

## Part 1: Random Walks

Let's begin by exploring how random walks work. Consider the following map with four points of interest.



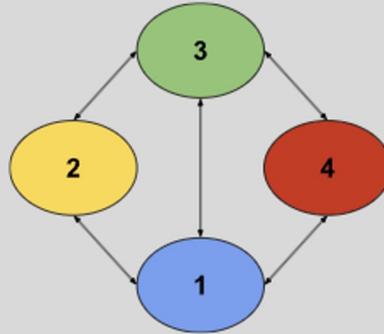
1. If someone starts at one of the points and randomly decides where to go next, what do you anticipate will happen? Make at least three predictions.
2. Design and carry out a simulation to test one of your predictions. Determine ways to quantify how often someone can end up at one of the points.
3. What did you learn from designing a simulation to test your predictions?
4. What do you anticipate the random walk phenomenon has to do with internet searches?

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

# Content and Practice Expectations

## Part 1: Random Walks

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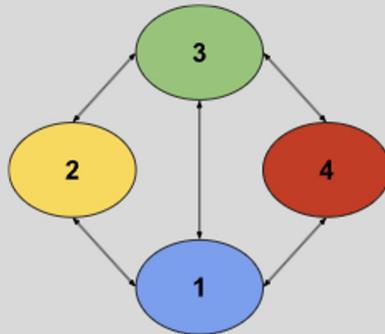
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Choose 1-2 Content and Practice Expectations that student work could give evidence of.

# Content and Practice Expectations

## Part 1: Random Walks

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113.b: Understand and evaluate random processes underlying statistical experiments.

# Learning Principles

**In M113 Modeling with Probability, 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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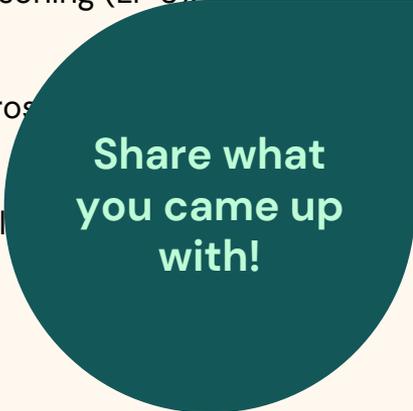
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**Which of these principles does this task lend itself to? Which ones can the task be easily adapted to accommodate?**

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- 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).



**Share what  
you came up  
with!**

05

# Task 2: Student Work

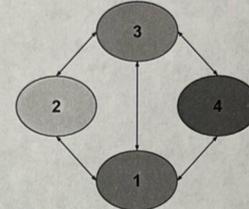
# Round 1: What do you notice?

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

In this task you will explore the connection between random walks and internet searches.

## Part 1: Random Walks

Let's begin by exploring how random walks work. Consider the following map with four points of interest.



1. If someone starts at one of the points and randomly decides where to go next, what do you anticipate will happen? Make at least three predictions.

- they will make lots of circles
- they will go back and forth
- they might never hit a point.

2. Design and carry out a simulation to test one of your predictions. Determine ways to quantify how often someone can end up at one of the points.

You can do 20 spins, and then see how many times you hit each point.

3. What did you learn from designing a simulation to test your predictions?

That you will hit every number more than one time and you will go back and forth a few times.

4. What do you anticipate the random walk phenomenon has to do with internet searches?

I think it has to do with internet searches because it is very random and you never really know what they are going to search up or what way you are going to turn on your walk.

# Round 1: What do you notice?

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

Come off mute and share what you saw!

2. Design and carry out a simulation to test one of your predictions. Determine ways to quantify whether or not we can visit all four locations each week.

You can't go to bear world after going to float use dice, depending where you're at the num. of sides changes

3. What did you learn from designing a simulation to test your predictions?

As difficult bc some places can only go to two places and others 3.

4. What do you anticipate the random plans phenomenon has to do with internet searches?

The internet takes what you put in and connects to related articles

Before you move on, you will need to watch a video.

1. What connections do you see between the work on Part 1: Random Walks and internet searches?

Links that connect articles to each other

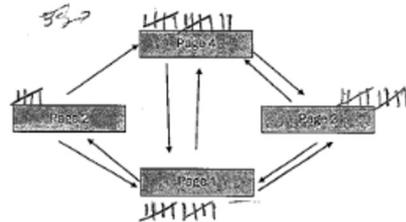
2. Let's examine how internet pages are ranked by building on what you've learned about random walks. To simplify things, let's consider an internet with four pages that have links to each other as illustrated in the diagram below.

- a. What do you notice about the relationships between the pages?

You can't backtrack to some of the pages

- b. How do you anticipate the pages will rank?

4  
1  
3  
2



3. Design and carry out a simulation to test your prediction. Based on the simulation, how do the pages rank? Does this surprise you? 4, 3, 1, 2

No, it doesn't surprise me.

- a. What is the relative frequency of visits to each page? What do these percentages mean?

Page	Frequency	Relative Frequency
1	27%	12/37
2	13%	3/37
3	27%	13/37
4	32%	12/37

4. In the video, we hear Akshaya explain how "spammers try to game the search algorithm." How might you modify the map above to illustrate how this works? Design a simulation as before and prepare to share your results.

Modify so the more a page is visited the more arrows it has pointing towards it

5. Based on your current understanding, what might explain why people have different experiences when they search the internet? What are your thoughts on this?

People got different results based on their past search history.

# What evidence of learning is there?

**113.b: Understand and evaluate random processes underlying statistical experiments.**

## 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".

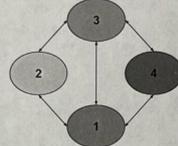
# Example #1

Let's norm our feedback

In this task you will explore the connection between random walks and internet searches.

## Part 1: Random Walks

Let's begin by exploring how random walks work. Consider the following map with four points of interest.



1. If someone starts at one of the points and randomly decides where to go next, what do you anticipate will happen? Make at least three predictions.

- they will make lots of circles
- they will go back and forth
- they might never hit a point.

2. Design and carry out a simulation to test one of your predictions. Determine ways to quantify how often someone can end up at one of the points.

You can do 20 spins and then see how many times you hit each point.

3. What did you learn from designing a simulation to test your predictions?

That you will hit every number more than one time and you will go back and forth a few times.

4. What do you anticipate the random walk phenomenon has to do with internet searches?

I think it has to do with internet searches because it is very random and you never really know what they are going to search up or what way you are going to turn on your walk.

## Part 2: Internet Searches

Watch this short video [The Internet: How Search Works](#) (Code.org., 2017)

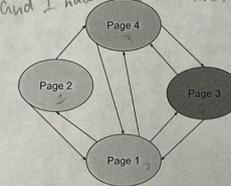
1. What connections do you see between the work on Part 1: Random Walks and internet searches?

That you will go back and forth a few times

2. Let's examine how internet pages are ranked by building on what you've learned about random walks. To simplify things, let's consider an internet with four pages that have links to each other as illustrated in the diagram below.

- a. What do you notice about the relationships between the pages? How do you anticipate the pages will rank?

Page 1 and 4 will rank the highest and then page 3 then 2.  
Page 4 and 1 have the most links going to them



3. Design and carry out a simulation to test your prediction. Based on the simulation, how do the pages rank? Does this surprise you?

It surprised me because out of 20 times, I didn't even hit 2 once

4. What is the relative frequency of visits to each page? What do these percentages mean?

$\frac{1}{20} = 0$      $\frac{1}{20} = 5\%$      $\frac{3}{20} = 15\%$     they mean what is the % that you will hit each number each time  
 $\frac{2}{20} = 10\%$      $\frac{2}{20} = 10\%$      $\frac{4}{20} = 20\%$

5. In the video, we hear Akshaya explain how "spammers try to game the search algorithm." How might you modify the map above to illustrate how this works? Design a simulation as before and prepare to share your results.

People might try to hack the system or search up wrong things

6. Based on your current understanding, what might explain why people have different experiences when they search the internet? What are your thoughts on this?

(adapted from Dr. Claudio Gómez-González, Carleton College)

they might search a word in the wrong placement or sentence so it differs the results.

# Example #2

Let's norm our feedback

2. Design and carry out a simulation to test one of your predictions. Determine ways to quantify whether or not we can visit all four locations each week.

You can't go to bear world after going to float. Use dice, depending where you're at the amn. of sides averages

3. What did you learn from designing a simulation to test your prediction?

It's difficult bc some places can only go to two places and others 3.

4. What do you anticipate the random plans phenomenon has to do with internet searches?

The internet takes what you put in and connects to related articles

Before you move on, you will need to watch a video.

1. What connections do you see between the work on Part I: Random Walks and internet searches?

Links that connect articles to each other

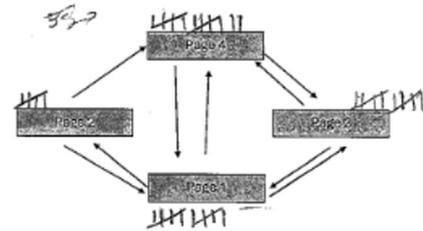
2. Let's examine how internet pages are ranked by building on what you've learned about random walks. To simplify things, let's consider an internet with four pages that have links to each other as illustrated in the diagram below.

- a. What do you notice about the relationships between the pages?

You can't backtrack to some of the pages

- b. How do you anticipate the pages will rank?

4  
3  
3  
2



3. Design and carry out a simulation to test your prediction. Based on the simulation, how do the pages rank? Does this surprise you? 4, 3, 1, 2

No, it doesn't surprise me.

- a. What is the relative frequency of visits to each page? What do these percentages mean?

Page	Frequency	Relative Frequency
1	27%	$\frac{12}{37}$
2	13%	$\frac{3}{37}$
3	27%	$\frac{13}{37}$
4	33%	$\frac{15}{37}$

4. In the video, we hear Akshaya explain how "spammers try to game the search algorithm." How might you modify the map above to illustrate how this works? Design a simulation as before and prepare to share your results. Modify so the more a page is visited the more arrows it has pointing towards it

5. Based on your current understanding, what might explain why people have different experiences when they search the internet? What are your thoughts on this?

People got different results based on their past search history.

# Example #3

Let's norm our feedback

2. Design and carry out a simulation to test one of your predictions. Determine ways to quantify whether or not we can visit all four locations each week.  
*zoo then aquarium work work*

3. What did you learn from designing a simulation to test your predictions?  
*It can't be completely random*

4. What do you anticipate the random plans phenomenon has to do with internet searches?  
*one thing leads to another making it not random*

Before you move on, you will need to watch a video.

1. What connections do you see between the work on Part 1: Random Walks and internet searches?

*spider web*

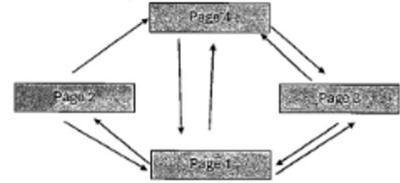
2. Let's examine how internet pages are ranked by building on what you've learned about random walks. To simplify things, let's consider an internet with four pages that have links to each other as illustrated in the diagram below.

a. What do you notice about the relationships between the pages?

*All of them have at least one thing in common so they can somehow connect*

b. How do you anticipate the pages will rank?

*most 4 1 3 4 1 2 3 4  
 3 3 4 3  
 1 4 3  
 least 2 2 2*



3. Design and carry out a simulation to test your prediction. Based on the simulation, how do the pages rank? Does this surprise you?

*yes*

a. What is the relative frequency of visits to each page? What do these percentages mean?

Page	Frequency	Relative Frequency
1	8	8/25 32%
2	6	6/25 24%
3	4	4/25 16%
4	7	7/25 28%

*25 100%*

4. In the video, we hear Akshaya explain how "spammers try to game the search algorithm." How might you modify the map above to illustrate how this works? Design a simulation as before and prepare to share your results.

*some have more access than others because of the ads*

5. Based on your current understanding, what might explain why people have different experiences when they search the internet? What are your thoughts on this?

*things get moved up the search engine*

# 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 M113 content? Why?
3. What impact do you think using a portfolio system will have on your students? Why?