

Math Practice 4: Model with Mathematics (Facilitation Guide)

Presenter:

Intended Use

This facilitation guide is intended to be used by educators when viewing the voice-over recording of Math Practice 4: Model with Mathematics. State Support Team staff, Educational Service Center consultants, districts, and schools are encouraged to use this resource as part of a professional learning series that covers all 8 of the Standards for Mathematical Practice.

Viewing the Math Practice series can be done in any order. While viewing the series is encouraged in groups, it can also be done individually. To get the full benefit of the professional development series, educators should engage in the tasks and participate in local discussions on Mathematical Practice. Therefore, viewing the professional learning series in small groups is encouraged over individuals watching it in isolation.

Reproducing the Facilitation Guide

If you make copies of any portion of this facilitation guide or accompanying PowerPoint presentation, please credit the Ohio Department of Education.

During Facilitation: Discussion Questions

Pause the recording at the times indicated in the recording and have discussions in smaller groups, and then in the larger group.

DISCUSSION QUESTIONS

PowerPoint Slide 16: Act 1 - A Guatemalan Sinkhole Activity

- What do you notice?
- What do you wonder?

Other potential discussion questions include:

- How much material will they need to fill the sinkhole?
- How much will it cost to fill the sinkhole?
- What events cause sinkholes?
- Why did it happen here instead of somewhere else?
- What are the land compositions that cause sinkholes?

DISCUSSION QUESTIONS

PowerPoint Slide 17: Act 2 - Estimate

- What do you know?
- What information do we need?
- Create a high estimate and a low estimate for the volume of this sinkhole.

DISCUSSION QUESTION

PowerPoint Slide 18: Act 2 - Create a Mathematical Model to Describe the Situation

- Create a model to describe the situation using the measurements given.

DISCUSSION QUESTIONS

PowerPoint Slide 20: Act 3 – Next Steps

- How could you revise your model to make it better?
- What new questions do you have?

DISCUSSION QUESTIONS

PowerPoint Slide 23: Kindergarten-Grade 2 Task

- Which shape does not belong in the group? Why?
- What makes each shape special or unique?

DISCUSSION QUESTIONS

PowerPoint Slide 24: Kindergarten-Grade 2 Tasks

- Include a model in your answer
 - Model the math in an expression such as $3 + 1$ or $27 - 15$.
 - 11 horses are in a field. 6 horses are black. The rest are brown. How many horses are brown?
 - Kelly was in line to buy lemonade. There were 3 people in front of her in the line. There were 2 people behind her in the line. How many people were waiting in line to buy lemonade?
- Use a model to answer a question (Reflect upon how the models will look different in each context)
 - Marcus has 3 apples. He picks 2 more apples. How many apples does Marcus have now?
 - Three apples are lying on the ground. Some more apples fell from the tree to the ground. There are now 5 apples lying on the ground. How many apples just fell from the tree?
 - Some apples were in a basket. Three more apples were added to the basket. There are five apples in the basket. How many apples were in the basket before?

DISCUSSION QUESTIONS

PowerPoint Slide 26: Grades 3-5 Tasks

- A school bus holds 36 students. If an entire school building has 1,128 students going on a field trip together, how many school buses are needed?
- How do you know? Explain your reasoning.

DISCUSSION QUESTIONS

PowerPoint Slide 27: Grades 3-5 Tasks

- Include a model in your answer
 - Model the math in an expression such as $3\frac{1}{4}$, $1230 + 570$, $1 - \frac{1}{3}$, or $3.4 + 5.07$.
 - Jack and Jill shared a pizza. Jack ate $\frac{1}{3}$ of the pizza. Jill ate $\frac{1}{2}$ of the pizza. How much of the pizza was left?

- Use a model to answer a question (Reflect upon how the models will look different in each context)
 - There are 3 boxes with 6 toys in each box. How many toys are there?
 - 18 toys are packed equally into 3 boxes. How many toys are in each box?
 - 18 toys are packed 6 to a box. How many boxes are needed?

DISCUSSION QUESTIONS

PowerPoint Slide 30: Grades 6-8 Tasks

- Patient 0 stands up, showing that they are infected and transmits the disease by tapping one person. The person who gets tapped stands and taps one other person until the whole class is tapped and is standing. Record the number of people tapped (infected) after 10 rounds of tapping.
- Create a model (graph, equation, diagram, table, etc.) of a one-tap situation. Does your model show each round of tapping? How many new people are infected? The total number of people?

DISCUSSION QUESTIONS

PowerPoint Slide 33: Grades 9-12 Tasks

- Patient 0 stands up, showing that they are infected and transmits the disease by tapping two other people. The people who get tapped stand and tap two other people until the whole class is tapped and is standing. Record the number of people tapped (infected) after 10 rounds of tapping.
- Create a model of a two-tap situation. Does your model show each round of tapping? What is the number of new people who are infected? The total number of people?

DISCUSSION QUESTIONS

PowerPoint Slide 34: Breakout Room Discussions Debrief

- How was modeling incorporated into the breakout room tasks?
- How do you incorporate modeling in your classroom?
- What challenges do you anticipate when implementing modeling tasks, and how can you address them?
- How can you modify or scaffold modeling tasks to better suit the needs of your students?

DISCUSSION QUESTIONS

PowerPoint Slide 50: Rubric Questions to Consider

- What do you like and what do you not like about them?
- How could you use them in your classroom?
- Do some need to be modified for your classroom? If so, how?

Resource Links

- [Conrad Wolfram on Computational Thinking](#)
- [Engaging in Mathematical Practice *Look Fors*](#)
- [Standards for Mathematical Practice Rubric](#)
- [Guidelines for Assessment & Instruction in Mathematical Modeling Education \(GAIMME\)](#)
- [Using Mathematics and Computational Thinking](#)
- [MPRES Toolkit for Teachers Conceptual Change – Using Mathematics & Computational Thinking](#)
- [Ohio Learning Standards](#)
- Robert Kaplinsky
 - [Beware of Fake Math Modeling Problems](#)
 - [Do You Need Better Spies of Analysts?](#)
 - [Sink Hole](#)
 - [What Isn't Modeling?](#)

Conversation Notes: