Math Practice 6: Attend to Precision (District/Building Leader Facilitation Guide)

Presenter:

Intended Use

This facilitation guide is designed for district and school leaders to use when delivering sessions on the Standards for Mathematical Practice 6: Attend to Precision. The document can be used by district and building leaders to facilitate broader conversations on the use of local data, focusing on the broader impact of the MPs across building and district levels. Its purpose is to help broaden discussions with staff members on Math Practice 6 (MP 6) to a building and district level.

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 would like to make copies of any portion of this facilitation guide or accompanying PowerPoint presentation, please credit the Ohio Department of Education and Workforce.

During Facilitation: Discussion Questions

For each discussion question(s), pause the recording and facilitate a group discussion.

DISCUSSION QUESTION

PowerPoint Slide 15: In-person Discussion or Virtual Waterfall Chat

- *Live Session Participants:* Engage in local discussions using the question, “What comes to your mind when you think about MP 6: Attend to Precision? “
- *Virtual Presentation Participants*: Allow time for individual reflection and writing. Have participants enter their response to the question. “What comes to your mind when you think about MP 6: Attend to Precision?”, in a waterfall chat. Provide time for the attendees to read through and discuss responses from the waterfall chat prior to moving on.

DISCUSSION QUESTIONS

PowerPoint Slides 18-32: Breakout Room Discussions

Complete the problems on slides 18-32 that align to the grade level(s) or course(s) you teach.

DISCUSSION QUESTIONS

PowerPoint Slide 18: Kindergartners – Grade 2 Tasks

- Continue counting on to 100 starting at 57.
- How many acorns are there? How do you know?
- Show me 9 buttons. *(When given a collection of more than 9 buttons as manipulatives)*
- True or False? Identify the true expressions.

1 + 5 = 6	5 – 1 = 6	6 = 6	6 = 6	5 = 11 – 6
6 = 5 + 1	5 + 1 = 4 + 2	6 + 2 = 9	6 = 1 - 5	

DISCUSSION QUESTIONS

PowerPoint Slide 19: Kindergartners – Grade 2 Tasks

- How many dots do you see? How do you see them?
- Solve using mental math.

Kindergarten	Grade 1	Grade 2	Grade 3
2 + 2 2 + 3 3 + 3 3 + 4	7 + 7 7 + 6 7 + 8 8 + 8	50 + 50 49 + 49 48 + 49 48 + 48 49 + 51	128 + 34 119 + 36 56 + 129 126 + 49

DISCUSSION QUESTIONS

PowerPoint Slide 20: Kindergartners – Grade 2 Tasks

- How many dots do you see? How do you see them?

DISCUSSION QUESTIONS

PowerPoint Slide 22: Grades 3-5 Task

- Mrs. Frances drew a picture on the board.

  Then she asked her students what fraction it represents.

  - Emily said that the picture represents 26. Label the picture to show how Emily's answer can be correct.
  - Raj said that the picture represents 23. Label the picture to show how Raj's answer can be correct.
  - Alejandra said that the picture represents 2. Label the picture to show how Alejandra's answer can be correct.

DISCUSSION QUESTIONS

PowerPoint Slide 23: Grades 3-5 Tasks

- A slab of soap on one pan of a scale balances ¾ of a slab of soap and a ¾ pound weight on the other pan. How much does the full slab of soap weigh?
  - 6 × 4 = _____ × 3
- Write an expression that records the calculations described below, but do not evaluate.
- *Add 2 and 4, and multiply the sum by 3. Next, add 5 to that product and then double the result*.

DISCUSSION QUESTIONS

PowerPoint Slide 24: Grades 3-5 Tasks

- Which of these models represents ¼ of the whole? How do you know?
- Where should $^5/_8$ and $^5/_6$ be placed on the number line? How do you know?

Discussion Questions

PowerPoint Slide 25: Grades 6-8 Tasks

- Ocean water freezes at about $-2\frac{1}{2}$ °C. Fresh water freezes at 0∘C. Antifreeze, a liquid used in the radiators of cars, freezes at −64 °C.
- Imagine that the temperature has dropped to the freezing point for ocean water. How many degrees more must the temperature drop for the antifreeze to turn solid?

DISCUSSION QUESTIONS

PowerPoint Slide 26: Grades 6-8 Tasks

- What is the percentage equivalent of the fraction ____ ? How do you know? How can you use what we already know to solve the next problem?

A.	**B.**	**C.**
$\frac{1}{2}$ = ___ ?	$\frac{1}{5}$ = ___ ?	$\frac{1}{2}$ = ___ ?
$\frac{1}{4}$ = ___ ?	$\frac{2}{5}$ = ___ ?	$\frac{1}{4}$ = ___ ?
$\frac{3}{4}$ = ___ ?	$\frac{4}{5}$ = ___ ?	$\frac{1}{8}$ = ___ ?
$\frac{4}{4}$ = ___ ?	$\frac{3}{5}$ = ___ ?	$\frac{3}{8}$ = ___ ?

DISCUSSION QUESTIONS

PowerPoint Slide 27: Grades 6-8 Tasks

- Make up a set of eight numbers that simultaneously satisfy these constraints:
  - Mean: 10
  - Median: 9
  - Mode: 7
  - Range: 15

DISCUSSION QUESTIONS

PowerPoint Slide 28: Grades 6-8 Tasks

- How would you order these numbers from least to greatest? How do you know?

A. 10%, $\frac{1}{4}$, 0.1, 20%

B. 25%, $\frac{1}{3}$, 0.5, 36%

C. 0.7, $\frac{3}{4}$, 60%, 0.52

D. 0.75, $\frac{5}{6}$, $\frac{2}{3}$, 60%

E. 67%, $\frac{3}{4}$, 0.7, $\frac{3}{5}$

F. $\frac{4}{5}$, 0.7, 75%, $\frac{7}{8}$

- Identify the missing values in the table below.

Time in Car (hr.)	Distance (mi.)
0.75	36
1.5	
3	
4.5	
1	
	108

DISCUSSION QUESTIONS

PowerPoint Slides 29: Grades 9-12 Tasks

- Solve.

$(3 \cdot 3)^2$

$(2^2)^3$

$(2^3)^2$

$(a^4)^3$

$(a^6)^2$

$(3^a)^3$

$(3^2)^b$

$(x^a)^b$

$(2a^2)^3$

$(-3ab^{10})^2$

DISCUSSION QUESTIONS

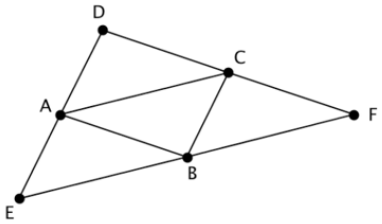
PowerPoint Slides 30: Grades 9- 12 Tasks

- Graph the following equations.
  - $y = x^2$
  - $y = |x|$
  - $y = (x - 250)^2$
  - $y = |x| - 750$
  - $y = |x + 3000| - 1200$
  - $y = (x - 120)^2 + 425$
- What do you notice about the relationships between the different graphs?
- What do you wonder about the relationships between the graphs?

DISCUSSION QUESTIONS

PowerPoint Slides 31: Grades 9- 12 Tasks

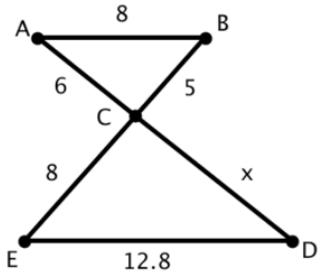
Figure 1: Given three non-collinear points, *A*, *B*, and *C*, as vertices, students found that they could forma parallelogram by placing the fourth vertex in any one of the example three positions, points, *D*, *E*, and *F*. Students noticed that *A*, *B*, and *C* seems to be midpoints of the sides of the newly formed $\triangle DEF$. How would you prove their conjecture?



DISCUSSION QUESTIONS

PowerPoint Slides 32: Grades 9- 12 Tasks

Figure 2: In the figure below, the two triangles are similar and points, *A*, *C*, and *D* are collinear and points *E*, *C*, and *B* are collinear. What is the length of the side *CD*?



DISCUSSION QUESTIONS

PowerPoint Slides 33: Breakout Room Discussions Debrief

- How can we ensure that Math Practice 6 is consistently implemented across all classrooms in our district?
- What strategies can we use to support teachers in attending to precision at the building and district levels?

DISCUSSION QUESTIONS

PowerPoint Slide 36: Accuracy vs. Precision Video

- Before you view the video, discuss whether it is better to be accurate or precise. Defend your reasoning.
- After you view the video, how has your opinion of whether it is better to be accurate or precise changed?

DISCUSSION QUESTIONS

PowerPoint Slides 40-43: Breakout Room Discussions

Review the MP progression document for MP 6: Attend to Precision.

- What do you think Math Practice 6: *Attend to Precision* means or looks like at your grade level/course?
- How does student demonstration of MP 6: Attend to Precision progress across the grade bands?

DISCUSSION QUESTIONS

PowerPoint Slides 44

- What are the specific learning needs of our students across the building and district levels?
- How can we address these needs to ensure that students regularly demonstrate their understanding of Math Practice 6 in the classroom?

DISCUSSION QUESTIONS

PowerPoint Slides 53

- What local data do we currently collect that can help us understand the implementation of Math Practice 6?
- How can we use this data to improve our instructional practices and student outcomes?

DISCUSSION QUESTIONS

Feedback on Additional Supports

- What additional supports do our teachers and students need to effectively implement Math Practice 6?
- How can building and district leaders provide these supports?

Engagement Activities

The following are optional activities for district and school leaders to use as part of their facilitation session(s) to further engage their audience.

Precision in Measurement Activity

- Engage in activities that require precise measurement and calculation.
- Set up stations with various measurement tools (e.g., rulers, protractors, scales). Ask participants to complete tasks that require precise measurements and calculations. Facilitate a group discussion on the importance of precision in mathematical tasks and how it can be emphasized in the classroom.

Error Analysis Workshop

- Analyze and correct mathematical errors to understand the importance of precision.
    - Provide participants with examples of mathematical problems that contain errors. Ask them to identify and correct the errors and discuss the impact of precision on the accuracy of the solutions. Facilitate a group discussion on strategies for teaching students to attend to precision in their work.

Interactive Graphing Activity

- Use graphing tools to create accurate and precise representations of data.
    - Provide participants with data sets and graphing tools (e.g., graph paper, graphing software). Ask them to create accurate and precise graphs based on the data. Facilitate a group discussion on the importance of precision in graphing and how it can be taught to students.

Resource Links

Ohio Department of Education Documents

- Standards for Mathematical Practice
- Kindergarten-Grade 5
- Grades 6-8
- High School

University of Arizona Progressions

- Standards for Mathematical Practice: Commentary and Elaborations for K-5
- Standards for Mathematical Practice: Commentary and Elaborations for 6-8

Other National Resources

- Inside Mathematics
- Illustrative Mathematics
- Math Practices
- Robert Kaplinsky: Math CCSS Math Practices Readable

References

Harris, P. W., & Imm, K. L. (2017). *Algebra Problem Strings*. Dubuque, IA: Kendall Hunt.

Illustrative Mathematics. (2014, February 12). Standards for Mathematical Practice: Commentary and Elaborations for K–5. Tucson, AZ.

Illustrative Mathematics. (2014, May 6). Standards for Mathematical Practice: Commentary and Elaborations for 6–8. Tucson, AZ.

Koestler, C., Felton-Koestler, M. D., Bieda, K., & Otten, S. (2013). *Connecting the NCTM process standards and the CCSSM Practices*. Reston, VA: The National Council of Teachers of Mathematics.

O'Connell, S., & SanGiovanni, J. (2013). *Putting the practices into action: Implementing the common core standards for mathematical practice, K-8*. Portsmouth, NH: Heinemann.

Parrish, S. (2014). *Number talks: Helping children build mental math and computation strategies, grades K-5*. Sausalito, CA: Math Solutions.

Parrish, S., & Dominick, A. (2016). *Number talks: Fractions, decimals, and percentages*. Sausalito, CA: Math Solutions.

Conversation Notes: