**Classroom Connection Activity**

Please engage in the following activities and submit responses using the methods described for each activity. We will be having our final video workshop time in Session 10. **Please carefully consider the problem/task you might use for this.** We will spend time discussing the tasks in our next session**.**

1. *Selecting a task for working on reasoning with your students*

Select a problem from your curriculum that you feel can be used to provide students with a strong opportunity to engage in mathematical reasoning. Recall from our work in previous sessions and CCAs that there are many problems in your curriculum that can be used for this purpose. We are attaching a resource, “Approaches to Modifying Tasks” that you can use to support your selection and revision of a task that could be used to provide opportunities for you students to reason and engage in mathematical practices. Provide rationale for the problem you select. We will discuss your selection at our next session.

**Optional:**

1. *Professional Readings*

In all strands of mathematics, teachers can support students’ engagement in mathematical reasoning. It can help to have images of tasks that encourage student reasoning in different topic areas. It can also be useful to have examples of the kinds of reasoning that students do in the context of those tasks. Below are several resources that could support your thinking about tasks that support students’ reasoning in an array of mathematical strands beyond number and operations. Read one of the following and make connections between the article and our work to support students’ reasoning.

*Geometry:* Lehrer, R., & Curtis, C. L. (2000). Why are some solids perfect? Conjectures and experiments by third graders. *Teaching Children Mathematics*, *6*(5), 324-329.

*Measurement:* Nitabach, E., & Lehrer, R. (1996). Research into Practice: Developing Spatial Sense through Area Measurement. *Teaching Children Mathematics*, *2*(8), 473-476.

*Data:* Mathematical Sciences Education Board (1993).Mystery Graph*. Measuring up: prototypes for mathematics assessment*, p. 23-29. [*http://www.nap.edu/openbook.php?record\_id=2071&page=23*](http://www.nap.edu/openbook.php?record_id=2071&page=23)

*Algebra:* Carpenter, T. & Levi, L (2000). Developing conceptions of algebraic reasoning in the primary grades. *National Center for Improving Student Learning and Achievement in Mathematics and Science research report 00-2.* <http://mathematics.ocde.us/Assets/Math/Developing%20Conceptions%20of%20Algebraic%20Reasoning%20in%20the%20Primary%20Grades.pdf>

1. *Read the “Justifying Geometry Statements” Math Notes document. Consider:*
	1. The uses of definitions;
	2. the ways in which language influences the interpretation of mathematical statements;
	3. how mathematical practices 6 “attending to precision” is particularly implied in the geometry statements.

Approaches to Modifying Tasks[[1]](#footnote-1)

There are many approaches that can be used to modify mathematics exercises or problems to encourage reasoning and provide opportunities to engage in mathematical practices, such as:

* Change the constraints of a story problem so that the problem has more than one possible answer

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| ***Original problem*** | ***Modified problem*** |
| Ali’s garden is 4 feet wide and 3 feet long. How much fencing does she need to put up a fence all the way around her garden? | Ali bought 14 feet of fence for her garden. Figure out different possibilities for how wide and long her garden might be? (Assume that the dimensions are whole numbers and that she uses all of the fencing) How do you know you have found all the possibilities?  |
| *(with pattern blocks)* How many triangles fit on the trapezoid? | *(with pattern blocks)* What different combinations of pattern blocks fit exactly on top of the trapezoid? What different combinations of pattern blocks fit exactly on top of the hexagon? |

* Change the problem to work backwards (i.e., give a solution and ask students to write expressions to equal a specific answer)

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| ***Original problem*** | ***Modified problem*** |
| 5 + 8 = | \_\_\_ + \_\_\_ = 13 |
| 20 x 3 =  | Write a multiplication problem that equals 60.  |

* *Change the problem to involve more than one step*

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| ***Original problem*** | ***Modified problem*** |
| Sara bought 5 candy bars. If each one cost 50¢, how much money did she spend? | Sara wants to buy 5 candy bars for 50¢ each. She has $3. Is that enough money? If not, how much more money does she need? If it is enough, does she get any change back? How much? |
| (picture of different kinds of animals at a birthday party) How many bears are in the picture? | *(picture of different kinds of animals at a birthday party)* How many more bears need to come to the party so that there are more bears than any other animal? |

* *Ask students to write story problems to go with particular calculations*

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| ***Original problem*** | ***Modified problem*** |
| 56 ÷ 8 = | Write a story to go with 56 ÷ 8. |
| 2 ÷ 1/2 =  | Make a picture that shows 2 ÷ 1/2. |

* Change specific cases to requests to generalize across cases or beyond the range of the initial problem by using phrases like “find all \_\_\_ that \_\_\_”

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| --- | --- |
| ***Original problem*** | ***Modified problem*** |
| 6 + 4 = | Write all the problems that add two whole numbers together to equal 10. |
| Circle the even numbers:2 5 10 17 21 30 | Find all the even numbers less than 32. |
| How much are two dimes plus one nickel? | What are all the ways to make change for 25¢? Prove that you have all the possibilities. |

* Rephrase closed problems as ones that encourage conjectures by using phrases like “What happens if…”

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| ***Original problem*** | ***Modified problem*** |
| True or False: A square is a parallelogram. | If a square is a parallelogram, is a parallelogram a square? |
| 249 x 17 =  | If 249 x 17 = 4233, what happens to the product if you place a decimal point at different places in either factor? |

*Change problems from find solutions and generate justifications to involve analysis of an alternative method, a general claim, evaluation of correctness or validity, and if incorrect, error analysis*

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| ***Original problem*** | ***Modified problem*** |
| Which is more?  | A student claims that she has found a new method for comparing fractions less than 1. She looks at the numerator and denominator and the closer they are to one another, the greater the fraction. An example:She explains her example: “The difference between 4 and 7 is 3, and the difference between 7 and 8 is 1. This means that 7/8 is greater than 4/7.”Is the general claim true? |
| Subtract: | What method for subtraction was used here? How does it work, and why?Would it work for any subtraction problem? |
| Multiply: | Here is someone’s solution to a multiplication problem:Is it correct or incorrect?If it is correct, how can you show that?If it is incorrect, what is wrong, and what caused the error? |

1. Used with permission from the Mathematics Methods Planning Group at the University of Michigan. Adapted from the Teaching Children Mathematics course, Fall 2004. [↑](#footnote-ref-1)