

# ENGAGING STUDENTS WITH POSTER PROBLEMS

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Through our work, we know that all students have the potential to achieve in mathematics, and we believe that active student involvement will help students experience success as they see the beauty and utility of mathematics. One routine we have found to be particularly successful is “Poster Problems.” Through this activity, students do mathematics as they travel from poster to poster, share ideas in safe, small group conversations, confront misconceptions, and critique the reasoning of their peers. Additionally, Poster Problems allow teachers to informally assess learning and identify areas for follow-up.

We have seen Poster Problems used successfully from Grades 2 through college, and the setup for the activity is fairly easy. An upper elementary school example that focuses on fraction concepts and a middle school example that focuses on algebraic representations are given on page 4.<sup>1</sup>

## First: Create your Poster Problems activity

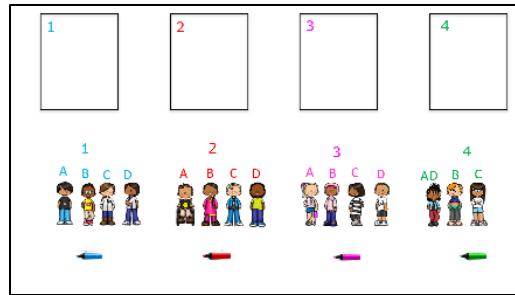
- (1) Identify four “fact statements” for a topic. For the first example, fractions are given. In the second example, visual patterns are given.
- (2) Write four prompts related to the fact statements. These may be independent of each other (as in the fraction example) or build upon each other (as in the patterns example).
- (3) Determine a follow-up plan. In the first example, students further critique the work of their peers. In the second example, students work on problem extensions. If desired, this can simply be a discussion of strengths and misconceptions observed during the activity.

## Next: Prepare ahead for the activity

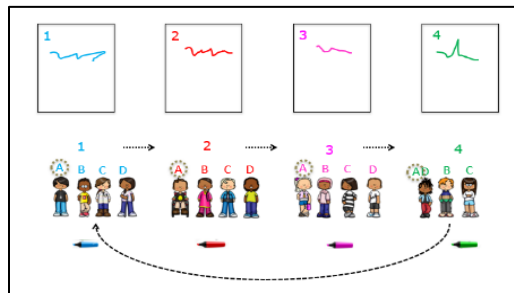
- ✓ Determine the number of groups for your class. The total number of groups needs to be a multiple of 4 (e.g. 4, 8, or 12 groups). We have found that 3-4 students per group work best. For example, if you have 30 students in your class, make 8 posters (6 groups of 4 and 2 groups of 3).
- ✓ Assemble supplies: a different colored marker for each group; 1 sheet of poster paper (or butcher paper, or designated board space) for each group; at least one copy of the poster problems activity sheet for each group. Consider using grid chart paper or affixing a piece of graph paper to posters when helpful, especially in the second example when graphing is required.
- ✓ Create space around the room for the posters and number them as 1, 2, 3, 4, 5, ...

## Finally: Implement the activity

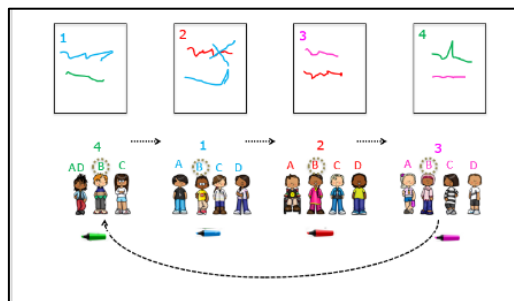
To launch your Poster Problems activity, make groups with no more than 4 students. Identify group members as A, B, C, or D. (If groups have less than 4 students, one or more students will be in the writing role more than once). Number the groups. This will be their “start” poster. Give each group a different colored marker. The group will use this marker on all posters (for accountability purposes).



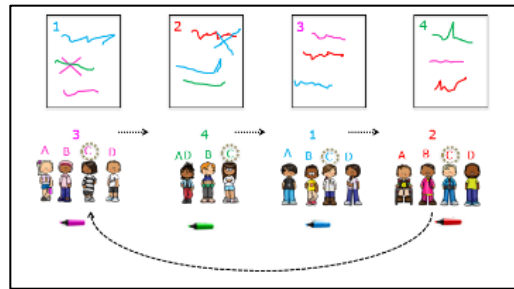
Now it is time for students to get to work. Each group begins at their start poster. Remind students that ALL group members are expected to collaborate on ALL steps, no matter who is holding the pen. Student A completes ONLY part A of the poster problem with the group’s colored marker. Other members support and help. After an appropriate amount of time, give a signal (such as a bell or “time to move”) for all groups to move to the next poster.



At the next poster, the entire group checks the previous work on part A of the poster for that problem, and makes (polite) corrections as needed. Then Student B completes part B for that problem with the group’s colored marker. Other members support and help.



Repeat the process twice more so students can complete parts C and D.



And then the poster will be done!



To complete the Poster Problems (Part 3) activity, we like to follow up with a debriefing question or extension prompt. In the first example, students critique the work on the poster. In the second, they complete follow-up problems.

We've found that the first time that students do the Poster Problems activity, it can be a little chaotic as they learn the routine. But once they understand the process, students and teachers alike look forward to doing them again and again. To save paper, we recommend allocating board space if possible. But posters also provide excellent, attractive, and authentic student work for reference, and they will decorate your room!

<sup>1</sup>We invite you to watch a video at [www.mathandteaching.org/videos](http://www.mathandteaching.org/videos) or contact us for more examples.

Resources:

Goldstein, M., Kriegler S., Moffett, J., Gamelin, T. (2023) **MathLinks (2<sup>nd</sup> ed): Grades 6-8**. Center for Mathematics and Teaching, Inc.

Liljedahl, P. (2020) Building Thinking Classrooms in Mathematics, Grades K-12: 14 Teaching Practices for Enhancing Learning

Lambert,R., and Sugita, T. (2016). "Increasing engagement of students with learning disabilities in mathematical problem solving and discussion." **Support for Learning** 31. Pp. 347-366.

Stein, M. and Smith, M. (2018) **5 Practices for Orchestrating Productive Mathematics Discussions**. Corwin Press



## POSTER PROBLEMS: FRACTION CONCEPTS

Part 1: Your teacher will divide you into groups.

- Identify members of your group as A, B, C, or D.
- Each group will start at a numbered poster. Our group start poster is \_\_\_\_\_.
- Each group will have a different colored marker. Our group marker is \_\_\_\_\_.

Part 2: Do the problems on the posters by following your teacher's directions.

Poster 1 (or 5)	Poster 2 (or 6)	Poster 3 (or 7)	Poster 4 (or 8)
$\frac{3}{5}$	$\frac{3}{4}$	$\frac{3}{10}$	$\frac{3}{2}$

- A. Copy the "start" fraction. Draw an "area model" diagram using a rectangle that represents the fraction.
- B. Represent the fraction with a "number line" diagram.
- C. Write a fraction that is equivalent to the start fraction. Justify with pictures, numbers, or words that they are equivalent.
- D. Write a decimal that is equivalent to the start fraction. Justify with pictures, numbers, or words that they are equivalent.

Part 3: Return to your original poster. Show how to improve one of the representations or justifications.

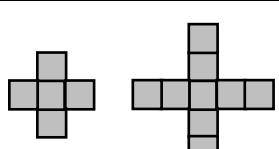
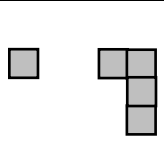
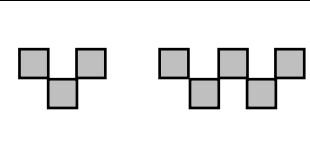
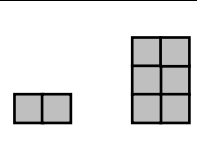
## POSTER PROBLEMS: ALGEBRAIC REPRESENTATIONS

Part 1: Your teacher will divide you into groups.

- Identify members of your group as A, B, C, or D.
- Each group will start at a numbered poster. Our group start poster is \_\_\_\_\_.
- Each group will have a different colored marker. Our group marker is \_\_\_\_\_.

Part 2: Do the problems on the posters by following your teacher's directions.

Steps 1 and 2 of tile patterns are given below.

Poster 1 (or 5)	Poster 2 (or 6)	Poster 3 (or 7)	Poster 4 (or 8)
			

- A. Copy steps 1 and 2 onto the poster and draw step 3. Explain your step 3 in words.
- B. Make a table, label it appropriately, and record values for steps 1 through 5.
- C. Make a graph and label it appropriately.
- D. Write an input-output rule that relates the total number of tiles to the step number.

Part 3: Return to your original poster. Check all the work. Find the total number of tiles in Step 100. Explain why there is no step with exactly 100 tiles.