

Appendix D

Sample Rich Tasks

Rich tasks, introduced in Chapter 2, require our students to think and act like mathematicians. They create a mathematics experience that integrates most, if not all, of the Standards for Mathematical Practice. These tasks may take more than one class period and offer many opportunities for extensions and variations. These tasks are about *doing* math.

Following are three rich tasks (primary, intermediate, and middle grades levels), including a series of before, during, and after questions to guide students' thinking throughout the task. Before the task, the teacher poses questions to set up the task. During the task, questions guide students' explorations. After exploring the task, questions facilitate the sharing of strategies and solutions, as well as provide optional extensions of the task. During these tasks, support your students with guiding questions, being cautious not to provide too much assistance, allowing students to think, explore, and learn.

Primary Task: *Helping Pets*

Following is a rich task in which students must determine solutions, of which there are many, with precisely 63 dogs and cats.

Three different veterinarians each help a total of 63 dogs and cats in a week, but each veterinarian helps a different number of dogs and cats. How many dogs and cats could each veterinarian have helped?

Setting Up the Task

- ▶ What types of animals do people have as pets?
- ▶ What do we do when our pets get sick?
- ▶ What is a veterinarian?
- ▶ How many pets do you think a veterinarian can help in an hour or a day?
- ▶ What math is in this task? (Encourage students to come up with this, but the following questions may help if they get stuck.)
- ▶ How many dogs and cats do the three veterinarians help?
- ▶ Does each veterinarian help the same number of dogs or cats?

- ▶ What word do we use to describe the *total* number of dogs and cats?
- ▶ What is an *addend* in the problem? Will the addends be the same for each veterinarian?

Facilitating the Task

- ▶ How will you find the possible *addends* in this problem?
- ▶ What tools could you use to be sure you are accurate?
- ▶ How will you prove your solutions are correct?
- ▶ How will you explain your solutions to the class?

**Connections
to other practice standards**

This is a problem-based task (Standard 1).

Students must create math equations to represent possible combinations of dogs and cats (Standard 2).

Students are asked to justify their solutions (Standard 3).

Students may use models (e.g., counters or base-ten blocks) to explore the problem (Standard 4).

Students are expected to find precise answers and use specific vocabulary (e.g., sum and addends) as they explore the task (Standard 6).

Students think about patterns as they increase or decrease the number of dogs or cats (Standard 7).

Extending the Task

- ▶ What are some of the solutions?
- ▶ Did we find all of the solutions? Are there more combinations of addends that have a sum of 63?
- ▶ How would our numbers change if each veterinarian also helped guinea pigs?
- ▶ How are the number of dogs and the number of cats related? What happens to the number of dogs when we decrease the number of cats?

Intermediate Task: *The Missing Puzzle Piece*

For this task, students should have had previous exposure to tangrams and know that there are 7 pieces of varied sizes and shapes in a set and that each set contains the same 7 pieces. The teacher arranges all 7 tangram pieces to form a design and traces its perimeter to create a puzzle. The teacher then gives each group of students a copy of the puzzle and a paper bag containing a set of tangrams, but with one piece randomly removed from each bag. The teacher tells the class that each group has one missing piece and challenges students to complete the puzzle to determine which piece is missing from their bag and then solve the following problem:

What fraction of your tangram puzzle is missing?

Setting Up the Task

- ▶ What types of puzzles have you worked with at school or at home?
- ▶ What are some strategies you have used to complete puzzles?

- ▶ What are tangrams? How many pieces are in a set?
- ▶ Are all of the pieces the same size and shape? What are the different shapes?
- ▶ What math is in this task? (Encourage students to come up with this, but the following questions may help if they get stuck.)
 - ▶ Will every piece represent the same fractional part? Why or why not?
 - ▶ What is one whole?
 - ▶ How do you think you can find the fractional piece that is missing?

Facilitating the Task

- ▶ What piece is your group missing? How do you know?
- ▶ How can you find the fractional amount of that piece?

**Connections
to other practice standards**

The Missing Puzzle Piece is a problem-solving task (Standard 1).

This task requires students to justify their solutions and strategies (Standard 3).

Students use tangrams to model fractions (Standard 4) and also use them as tools as students find benchmarks and compare one tan to another to determine a fraction of the whole (Standard 5).

Precision is expected as students determine the fraction of the set that is missing (Standard 6).

The extension challenges students to look for patterns as they explore the changes if a piece were missing from 1, 2, 3, or 4 sets of tangrams (Standard 7).

Middle Grades Task: *Usable Classroom Floor Space*

Following is a rich task in which students must determine floor space in various classrooms and make judgments based on their findings:

Which mathematics classroom in our school has the greatest amount of usable floor space?

Setting Up the Task

- ▶ What is floor space?
- ▶ How is floor space different from the total area of a classroom?
- ▶ Why is floor space important in any room, especially a classroom?
- ▶ What math is in this task? (Encourage students to come up with this, but the following questions may help if they get stuck.)
- ▶ What is the area of our classroom?
- ▶ What is the area of the floor space in our classroom?
- ▶ What is the area of other classrooms?
- ▶ What is the area of the floor space in those classrooms?
- ▶ Is it fair to say a larger classroom has a larger amount of floor space? Should we consider the overall size of the classroom in relation to its overall floor space (percentage of floor space)?

Facilitating the Task

- ▶ How will we find the area of our classroom?
- ▶ What tools will help us find the area of our classroom?
- ▶ What tools will help us find the area of the closets, tables, furniture, etc.?
- ▶ Will we need to find the area of every desk? How will we find the area of all the desks?
- ▶ Do we need exact measurements of each desk or table? What would “good” measurements be?

Extending the Task

- ▶ Which classroom had the greatest amount of floor space? Justify your answers.
- ▶ How could our classroom be rearranged to maximize the floor space?
- ▶ What room in your house has the most usable floor space?