Multiple representations in the real world
Student Activity Sheet 1; use with *Overview*

1. Anthony’s father is going to put a tile border around this square fish pond. The pond is 1 yard on each side. The tiles are squares that are 1 foot on each side. How many tiles will Mr. Chen need? Explain how you solved this problem.

2. When you use real objects (or pictures of real objects) to model a problem, you are making a ____________________________ of the problem.
Multiple representations in the real world
Student Activity Sheet 1; use with Overview

The owners of the fish pond, Jane and Joachim Romez, have decided to add some additional landscaping in their backyard by planting Japanese peonies. They want to create a flowerbed along one side of their 24-yard-long fence. They plan to start with a flowerbed that is 8 yards long and 1 foot wide and expand it later. The peony plants need to be planted 2 feet apart.

3. **REINFORCE** If they plant the first peony 1 foot inside the end of the flowerbed, how many peony plants do they need to purchase to fill the 8-yard-long flowerbed? Solve this problem using a concrete model.

4. **REINFORCE** Jane used this graph to solve the peony problem.

![Peony Plants Needed Graph](image)

a. How can you use Jane’s graph to find the answer to the problem?
Multiple representations in the real world
Student Activity Sheet 1; use with Overview

b. State at least one reason why Jane’s solution method may be more useful than the concrete model.

5. **REINFORCE** Joachim decides to use a different type of representation to solve the problem. He represents the problem by stating, “For every 2 yards of flowerbed, you can plant 3 peonies.”

   a. What type of representation did he use? How do you know?

   b. Describe how you can use Joachim’s representation to solve the problem.

6. **REINFORCE** Forever Flowers, the nursery that sells the peony plants, has an app that uses equations to help customers order the correct number of plants. The function rule for peony plants is \( P = 1.5n \) where \( P \) represents the number of plants needed for \( n \) yards.

   a. What type of representation is a function rule?

   b. State at least one reason why using this type of representation may be more useful than other representations.
Multiple representations in the real world
Student Activity Sheet 2; use with Exploring “Tiling square pools”

1. Here is Anthony’s model for the 1-yard-square pool and border.

What should Anthony’s models for the two smallest pools in this sequence look like? Make a sketch.

2. What is the relationship between the length of the side of each pool and the number of tiles in the border? Make a numerical representation of the relationship.

<table>
<thead>
<tr>
<th>Pool Side Length and Borders</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length of pool side in feet</strong></td>
</tr>
<tr>
<td>-----------------------------</td>
</tr>
<tr>
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</tbody>
</table>
Multiple representations in the real world
Student Activity Sheet 2; use with Exploring “Tiling square pools”

3. What pattern does the numerical representation reveal, and how does it connect to the model?

4. Write a symbolic representation (a function rule) of the relationship between the length of the side of the pool and the number of tiles in the border.
5. **REINFORCE** Benton Middle School’s 7th grade science classes are building and maintaining a vegetable garden. The border of the garden will be rectangular with a fixed interior length of 6 feet. The students will build the borders of the garden with cinder blocks that measure 1 ft by 0.5 ft. In addition to creating a border, each cinder block has two holes in it that can be used to plant small herb plants.

These models show the two smallest 6-foot long gardens that can be created with the cinder blocks.

![Diagram of garden models]

a. Draw models for two gardens, one that is 6 ft × 3 ft and one that is 6 ft × 4 ft.
Multiple representations in the real world
Student Activity Sheet 2; use with Exploring “Tiling square pools”

b. What is the relationship between the width of the garden and the number of cinder blocks needed? Show this relationship using a numerical representation.

c. What pattern do you notice in the numerical representation? How does it relate to the models?

d. Write a symbolic representation of the relationship between the width of the garden and the number of cinder blocks needed.

e. Each cinder block can hold two small herb plants. Describe the relationship between the width of the garden and the number of small herb plants that can be grown in the cinder blocks.
Multiple representations in the real world
Student Activity Sheet 2; use with Exploring “Tiling square pools”

6. Make a graph of your numerical representation of the relationship between the length of the side of the pool and the number of tiles in the border. Then add the graph of your symbolic representation to the same graph.

7. Notice that the graph of the mathematical function $y = 4x + 4$ is continuous.
   a. What are the domain and range of the mathematical function?
   b. Anthony’s pool-tiling problem is a discrete situation. What are the domain and range of the function that models this situation?
Multiple representations in the real world
Student Activity Sheet 2; use with Exploring “Tiling square pools”

8. Create each of the following representations of the relationship between the length of the side of a square pond and the number of tiles in the border for this new design.

a. Numerical representation

b. Verbal representation
Multiple representations in the real world
Student Activity Sheet 2; use with Exploring “Tiling square pools”

c. Graphical representation

d. Symbolic representation
Multiple representations in the real world
Student Activity Sheet 2; use with Exploring “Tiling square pools”

9. **REINFORCE** Make a graph of your numerical representation from question 5, part b of the relationship between the garden width and the number of cinder blocks needed. Then add the graph of your symbolic representation from question 5, part d to the same graph.
Multiple representations in the real world
Student Activity Sheet 2; use with Exploring “Tiling square pools”

10. REINFORCE The graph of the mathematical function $y = 2x + 14$ is continuous. What are the domain and range of this mathematical function?

11. REINFORCE The cinder block garden problem is a discrete situation. What are the domain and range of this situation?

12. REINFORCE After having the students lay out some cinder blocks for the school garden, the science teacher notices that it would be too difficult for her students to reach the center of the 6-foot-long garden. She decides to alter the design to make a rectangular garden that is 4 feet long instead. Create each of the following representations of the relationship between the width of the garden and the number of cinder blocks needed for the new garden.

   a. Numerical representation

   b. Verbal description
**Multiple representations in the real world**

Student Activity Sheet 2; use with *Exploring* “Tiling square pools”

<table>
<thead>
<tr>
<th>c. Graphical representation</th>
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</thead>
<tbody>
<tr>
<td><img src="image" alt="Graphical Representation" /></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>d. Symbolic representation</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Symbolic Representation" /></td>
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</tbody>
</table>
Multiple representations in the real world
Student Activity Sheet 3; use with Exploring “What’s in a rule”

1. Anthony explains his representations to his dad and his uncle Tajil. Mr. Chen is impressed, but Uncle Tajil, unconvinced, makes a model of his own. "Look here, Anthony," he says. "I think of the pools like this."

Let $s$ represent the length of one side of the pool, and $t$ represent the number of tiles in the pool's border. Can you write a rule that represents Uncle Tajil’s model?

2. This model shows that ___(__________) = __________.

This is an example of the _____________________________ property of _____________________________ over _____________________________.

This model shows that ___(__________) = __________.

This is an example of the _____________________________ property of _____________________________ over _____________________________.

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With space for student work
Multiple representations in the real world
Student Activity Sheet 3; use with Exploring “What’s in a rule”

3. Explain why the number of tiles in the border of a pool is the same as the area of the border.
4. Explain using words and pictures why \((s + 2)^2 - s^2 = s^2 + 4s + 4 - s^2 = 4s + 4\).

5. Evaluate each of the expressions at your assigned number and record the results in the table. What do you notice?

<table>
<thead>
<tr>
<th>(t = 4s + 4)</th>
<th>(t = 4(s + 1))</th>
<th>(t = (s + 2)^2 - s^2)</th>
</tr>
</thead>
<tbody>
<tr>
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