Practicing Mathematical Practices

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Dr. Chris Larson
South Dakota State University
christine.larson@sdstate.edu

Dr. Sharon Vestal
South Dakota State University
sharon.vestal@sdstate.edu

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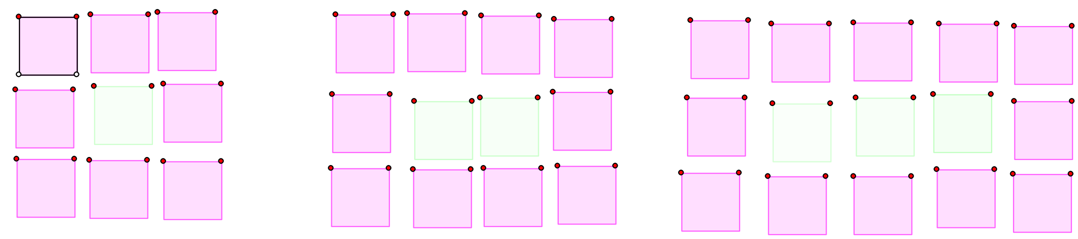
The Garden Problem

Explain your thinking for all parts of this problem.

Here are three sizes of gardens framed with a single "row" of tiles:



Garden 1 Garden 2 Garden 3

1. Build and then draw the next two steps in the pattern. How many border tiles would you need for Garden 4 and for Garden 5? Explain how you know. Begin a table that shows the number of tiles used for the border of each garden.

2. How many tiles would you need to make a border around gardens of each of these lengths? Explain.

   a. Garden 10 b. Garden 100

3. What patterns do you notice in the models/drawings? In the table?

4. Explain how you would figure out the number of tiles you would need for a garden of any length.

5. How does your rule relate to the model (show geometrically why your rule makes sense)?

6. Graph the values in your table on a coordinate grid.

7. Theoretically, what would the step before Garden 1 (the "zero" step) look like? (Think about how the garden is "growing" in each step; go backwards to think about the "zero" step). Add this information to your table. Does it "match" the other patterns in the table? Add this point to your graph.

8. Using the expression that is in simplest form, compare your table, your graph, and the expression.
   a. Where does the "2" in the expression "show up" in your table? In your graph? In the model?

   b. Where does the "6" show up in your table? In your graph? In the model?

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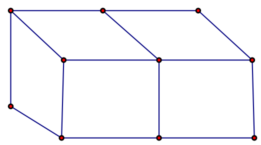
The Painting Cubes Problem

A company makes colored rods by joining cubes in a row and using a sticker machine to place "smiley" stickers on the rods. The machine places exactly 1 sticker on each exposed face of each cube. Every exposed face of the cube has to have a sticker. Therefore, this rod of length 2 would need 10 stickers.



1. Use your linking cubes to build rods of lengths 1-5.

2. How many stickers would you need for rods of lengths 1-10? Record this information in a table.

3. How many stickers would you need for a rod of length 20? Of length 50? Explain how you determined these values.

4. Write a rule in words and symbols that would allow you to find the number of stickers needed for a rod of any length.

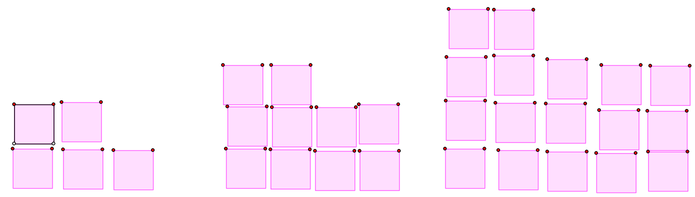
5. How does your rule relate to the model" (show geometrically why your rule makes sense)?

6. What are the variables? Which is the independent variable? Why? Which is the dependent variable? Why?

7. Graph your data. What's the "shape" of your graph?

8. What does this problem have in common with "The Garden Problem"? Compare the growth patterns in the tables and the graphs.

The Increasing Tiles Problem



Step 1 Step 2 Step 3

1. Build or draw the next two steps in the pattern.

2. Describe what the 10th step will look like.

3. How many tiles in the 10th step? How do you know?

4. Record your findings in a table.

5. What patterns do you notice in the models/drawings? In the table?

6. Write an algebraic rule to find the number for any stage of the growth.

7. Explain geometrically why your rule makes sense.

8. Find a different way to visualize the pattern, write a different algebraic expression that matches it and show geometrically why it makes sense.

9. Show that the two expressions are algebraically equivalent.

10. Picture in your mind what the graph of your expression will look like. Graph it.

11. What would the zero-step look like? Add this information to your table and graph this point.

12. Compare the table and graph for this problem to the other problems you've done. Which problem is most "like" this one? Explain.

13. What are the advantages and disadvantages of all the different representations that we've used so far? (symbolic, table, graph, verbal).

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PMP Workshop Triangle Inequality Worksheet

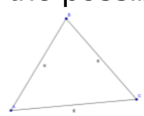
Using the Exploragons, create as many different triangles as you can. Record the lengths of the sides of each of your triangles.

Side 1	Side 2	Side 3

Using the Exploragons, find examples of side length combinations that will **not** create a triangle. Record the lengths of these sides.

Side 1	Side 2	Side 3

In the isosceles triangle, what are the possible values for the third side, x?



The possible values will be an inequality statement, _____ $< x <$ ______.

A triangle has side lengths of 10 ft and 24 ft. What are the possible lengths of the third side? Show your work and answer in the space below.

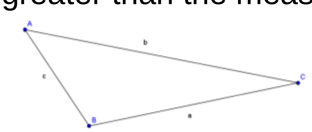
Determine whether the following triangles are possible. Explain your answers.

Triangle with side lengths 5 in, 7 in, and 9 in.

Triangle with side lengths of 1 cm, 3 cm, and 1 cm.

Triangle with side lengths of 0.5 m, 0.25 m, and 0.25 m.

Triangle Inequality Theorem--The sum of the measures of any two sides of any triangle is greater than the measure of the third side.



$a + b > c$
$a + c > b$
$b + c > a$

PMP Workshop Investigating SSA Congruence with Exploragons

Take a purple Exploragon and attach two red Exploragons on top of one of the ends of the purple Exploragon. Now take a blue Exploragon and attach it to the other end of the purple Exploragon. Then attach the blue Exploragon to both of the red Exploragons, making sure that you attach it in such a way that the distance from the end of the purple Exploragon to the attached point is equal.

Look at your figure. You have two triangles that satisfy SSA (two sides congruent and a congruent angle) or think of it as red Exploragon, purple Exploragon, shared angle.

Are the two triangles congruent?
Explain your answer.

Before you say that SSA doesn't work, do the following investigation. It will help you realize why SSA is called the ambiguous case.

Take a purple Exploragon and attach two orange Exploragons on the same end of the purple Exploragon. Now take a yellow Exploragon and attach it to the other end of the purple Exploragon. Attach the yellow Exploragon to a peg on one of the orange Exploragons. Now rotate the other orange Exploragon until it is on top of the first orange Exploragon. You should see one triangle, which is congruent to itself.

SSA **does NOT work** when the middle S (side) is _________________ than the other S.

SSA **DOES work** when the middle S is __________________ than the other S.

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Representations

Graphical	Table of Values
	Model
	Verbal
	Algebraic

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