Supporting Algebra Learners Through Modeling Investigations of the (Extra)ordinary

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Bouncing Ball

Kasey is curious to see what happens when a ball is dropped from different heights and how high it bounces after the first bounce.

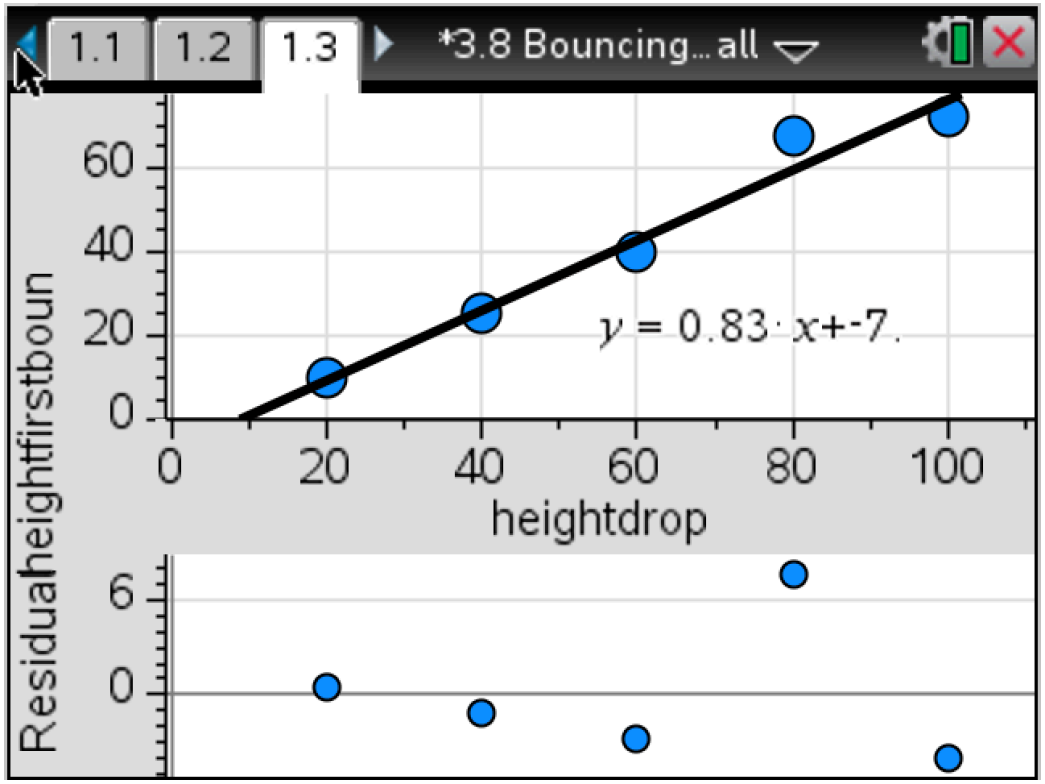
Collecting Data

1. Place a centimeter tape or meter stick from the floor up against a wall designated for your group.
2. Drop the ball from the 20 cm mark. Make sure that another member in your group is ready to watch. Observe and record the height of the ball after its first bounce.
3. Drop the ball 1 or 2 more times from the 20 cm mark. After each drop, observe and record the height after its first bounce. You should have 2 or 3 heights recorded in the table provided.
4. Repeat this procedure for drops from 40 cm, 60 cm, 80 cm, and 100 cm.

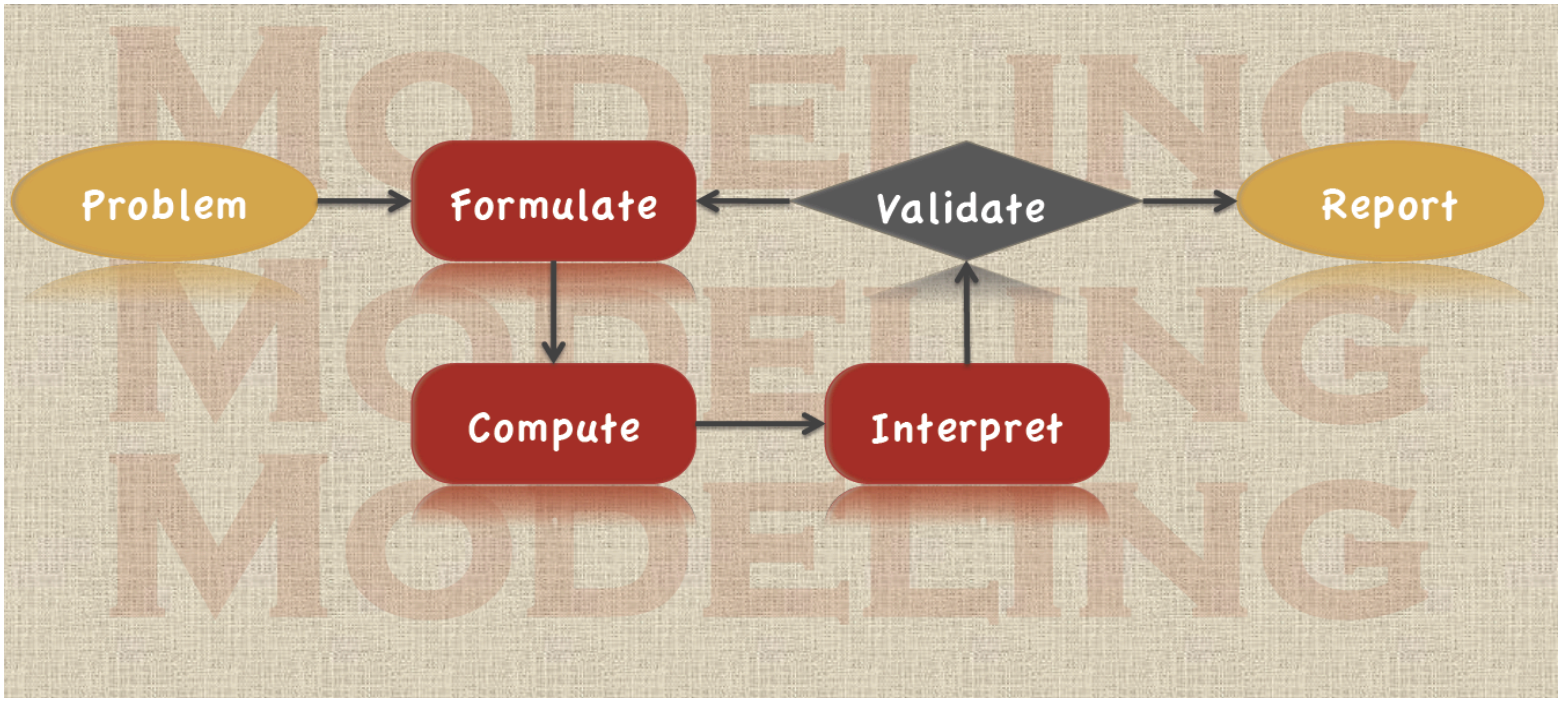
Using the Data

1. Make a graph of the data.
2. Draw a line that you think best represents your data. Describe how you decided on your line.
3. Determine an equation for your line. Describe how you found the equation.

Function Fit and Residuals



The Modeling Cycle



The Shape of a Bottle

For the bottle assigned to you, sketch a graph predicting the water height as a function of its volume in the bottle. Indicate on the bottle where you predict the volume will be ¼ full, ½ full, and ¾ full.

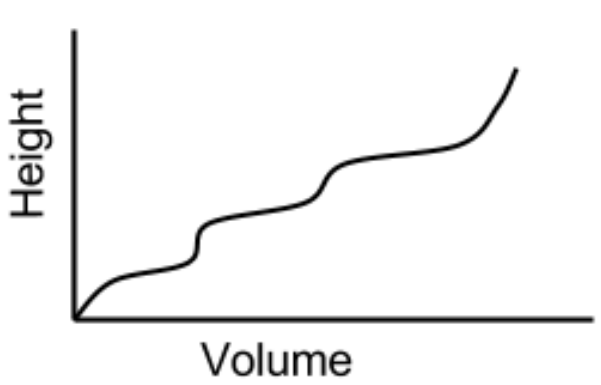
Describe how a measuring cup could help you sketch an accurate graph representing the water height as a function of the volume.

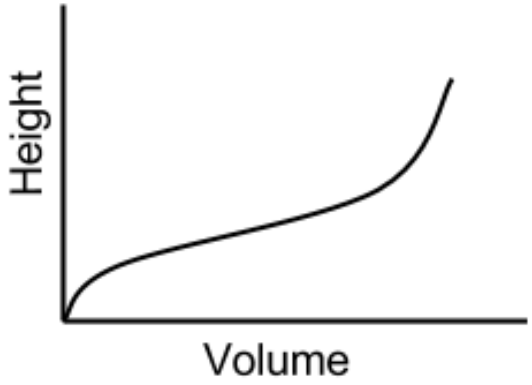
Describe how you could use a measuring cup or graduated cylinder units to accurately mark the bottle where it is ¼ full, ½ full, and ¾ full.

The Shape of a Bottle

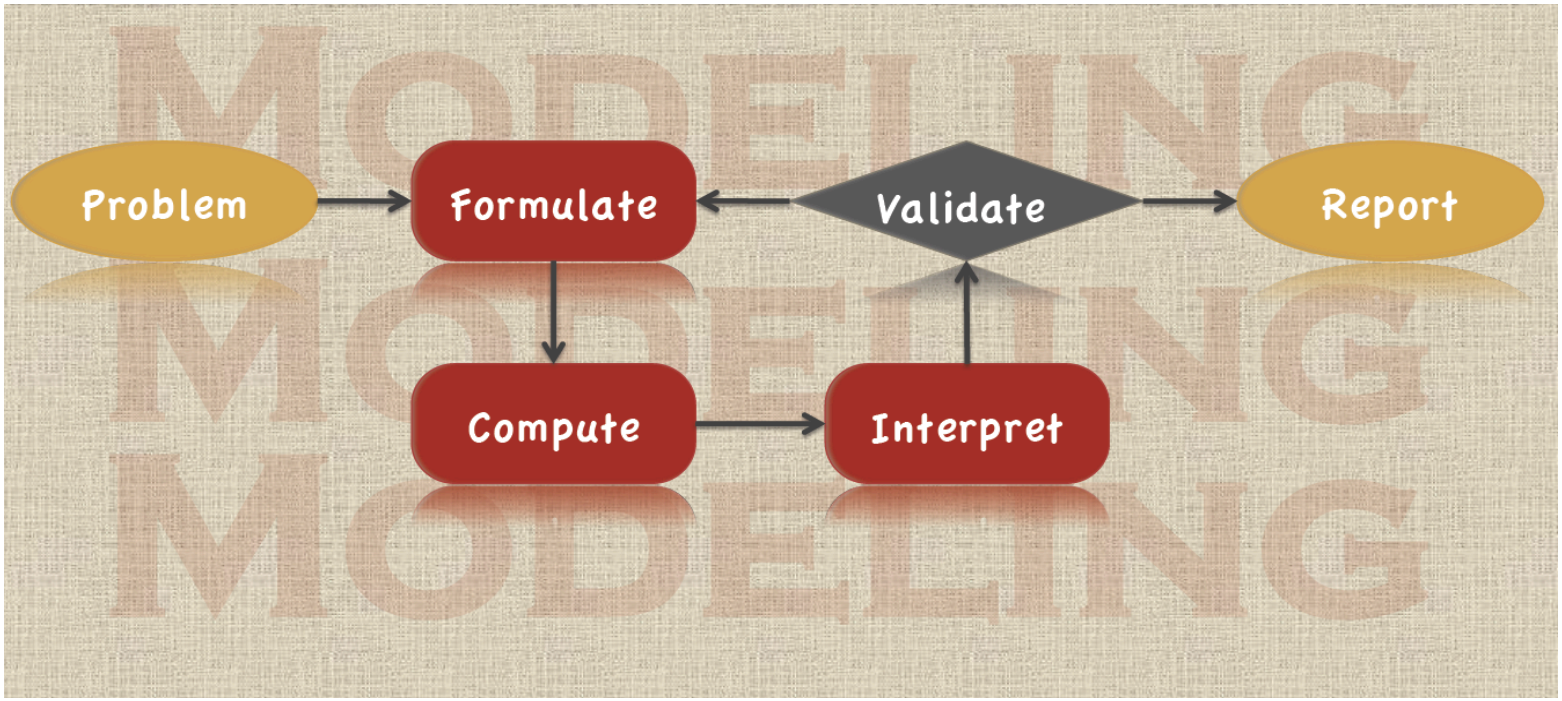
Sketch bottle shapes that you believe the following graphs represent and explain your thinking.

a.



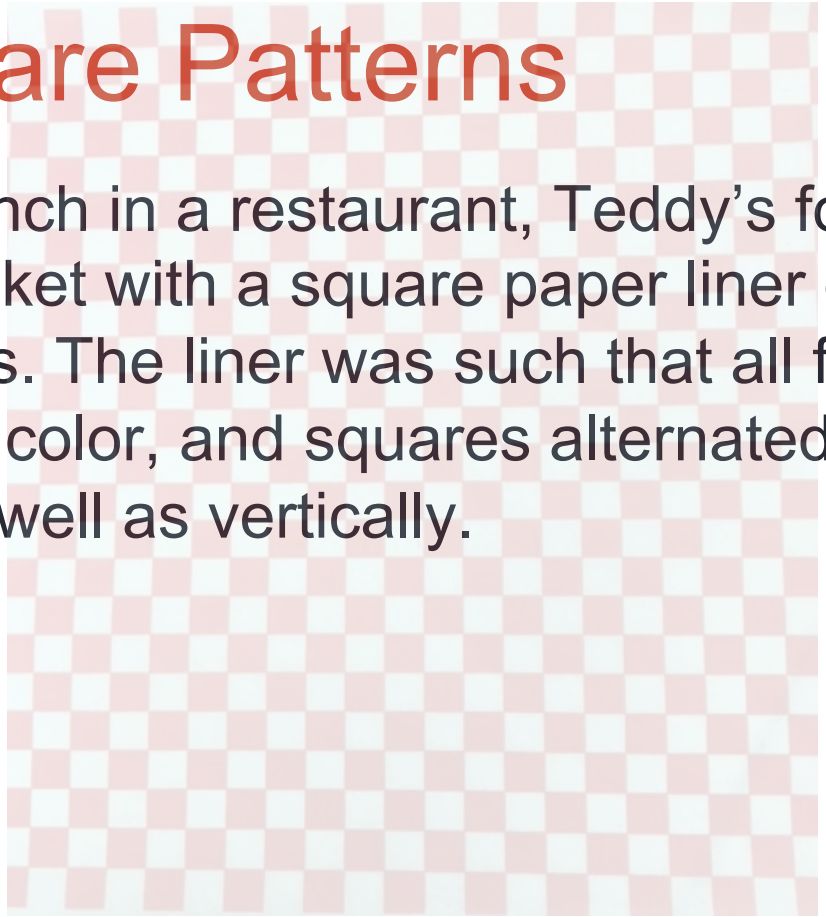


The Modeling Cycle



Odd Square Patterns

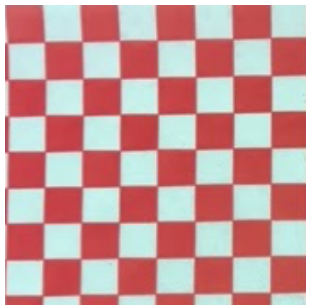
While eating lunch in a restaurant, Teddy's food was served in a basket with a square paper liner composed of smaller squares. The liner was such that all four corners were the same color, and squares alternated colors horizontally as well as vertically.

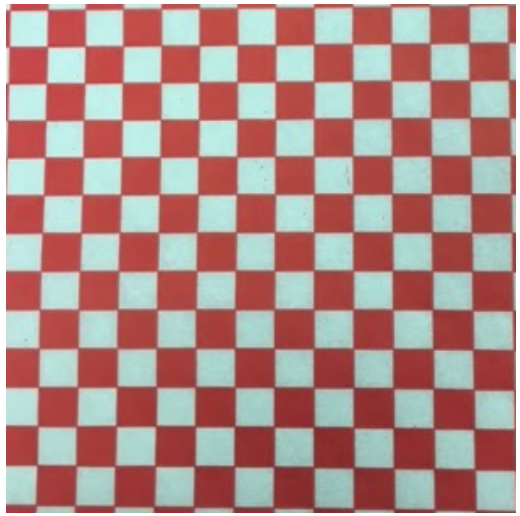


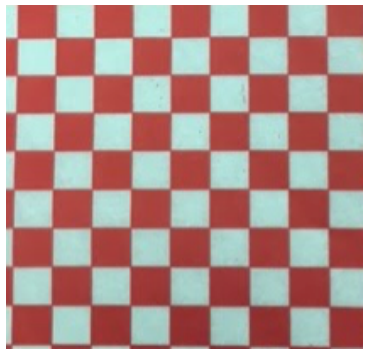
Let's Investigate

1. Teddy wondered how many individual squares there were of each color. Think of different ways you could help Teddy determine these amounts.
2. In any sized square, if the colors alternate horizontally and vertically, will the four corners be the same color?
3. How can Teddy find the number of red squares in any sized square liner, where the colors of squares alternate and all four corners are red?

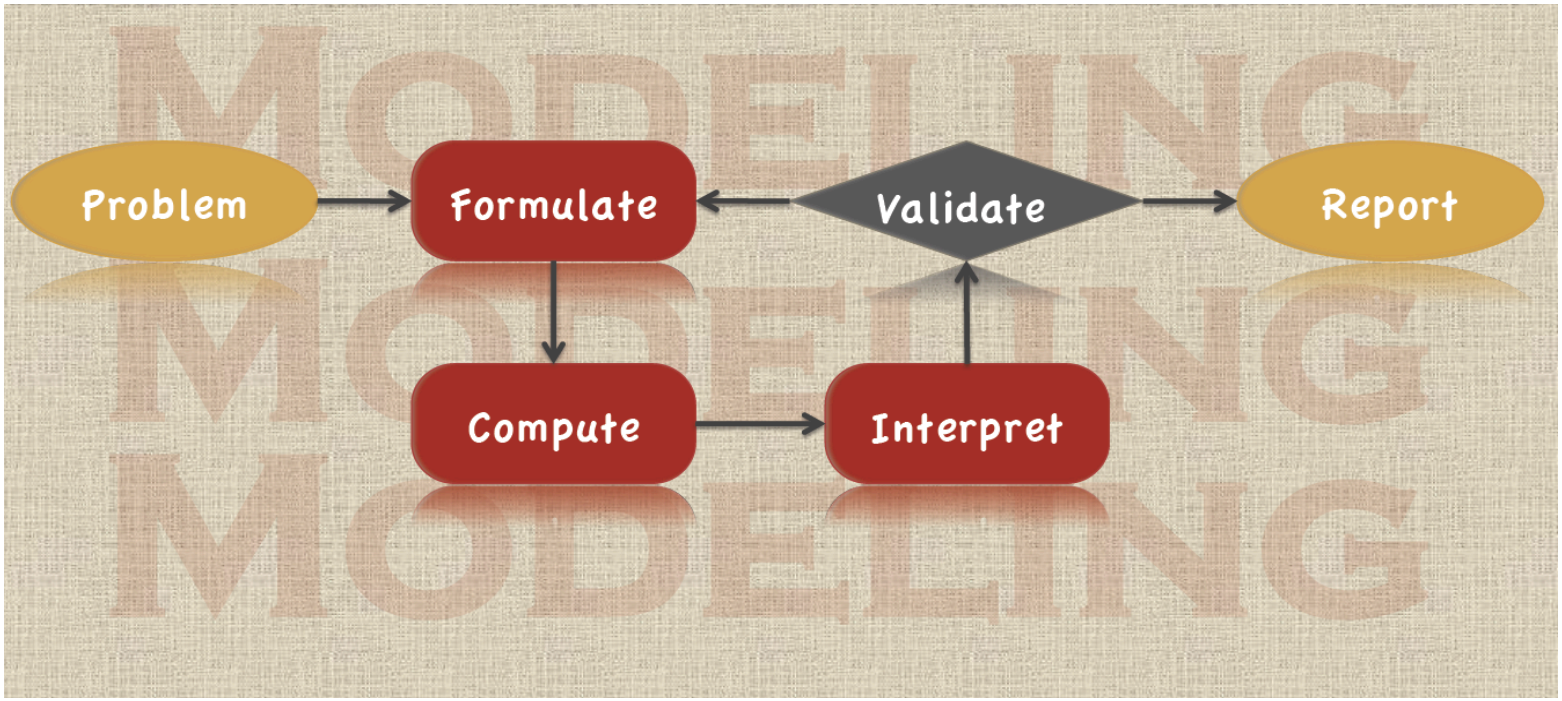
What did you see?







The Modeling Cycle



Model with Mathematics, the SMP

Students can

- Apply what they know
- Make assumptions and approximations to simplify a situation
- Identify important quantities in a situation
- Map relationships using diagrams, tables, graphs, etc.
- Analyze relationships mathematically to draw conclusions
- Interpret and reflect on their results

Mahalo!

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