Opening Activity:

*Preliminary question:* In the figure, as the step changes, _______ also changes. Fill in the blank in as many ways as you can.

Focus on the number of blue tiles and total tiles in each step. Represent each relationship as an equation, table, and graph.

Where do you see the elements of your equation in the tile pattern itself?
Structural Components of Algebra

- Generalization & Justification
- Modeling relationships with multiple representations
- Equivalence & Relational thinking

Conceptions of Variable

**Variable as unknown**
Focus on equality and equivalence

**Variable as varying quantity**
Developing concept of function and covariance
Astronaut Activity:

Watch the astronaut video and answer the following questions. First try to answer *without graphing* anything. Then go back again and create a graph. What does the graph do for us?

1) For how much of the video was the astronaut’s feet above a height of 4 inches?

2) Over what 3 second interval was she ascending fastest?

3) What was her height at the 5 second mark?
Development of Function Concept

**Correspondence**

*Input → 1 Output*

**Covariation**

*Relationship between variables*

<table>
<thead>
<tr>
<th>input (domain)</th>
<th>output (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>A</td>
</tr>
<tr>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>G</td>
<td>C</td>
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Definition: A relation between a set of inputs (domain) and a set of permissible outputs (range) with the property that each input is related to exactly one output.

Is each rule (relation) a function? If no, what is needs to change?

1. Triangles go to A, circles go to B and squares go to C.
2. Orange go to A, green go to B.
3. Orange go to A, triangles to B, and everyone else to C.
The factory presents a model that the contaminant will continue to travel towards the well at a rate of 2.4 km per year.

The city engineer develops a model that each year the contaminant will spread $\frac{1}{2}$ the total distance it has already spread.

1. How long will it take the contaminant to reach the well by the city engineer’s model?

2. How long will the spill take to reach the well by the factory’s method?

3. How are the two models alike?

4. How are the two models different?
Ferris Wheel Activity

Where will the orange car be after 25 minutes?

1. What do you need to know to figure this out?