2.1.1 How does it grow?

Seeing Growth in Linear Functions

Throughout this chapter you will explore the multiple representations of a linear function. You will look at tile patterns, using the growth and number of tiles in Figure 0 of these linear relationships to find specific connections between situations, tables, graphs, and equations.

The specific situation you will work with today is the growth of tile patterns.

As you work today, keep these questions in mind:

- How can you see growth in the tile pattern?
- How many tiles are in Figure 0?
- What is the connection between the pattern and the equation?
- What is the connection between the pattern and the table?

2-1. TILE PATTERN INVESTIGATION

Obtain a Lesson 2.1.1B Resource Page and find Pattern A, shown below. Complete the following tasks for Pattern A, recording your work on the resource page or on your paper as appropriate. (Do not consider Patterns B or D yet.) You may want to explore using the 2-1 Student eTool (CPM).
a. What do you notice about Pattern A? After everyone has had a moment on his or her own to examine the figures, discuss what you see with your team.

b. Sketch the next figure in the sequence (Figure 4) for Pattern A on your resource page. Figure 0 is the name of the figure that comes before Figure 1. Sketch Figure 0.

c. By how much is Pattern A growing? Where are the tiles being added with each new figure? Color in the new tiles in each figure with a marker or colored pencil on your resource page.

d. What would Figure 100 look like for Pattern A? Describe it in words. How many tiles would be in the 100th figure? Find as many ways as you can to justify your conclusion. Be prepared to report back to the class with your team’s findings and methods.

ey. Assume the starting value of any tile pattern is the number of tiles in Figure 0. Assume the growth is the number of tiles that are added from one figure to the next. What are the growth and starting value for Pattern A?

f. Write an equation that relates the figure number, \( x \), to the number of tiles, \( y \).

\[ y = 3x + 4 \]
Pattern B:
- Growth: 2
- Starting: 3
- Equation: y = 2x + 3

Pattern A

Pattern D

y = 3x + 4
2-3. The growth of tile Pattern C is represented by the equation \( y = 3x + 1 \).

a. Copy and fill in the table for Pattern C.

<table>
<thead>
<tr>
<th>Figure # ( x )</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td># of Tiles ( y )</td>
<td>1</td>
<td>4</td>
<td>7</td>
<td>10</td>
<td>13</td>
</tr>
</tbody>
</table>

b. By how many tiles is each figure in Pattern C growing? What is the starting value?

- Starting: 3(0) + 1
- Growth: +3

b. How can you use the table to determine the growth and starting value?

d. Where do you look in the equation to see the growth and starting value?
a. Draw Figures 0 and 4 for this pattern on the resource page.

b. Write an equation for the number of tiles in this pattern. Use color to show where the numbers in your equation appear in the tile pattern. Use $x$ for the figure number and $y$ for the number of tiles in the figure.

$$y = 4x + 1$$

Figure 1 Figure 2 Figure 3

c. Make a table for the equation you wrote in part (b). Does the information in your table match the figures in the tile pattern?

d. What is the same about this pattern and Pattern C? What is different? What would those similarities and differences look like in a tile pattern?

e. What do the similarities and differences in part (d) look like in the equations?

f. What do the similarities and differences look like in the table?