

# DAY 5: Circle Patterns

## Materials

*Copies:* 5.1 Circle Patterns  
5.2 Shrinking Pattern  
Ticket Out the Door Day 5

*Supplies:* Rulers  
Colored pencils (2 per person)

## Objective

Students will extend two linear patterns created with circles and predict how the graphs of those functions will look different from one another as a result of their rates of change or slope. Students will be able to explain that the greater the slope, the steeper the line. Students will extend a linear pattern where the number of circles is decreasing each time and graph the resulting ordered pairs to understand the concept of a negative slope.

## Student Talk Strategy

Report to a Partner for 5.1

Think-Pair-Share for 5.2

## Academic Language Use

Origin- The center of the coordinate plane, represented by the point  $(0,0)$ . This will be understood by the students as the “starting point” before graphing a point.

Coordinate Plane- The  $xy$ -coordinate plane has two coordinate axes, the  $x$ - and  $y$ -axis. They are perpendicular to each other. A point in the  $xy$ -plane is represented by two numbers,  $(x, y)$ , where  $x$  and  $y$  are the coordinates of the  $x$ - and  $y$ -axes.

$x$ -axis- The horizontal axis in the coordinate plane.

$y$ -axis- The vertical axis in the coordinate plane.

Slope- The rate of change. In this unit, students will understand slope, initially, as the amount a pattern grows each time and then later by the change in  $y$  compared to the change in  $x$ .

## Activity Notes

Note: Today’s major activity is very similar to Day 4’s to help the students cement their conceptual understanding of slope as it relates to growth in a pattern, on a table and on a graph.

### **15 minutes: Pattern A & B: Figuring our figures 4 & 5**

Pass out activity sheet 5.1 to each student. Give them 5 minutes to study pattern A and draw figures 4 and 5 on their own. When the 5 minutes are done, have students “Report to a Partner”, take turns sharing what they drew and how they figured that out. Circulate to make sure students have built the pattern correctly and ask them questions, such as, “How do you see this growing?” “How many circles are in figure 1?” “What is different about figure 3?” Select a student to present the pictures of

figures 4 & 5 and to share the data in the T-chart (it is essential that all students have the correct data). Repeat the same process for pattern B.

**10 minutes: Analysis Questions & Predictions**

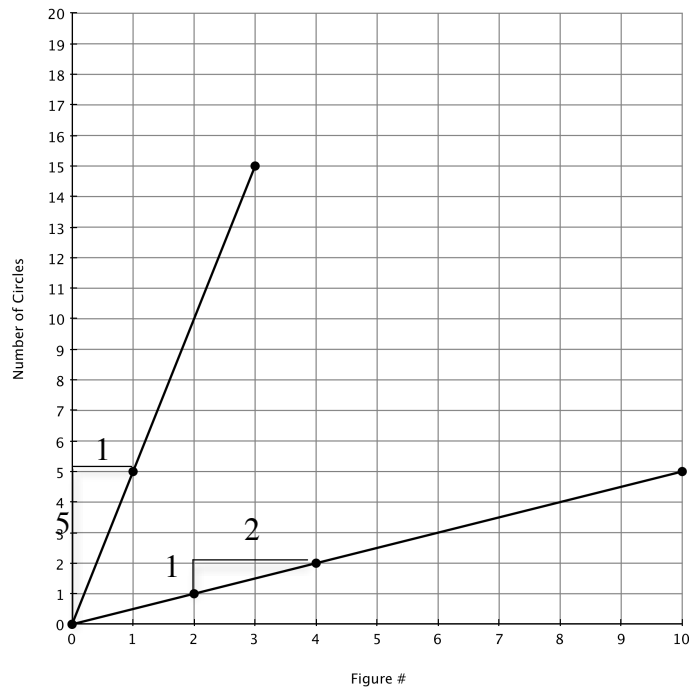
Put the students into groups of 2. Give the students 5 minutes to answer questions 1-4. Use random selection to have a few students share their responses to each question. For question #1, you want to guide the class to see that the pattern is increasing by 5 each time. For question #2, you want to guide the class to see that the pattern is increasing by  $\frac{1}{2}$  each time (or it increases by 1 every 2 figures).

**5 minutes: Making the Graph**

Pass out the colored pencils. Model with the students how to graph the first 3 points from the table for Pattern A. Give them the remaining time to graph all the points from Pattern A and draw a line to connect those with one color and then graph all the points for Pattern B and connect those with a different color. Set the timer to make sure they finish by the end of the 10 minutes. Circulate to assess students and question them to guide them in the right direction.

**5 minutes: Analysis**

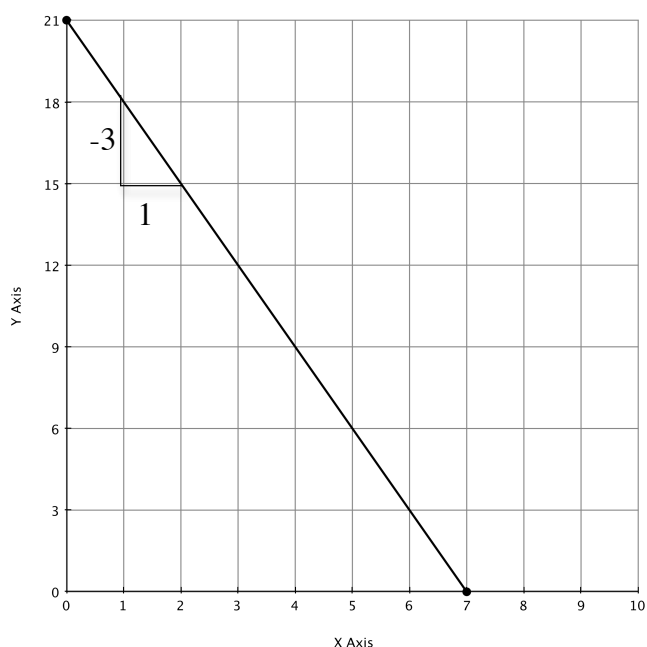
Select a student to bring their graph up to share. Ask the students if their predictions from question #4 were correct or not. Show the class where the growth of 5 and the growth of  $\frac{1}{2}$  show up on the graph by drawing a slope triangle (note: the students will formally begin slope triangles on Day 6)



### 20 minutes: Shrinking Pattern

Pass out activity sheet 5.2. Give the students 5 minutes to try to figure out the pattern on their own. Then allow them to work with a partner to draw figures 4 and 5 and complete the table. Have the students do a think-pair-share to discuss questions 1-3. Set the timer for 2 minutes to allow each student to think (and write, if desired). Then have the pairs take turns sharing ideas. Finally, select a few students to share. The major idea you want to guide the students to see are that the pattern is decreasing (or you are subtracting) each time. Note: While there is no circle picture that would satisfy figure 10, the 10 is left in the table to help the students see the pattern and the function (as separate from the concrete objects representing part of it. If the students are confused, they can stop the chart at figure 6 and still learn all that is intended!!)

Give the students 5 minutes to graph the coordinates. Have a volunteer bring up their graph to share and ask the students, "What is different about this graph?" Give them 30 seconds to think silently. Ask them, "How is what is different in the graph related to how this pattern was different from all the other ones?" Give them 1 minute to discuss with a partner and then select students to share ideas. Guide the class to the major idea for this activity: when you subtract from the pattern each time, the line goes down (meaning the slope is negative); when you added the same amount each time, the graph went up.



### 5 minutes: Ticket out the Door

Pass out the Ticket out the Door and have the students raise their hands when finished (so that you can check it and then dismiss them).