# **Bullseye**

### **Your Challenge**

How are the circumference and area of a circle related to its radius?

#### Use graphing technology to investigate the relationship between the radius, circumference, and area of a circle.\*

- **a.** Open the graphing technology program.
- **b.** Type (0, 0) in the field to enter a center point for the circles.
- c. Use the *Circle* tool to draw circles with their center at the origin and with radii of 1, 2, 3, 4, and 5 units.
  - Do the circumferences of the consecutive circles appear to be in a proportional relationship? Explain.

2 Do the areas of the consecutive circles appear to be in a proportional relationship? Explain.

**d.** Investigate the relationship between circumference and radius. Use the *Length* tool to find the circumference of each circle to the nearest tenth. Then open a new graphing window and plot five points using the format (radius, circumference) where the radius is the x-coordinate and the circumference is the y-coordinate. Connect the points.

What does the graph of the connected points look like?

Can you tell from the graph if the relationship between the circumference and the radius of a circle is a proportional relationship? Why or why not?

<sup>\*</sup> You may need to adjust the steps depending on which geometry software program you use. If needed, use Help or Support menus or online tutorials.



## **Bullseye**

e. Investigate the relationship between area and radius. Use the Area tool to find the area of each circle to the nearest tenth. Then open a new graphing window and plot five points using the format (radius, area) where the radius is the x-coordinate and the area is the y-coordinate. You may want to adjust the intervals on the axes in the Settings menu so the x-axis extends from 0 to 10 and the y-axis includes the maximum area. Connect the points.

5 What does the graph of the connected points look like?



6 Can you tell from the graph if the relationship between the area and the radius of a circle is a proportional relationship? Why or why not?

f. Look back at your answers to problems 1 and 2.



7 As the length of the radius of a circle increases, does the circumference increase proportionally? Does the area of the circle increase proportionally? Do your answers match your initial guesses in problems 1 and 2?



# **Build a Chicken Run**

### **Your Challenge**

Emma wants to build a run for her chickens. A *run* is an enclosure that gives chickens access to outdoor space. She wants the enclosure to be a composite figure, made of a rectangle and another figure, that has a total area of 100 square meters and uses as little fencing as possible.

#### Use graphing technology to design a composite figure with an area of 100 square meters.\*

- a. Open the graphing technology program.
- **b.** Use the *Polygon* tool to draw a composite figure in the grid space. The composite figure must be composed of two shapes, at least one of which must be a rectangle. This composite figure models the enclosure.
- c. Use the Area tool to calculate the area of the composite figure.
- **d.** Adjust the composite figure, or draw a new one, so that you have a figure that has an area of 100 square units.
- **e.** Use the *Distance* or *Length* tool to calculate the length of the sides of the figure. Find the perimeter.
  - 1 Describe your composite figure or sketch a drawing of it. How much fencing would be needed to build an enclosure shaped like this?

**f.** You may want to take a screenshot of the composite figure that includes the area of the figure and the lengths of the sides. Copy the screenshot into a blank document to keep track of the composite figures you draw.

<sup>\*</sup> You may need to adjust the steps depending on which graphing program you use. If needed, use Help or Support menus or online tutorials.



## **Build a Chicken Run**

- g. Analyze the composite figure. Think about ways you can change the composite figure so that the area of the figure remains 100 square meters but the perimeter decreases.
- **h.** Use the *Polygon*, *Area*, and *Distance* tools to make and record other composite figures. Try to decrease the perimeter of the enclosure while keeping the area the same. Stop when you think you have drawn an enclosure that will use the least amount of fencing possible.



2 Describe the ways you changed your composite figure to make the perimeter smaller.



Obscribe and sketch the enclosure you believe has the smallest perimeter with an area of 100 square meters. Explain why you chose this composite figure.