Day 2: Perimeter Strings

Understanding Circumference

Materials:

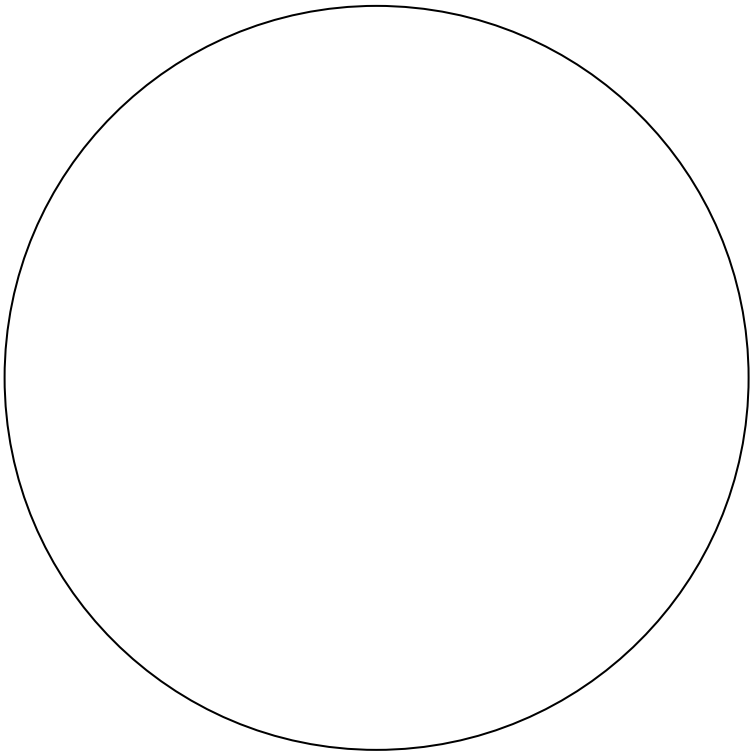
Paper with a circle on it.
Length of string at least four times the length of the diameter.
Glue or tape

1. Get a circle and a length of string.
2. Conjecture: How many diameters are needed to go around the entire circle? Describe the process you would use to check your conjectures.

3. Use your process to test your conjecture.
4. How accurate is your experiment? Describe a process you could use to be as accurate as possible in finding out how many diameters are needed to go around the entire circle.

5. Describe the relationships shown in the formulas $C = 2\pi r$ and $C = \pi d$. How does your experiment relate to these formulas? Your explanations should be able to convince a classmate that these formulas are correct.

Exploring the Relationships Between the Circumference and the Diameter of a Circle



Perimeter Strings Preview (Teacher Copy)

Today you will be given 7 different circles with different diameters.

Question 1:

a) What do you think the relationship will be between the radius of a circle and the diameter of the same circle?
Math Experiments: Math Explanation:

b) If you increase the radius of a circle by one, what will happen to the diameter and why?

Math Experiments: Math Explanation:

c) If you increase the diameter of a circle by one, what will happen to the radius and why?

Math Experiments: Math Explanation:

Question 2:

a) What do you think the relationship will be between the diameter of a circle and the length of the outer edge of the same circle? That is, how many diameters are needed to go around the entire circle?
Math Experiments: Math Explanation:

b) If you increase the diameter of a circle by one, what will happen to the circumference of the circle and why?
Math Experiments: Math Explanation:

c) If you increase the circumference of a circle by one, what will happen to the diameter and why?
Math Experiments: Math Explanation:

Question 3:

a) What do you think the relationship will be between the radius of a circle and the length of the outer edge of the same circle? That is, how many radii will be needed to go around the outer edge of the circle?

Math Experiments: Math Explanation:

b) If you increase the radius of a circle by one, what will happen to the circumference of the circle and why?

Math Experiments: Math Explanation:

c) If you increase the circumference of a circle by one, what will happen to the radius and why?

Math Experiments: Math Explanation:

Before you get your circles, create a chart for your measurements so that you can answer the above questions.

You may want to include items of comparison beyond just the measurements of the diameter, radius and circumference.

Once you have completed your chart you will get three pieces of grid paper. The increments on each grid paper are for one centimetre.

Graph 1: Enter your data comparing the radius to the diameter. Draw a line of best fit.

Graph 2: Enter your data comparing the diameter to the circumference. Draw a line of best fit.

Graph 3: Enter your data comparing the radius to the circumference. Draw the line of best fit.

On the back of your first graph, explain the relationship you see between diameter and radius.

Does your data and graph help you explain Question 1 from before? Here it is again:

Question 1:

What do you think the relationship will be between the radius of a circle and the diameter of the same circle?

a) If you increase the radius of a circle by one, what will happen to the radius and why?

b) If you increase the diameter of a circle by one, what will happen to the diameter and why?

On the back of your second graph, explain the relationship you see between diameter and circumference.

Does your data and graph help you explain Question 2 from before? Here it is again:

Question 2:

What do you think the relationship will be between the diameter of a circle and the length of the outer edge of the same circle? That is, how many diameters are needed to go around the entire circle?

a) If you increase the diameter of a circle by one, what will happen to the circumference of the circle and why?

b) If you increase the circumference of a circle by one, what will happen to the diameter and why?

On the back of your third graph, explain the relationship you see between radius and circumference.

Does your data and graph help you explain Question 1 from before? Here it is again:

Question 3:

What do you think the relationship will be between the radius of a circle and the length of the outer edge of the same circle? That is, how many radii will be needed to go around the outer edge of the circle?

a) If you increase the radius of a circle by one, what will happen to the circumference of the circle and why?

b) If you increase the circumference of a circle by one, what will happen to the radius and why?

Perimeter Strings Preview (Student Copy)

Today you will be given 7 different circles with different diameters.

Question 1:

a) Math Experiments: Math Explanation:

b) Math Experiments: Math Explanation:

c) Math Experiments: Math Explanation:

Question 2:

a) Math Experiments: Math Explanation:

b) Math Experiments: Math Explanation:

c) Math Experiments: Math Explanation:

Question 3:

a) Math Experiments: Math Explanation:

b) Math Experiments: Math Explanation:

c) Math Experiments: Math Explanation:

Perimeter Strings:

Materials:

Perimeter Strings (To make perimeter strings, lay out a string and mark it for every centimetre up to 30 cm long)
Set of Circles (radius of 1 cm up to 7 cm)
Graph Paper (3)

1. Cut out one set of circles.
2. Using your perimeter strings, find the circumference for each of the circles. Make a chart from the smallest value to the largest value. Using your perimeter strings, measure the radius and the diameter of each circle. Put the values into your chart.

3. Graph the following and draw a line of best fit. A **line of best fit** is the straight line that is as close as possible to all the data points.
    a. Radius vs Diameter
    b. Radius vs Circumference
    c. Diameter vs Circumference

4. For each graph, describe the **rate of change**. A **rate of change** is the relationship between the two variables you are graphing. For example, as your radius changes by one, what happens to your diameter? When we compare these changes by looking at the changes in the vertical variable (rise) and the horizontal variable (run) we call the result the **slope** of the line.

    The slope of a line is the rise divided by the run.

$$slope = \frac{rise}{run}$$

Radius and Diameter			**Radius and Circumference**			**Diameter and Circumference**		
Change in Radius	Change in Diameter	Slope	Change in Radius	Change in Circumference	Slope	Change in Diameter	Change in Circumference	Slope
1			1			2		
2			3			4		
3			5			7		

5. For your 3rd graph, what does it mean that the slope of your line was π? (Note: your measurements may have slight inaccuracies)

6. How accurate was your slope for each question? By what percentage were your measurements off?

7. Imagine that there was a rope tied around the earth. If the earth were a perfect sphere, how much more rope would be needed to raise the rope so it was 1 m off the ground all around the earth? Show your math experiments and explain your thinking.