# It’s as Easy as Pi

Unit 4: Positively Perfect Plane Figures

**Grade Level**

Grade 5

**Overview**

In this task, students will discover the relationship between a circle’s circumference and its diameter as an introduction to pi by measuring several circular objects.

**Key Standards**

M5G2. Students will understand the relationship of the circumference of a circle, its diameter, and pi (π or 3.14).

**Possible Materials**

- circular objects of varying sizes (try to include one large and one small circle per group)
- string or yarn that does not stretch (I used ribbon)
- scissors
- tape
- construction paper or heavy weight paper (legal sized)
- rulers or tape measures
- pencils and markers
- calculators

**Task**

Students will be given several circular objects. They will be instructed to use string to wrap around the circumference of each object, cut the string and record this measurement. Then take the “string circumference” and stretch it across the diameter of the circle it represents. Cut from the “string circumference” one diameter. Measure and record the diameter.

At this point have students make predictions about how many more “diameters” can be cut from the “string circumference”. Ask guiding questions such as:

- “Will larger circles produce more or less diameters from their circumferences?”
- “What about the small circle?”
- “How do you know?”

After discussion within their groups, have students write down their predictions and justify their reasoning before proceeding to measure the remaining circles.

Guide students to see the ratio (3.14) is consistent regardless of the size of the circle.
“Three and a little more” is adequate at this early stage. Most string will not give an exact 3.14 measurement. Have student groups share their findings to the class. This is a good time to explain the history of pi to students. It is very empowering for students to see they have discovered the same relationship that was used by ancient peoples.

Sample Questions

Questions for groups (Work time):

- How did you decide to begin?
- How did you divide the work?
- Which part of the circle is the diameter? How would you define it?
- Which part of the circle is the circumference? How would you define it?
- How do you know where to start measuring? Why is it important to start there?
- Why are you not using the standard side of the ruler? (Which side did you choose & why?)
- How many whole diameters did you cut for the 1st circle?
- How much would you estimate was left over after 3 diameters?
- What do you think that leftover part would be as a fraction? A decimal?
- How do you know? (fraction/decimal)

For 3rd or later circles

- What is the diameter of this circle? Can you make an estimate of the circumference based on the measurement of the diameter?
- What are you noticing about the relationship of the circumference and the diameter?
- Would that relationship change if the circle were larger/smaller? Why or why not?

Sample Question Solutions

- Students should be able to “show” diameter and circumference. (Diameter: a line segment passing through the center of circle with both end points on the circle. Circumference: the distance around the circle. Note: the diameter is a line segment and circumference is a measurement.)
- Students should be able to show correct use of a ruler. Many students will attempt to begin measuring at the end of the ruler, not at the zero mark, thus making their measurements slightly inaccurate.
- Students should be able to communicate why they chose either the metric side of the ruler or the standard side. Students could chose the metric side if they feel more comfortable converting those measurements into decimals.
- Students should be able to explain there were more than three “whole” diameters cut from the circumference and make an estimate of the left over amount in either a fraction or a decimal. At the very least be able to explain the amount is less than ¼.
- As students measure subsequent circles they should be able to see all the circles will have a diameter that is a little less than 1/3 the circumference despite the size of the circle.
### Assessment Ideas

- **Anecdotal Notes** – Record these during work time as you question group members. As this is an initial introduction of pi, it is advisable to focus on the students’ understanding of the vocabulary (circumference, diameter, & pi) and the idea pi is consistent regardless of the circle’s circumference and diameter.

- **Group Measurement Graph and Group work sample** – This is a good assessment of M5P3 - how well students can communicate the math they know.

- **Short Independent Practice** – This can be given as either homework or as a “ticket out the door”.