Ratios in Regular Polygons

Math Concepts

- fractions
- segments
- decimals
- polygons
- linear measure
- congruence
- ratio
- similarity
- proportion

Materials

- TI-15 Explorer™
- **Ratios in Regular Polygons** recording sheets
- rulers and pencils
- protractors

Overview

Students will use linear measurement and calculators to investigate the ratios between corresponding parts of regular polygons.

Introduction

1. Have students draw several triangles, compare their triangles with those of other students, and look for any similarities among all the triangles.

   Note: There should be very few similarities.

2. Next, have students draw several equilateral triangles, compare their triangles with those of other students, and look for similarities.

   Note: They are all the same shape but different sizes.

3. Have students do the same experiment with rectangles, and then squares.

   Note: The rectangles come in all shapes; the squares are all the same shape but different sizes.

4. Introduce the term *similar figures* to mean "having the same shape but not necessarily the same size."

5. Give students the picture of several different-sized squares (see page 98). Have students measure the length of the diagonal and the perimeter of each square, record their findings on the recording sheet, and look for patterns.

6. Have students record the same data for other regular polygons of several different sizes and look for patterns. Regular hexagons, pentagons, and octagons are on page 98.

Ratios in Regular Polygons *(continued)*

Collecting and Organizing Data

While students generate data for the different sets of similar figures, ask questions such as:

- How are all of these squares (or hexagons, pentagons, etc.) alike?
- How are you measuring the diagonals?
- How are you measuring the perimeters?
- How do you know your measurements are reasonable?
- Does it matter whether you measure in inches or centimeters? Why or why not?
- What patterns do you see? Why do you think those patterns are occurring?

How can you use division with the calculator to help you look for patterns?

How can you use F↔D to help you look for patterns?

How can you judge if what you see on your calculator is reasonable?

How can you use the calculator and the patterns you see to help you predict measurements?

Analyzing Data and Drawing Conclusions

After students have made and compared several sets of measurements, have them discuss their results as a whole group. Ask questions such as:

- Did your data turn out exactly like everyone else's? Why or why not?
- What patterns do you see in your data?
- How are the diagonals and the perimeters of squares related to each other? Of regular pentagons? Of regular hexagons? Of regular octagons?
- From the patterns in your data, what conjectures can you make about measurements in similar figures?

What operations or keys did you use on the calculator to help you find patterns in this activity? Why did you choose those operations or keys?

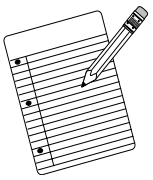
How did you determine if your calculator results were reasonable?

Continuing the Investigation

Have students:

- Look for relationships between measurements of other parts of similar figures; for example, perimeter and area.
- Investigate similar figures other than regular polygons; for example, different sizes of nonsquare rectangles that are the same shape, different sizes of scalene triangles that are the same shape, etc.

Name:



Ratios in Regular Polygons

Recording Sheet

Collecting and Organizing Data

Polygon investigated: _____

Measurement of Perimeter	Measurement of Diagonal	Ratio of Perimeter to Diagonal	Ratio in Decimal Form

Analyzing Data and Drawing Conclusions

What we noticed about the ratios of the different-sized polygons:

Questions we thought of while we were doing this activity:

Ratios in Regular Polygons

Regular Polygons of Different Sizes