Square Roots

STRAND: Number and Number Sense

STRAND CONCEPT: Exponents/Squares/Square Roots

SOL 6.4; 7.1d; 8.3a, b

Remediation Plan Summary

The students will explore the relationship between the square shape and the square root. They will estimate the square root of numbers that are not perfect squares. This lesson does not explore negative square roots.

Common Misconceptions

- Students will confuse the square root of a number and divide it by two instead of the square root. They might know the square root of small numbers like 25 or 16 but they think the square root of 10 is 5.
- When given the area of a square and students are asked to find the side length, students may divide by 4 instead of finding the square root of the area.

Materials

- Scissors
- “Squares Template” activity sheet
- Colored pencils
- Calculators
- “Perfect Squares” handouts
- White boards (optional)
- “Square Roots” recording sheet

Introductory Activity

Write the following incomplete sequences on the board. Ask students to complete the sequences and explain them.

- 1, 3, 6, 10, __, __, __, __
- 1, 1, 2, 3, 5, 8, __, __, __, __
- 1, 3, 5, 7, __, __, __ , ___ , __
- 9, 23, 37, 51, 65, __, __, __, __

Plan for Instruction

1. Make enough copies of the “Squares Template” activity sheet on card stock or heavy construction paper for each student to have two sheets.

2. Give each student a pair of scissors and two sheets of the “Squares Template.” Have the students cut out the squares from one of the templates so that they each have 56 individual squares.
3. Ask students to construct as many different sizes of larger squares out of their individual squares as they can. For each one they make, they should copy and shade it on the intact template, using a different color for each square.
4. After recording their squares, ask students to write the area of each larger square below the square on the template.
5. Conduct a class discussion. Begin by asking the class what areas their squares have, and record the areas on the board. Ask the students if these numbers look familiar.
6. Ask the students to take 15 individual squares and create a large square. *Is this possible*? Have them try 7, 8, and 3. Once the students are convinced that these numbers of individual squares cannot produce larger squares, write “15, 7, 8, 3” on the board apart from the perfect square numbers. *What is special about 4, 9, 16, 25, and 36 that is not true of 15, 7, 8, and 3?* Once the students come to that conclusion, name the special numbers *perfect squares*.
7. Once the perfect squares are named, point out the factors that are the square roots. Associate the square roots with the length of one side of each larger square. Ask students to identify in writing the perfect square numbers and the square roots for each larger square.
8. Have students work in pairs to answer the following questions: “*The first six perfect square numbers are 1, 4, 9, 16, 25, and 36. What are the next five? How did you find your answers?”* Assist partners in finding a strategy, if necessary.
9. Have the groups share their answers.
10. Ask students for the square roots of a number you call out. Begin with three or four perfect squares. Then ask for the square root of 15. Students should have difficulty. At this point, pass out the “Perfect Squares” list handouts, and ask the students to find where 15 would fall on the list.
11. If time permits or in the next lesson, distribute white boards to students. Call out a number that is not a perfect square, and ask students to estimate the square root of that number by giving the two whole-number square roots it falls between. Allow students to consult their list of perfect squares. Have students write their answers on the white board and hold them up for you to check. Continue for as long as needed. This is a good activity to repeat daily as a brief review.
12. Conclude the lesson by having the students complete the “Square Roots” worksheet for review.

Pulling It All Together (Reflection)

Exit Ticket: Have students explain in writing how a perfect square and a square root relate to the area of a square. Allow them to use drawings in their explanations.

Note: The following pages are intended for classroom use for students as a visual aid to learning.

Squares Template

Perfect Squares

1

4

9

16

25

36

49

64

81

100

121

144

Name:

Square Roots

Approximate the following square roots. Between which two perfect square numbers does the answer lie?

1. $\sqrt{33}$ __________________
2. $\sqrt{46}$ __________________
3. $\sqrt{26}$ __________________
4. $\sqrt{62}$ __________________
5. $\sqrt{87}$ __________________

Use a calculator to determine whether each of the following numbers is a perfect square. Support your answer.

1. 96 ____________
2. 132 ____________
3. 529 ____________

Find each of the following measurements.

1. Find the length of the side of a square whose area is 144 in^{2}.

   ____

2. Find the area of a square whose side length is 10 cm.

   ____