## Activity Overview

In this activity, students develop an understanding of the relationship between a number and its square root. They will first recognize perfect squares and order them from least to greatest with other numbers. Then students will estimate the square root of a number using perfect squares.

Topic: Numbers and Operations

- Understand meanings of operations and how they relate to one another
- Understand and use the inverse relationships of addition and subtraction, multiplication and division, and squaring and finding square roots to simplify computations and solve problems

Teacher Preparation and Notes

- Grid paper may be helpful for students that are more visual learners. Have grid paper available as needed for students.
- **To download the student worksheet, go to education.ti.com/exchange/esr**
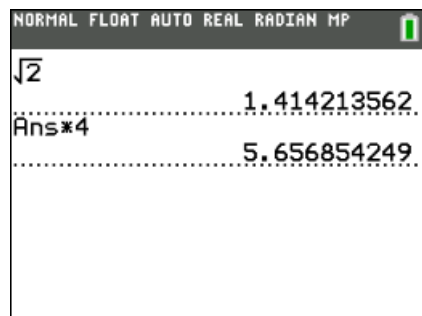
This activity utilizes MathPrint™ functionality and includes screen captures taken from the TI-84 Plus C Silver Edition. It is also appropriate for use with the TI-83 Plus, TI-84 Plus, and TI-84 Plus Silver Edition but slight variances may be found within the directions.

Compatible Devices:
- TI-84 Plus Family
- TI-84 Plus C Silver Edition

Associated Materials:
- Estimating_Square_Roots_Student.pdf
- Estimating_Square_Roots_Student.doc

Tech Tips:
- Access free tutorials at http://education.ti.com/calculators/pd/US/Online-Learning/Tutorials
- Any required calculator files can be distributed to students via handheld-to-handheld transfer.

Part 1 – Ordering Squares

The lesson can start with a brief discussion about what it means to square a number. Then, give students a square and ask how you would find the number that can be squared to find the square.

<u>Questions 1–2</u>

Students should recognize perfect squares to be able to find the square root. If desired, students can take time to explore square roots on the calculator. To find the square root of a number, press [2nd] [√], then enter the number, and press [ENTER].

Students need to recognize that square roots between perfect squares have roots that fall between the roots of the perfect squares as well. For example, any square root between $\sqrt{9}$ and $\sqrt{16}$ will be between 3 and 4.
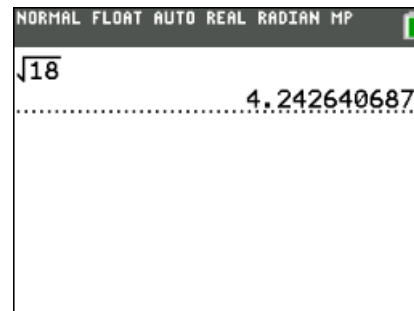
Part 2 – Finding the Running Distance

<u>Questions 3–6</u>

In this set, students may forget to multiply the square root by 4, the total number of sides. The intent of this exercise is to help students make a stronger connection between a square root and the length of the side of the square. To use the TI-84 to perform the calculations, press [2nd] [√] [2] [ENTER] [×] [4] [ENTER].
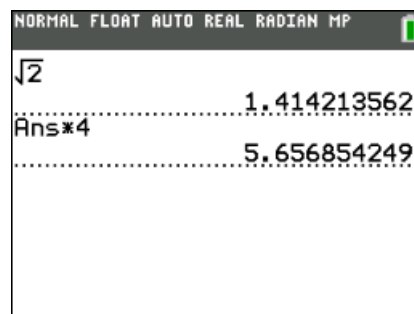
Part 3 – Mixed Up Carpets

<u>Questions 8–11</u>

Students may take several approaches to solving this set of problems. They may find the area of each room and then compare to the size of the carpets. Help students see that they can estimate the size of the non-square rooms as squares and then compare to the carpet sizes.

Students can also take the square root of each carpet roll and see what the length of a square room would likely be.

Grid paper may be a good in this situation so students can draw the rooms and visualize what the area of each would be.

Part 4 – Estimating Square Roots

Students are going to want to go right to the calculator to get the answer and skip the estimation step. Try to make sure they come up with an estimate to see that their approximate answer is close to the calculator's answer.

Discuss the estimation process with the class. For Instance, $\sqrt{50}$ can be described in the following ways:

- It is about 7

- It is between 7 and 8 but closer to 7

- It is about 7.1

Solutions to Student Worksheet

Part 1

1. 4, $\sqrt{25}$, 10, 2, $\sqrt{49}$, 6, $\dfrac{8}{3}$, $\sqrt{81}$ **Answer: 2, $\dfrac{8}{3}$, 4, $\sqrt{25}$, 6, $\sqrt{49}$, $\sqrt{81}$, 10**

2. –1, $-\sqrt{36}$, 5, $\sqrt{16}$, –3, 7, $\sqrt{121}$, $-\sqrt{64}$ **Answer: $-\sqrt{64}$, $-\sqrt{36}$, –3, –1, $\sqrt{16}$, 5, 7, $\sqrt{121}$**

Part 2

3. 2 square km **Answer: long**

4. 3 square km **Answer: none**

5. 1.2 square km **Answer: long**

6. 0.3 square km **Answer: short**

7. Explain how you determined which perimeter fit in which category.

    Answer: Answers will vary. Students should recognize that they must take the square root of the area to get the length of one side and then multiply by 4.

Part 3

8. 180 sq ft **Answer: Bedroom 2**

9. 330 sq ft **Answer: Living Room**

10. 45 sq ft **Answer: Hallway**

11. 102 sq ft **Answer: Bedroom 1**

Part 4

12. $\sqrt{30}$ **Answer: about 5.5, 5.48**

13. $\sqrt{42}$ **Answer: about 6.5, 6.48**

14. $-\sqrt{15}$ **Answer: about –3.9, –3.87**

15. $\sqrt{50}$ **Answer: about 7, 7.07**

16. $\sqrt{\dfrac{1}{4}}$ **Answer: about 0.5, 0.5**

17. $\sqrt{.5}$ **Answer: about 0.8, 0.71**