Square Tables

Activity Overview

In this activity, students will make a variety of squares using square tiles and use the Table feature of the calculator to discover patterns and make predictions of those patterns.

Topic: Algebraic Thinking

- Develop understanding of square numbers
- Represent, analyze, and generalize a variety of patterns with tables, graphs, words, and, when possible, symbolic rules

Teacher Preparation and Notes

- **To download the student worksheet, go to education.ti.com/exchange/st**

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X	Y1			
1	1			
2	4			
3	9			
4	16			
5	25			
6	36			
7	49			
8	64			
9	81			
10	100			
11	121			

X=1

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:
- Square_Tables_Student.pdf
- Square_Tables_Student.doc

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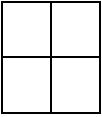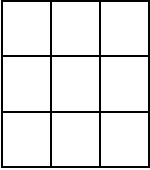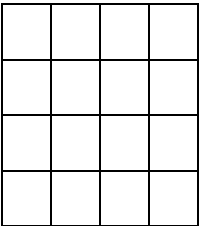- Any required calculator files can be distributed to students via handheld-to-handheld transfer.

Part 1 – Planning a Party

In this problem, students will use square tiles to create perfect squares. Describe the following scenario to students. They are planning an end-of-year banquet and need to plan for seating. The tables will be made from student desks which each take up 1 square yard. Desks are put together to form square tables.

Questions 1–3

If each group has 50 tiles, they can create up to a 7 × 7 table.

Discuss with students patterns they are seeing in the table they are creating. Explain to students that the number of desks on each side is also the side length because each desk has a side length of 1 yard. (1 yard × 1 yard = 1 square yard) The total number of desks is the total number of tiles that they used to create the table.

Number of Desks on Each Side	Total Number of Desks	
1	1	
2	4	
3	9	
4	16	

Questions 4–5

Discuss square numbers with students. Point out that all of the shapes built for this activity were squares because the length and width used to build the tables were the same number.

Guide students to write the pattern using *x* and *y*.

If the side length is *x* and the total number of tiles is *y*, how could the pattern be written using these variables?

$$x \cdot x = y \quad \text{or} \quad x^2 = y$$
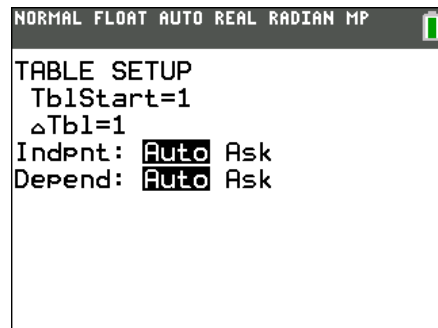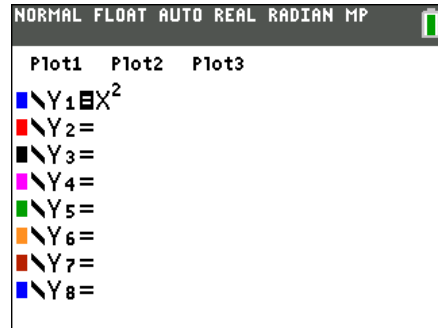
Part 2 – Square Number Tables

Questions 6–7

Show students how to create a table. They first have to enter the agreed upon function in the Y= editor. Press Y= CLEAR X,T,Θ,n x² ENTER. Pressing CLEAR is necessary if there is a previous equation beside **Y1**.

Note: If any of the **Plots** are highlighted, students can move the cursor up to each Plot number and press ENTER to turn that plot off. This is only necessary if you want to show the graph as well.

After the equation is entered, the next step is to set up the table format. Students will press 2nd [TBLSET] and change the settings as shown at the right. Once the table is set, press 2nd [TABLE].

Questions 8-12

To explore the table generated, students need to use the ▲ and ▼ keys. If desired, the table set up can be changed at any point by returning to the TABLE SETUP menu. Use the table to help students explore and answer the questions on the worksheet.

Extension

Use the triangular pieces from pattern blocks and investigate triangular numbers and their patterns.

Solutions – Student Worksheet

Part 1

1. Use the number tiles provided by your teacher to create as many different size square tables as possible. Fill in the following table with the sizes you find. Look for any patterns that may appear.

   Answer:

Number of Desks on Each Side	Total Number of Tiles
1	1
2	4
3	9
4	16
5	25
6	36
7	49

2. What do you notice happening to the total number of desks?

   Answer: Answers will vary. The number of blocks is going up. Students may begin to see that the number is the side times the side.

3. Can you see a pattern? If so, what is it?

   Answer: Answers will vary. Students should start to see a pattern. Side times side is the pattern.

4. Write the pattern you see in terms of *x* and *y*. **Answer: $x \cdot x = y$ or $x^2 = y$**

5. Discuss what you think square numbers are with another student. What are square numbers? Why do you think they are called square numbers?

   Answer: Check students' answers. They should begin to see that these numbers are "square numbers" because they create a perfect geometric square.

Part 2

8. How many student desks would be needed to create an 8 × 8 table? **Answer: 64**

9. If there are 121 desks and you wanted only one table, what is the largest size table that can be created? **Answer: 11 by 11**

10. Would this be an efficient way to seat everyone? Why or why not?

    Answer: No, because there will be lots of chairs in the middle of the square and no one can sit at them. Students can only sit around the perimeter.

11. Write about what a square number is and why it is called a "square number".

    Answer: Check students' answers.

12. Give at least 3 examples of square numbers.

    Answer: The numbers provided should be squares.