Algebra Activity: Patterns in Square Roots

Linda Wallace

CALCULATORS: Casio: *fx-260 Solar* • Casio: *fx-260 Solar School*

Teaching Notes

Grade Level: Middle School

Topic: Geometry and Measurement, Patterns

Objectives: ***To use the square root key to find the base or height measure of a square when given its area.***

To discover a pattern between the number of digits in a square number and the number of digits in its square root. This pattern can help students understand the relationship between these two values and can help them predict if their solutions make sense when relying on their own mental or paper and pencil calculations.

Using the Activity:

Finding the square root of a number is the inverse process to squaring a number. Since area represents the square of the base or height measure, to find the base or height measure you take the square root of the area. After finding the square root of the area, students should square the number to verify that the two processes are inverses of each other.

To reinforce what the numerical values for the symbolic x^2 and $\sqrt{\ }$ represent when referencing a square figure, students should create and label squares of different sizes. Using graph paper to create squares will reinforce the concepts of base and height as well as the concept of area as a value equal to square units.

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Answers:

	x^2	$\sqrt{\ }$	Number of Digits in x^2	Number of Digits in $\sqrt{\ }$
1.	4	2	1	1
2.	9	3	1	1
3.	16	4	2	1
4.	25	5	2	1
5.	64	8	2	1
6.	81	9	2	1
7.	100	10	3	2
8.	169	13	3	2
9.	625	25	3	2
10.	2025	45	4	2
11.	8100	90	4	2
12.	10,000	100	5	3
13.	30,625	175	5	3
14.	271,441	521	6	3
15.	490,000	700	6	3
16.	3,508,129	1873	7	4
17.	4,481,689	2117	7	4
18.	25,806,400	5080	8	4
19.	81,000,000	9000	8	4
20.	100,000,000	10,000	9	5

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1. If a square is a one or two-digit measure in size, its base and height measure is a single digit measure. (The numbers are the same number or one number apart in the Number of Digits in x^2 and Number of Digits in $\sqrt{\ }$ columns.) ex. 1 or 2 –1 = 1

If a square is a three or four-digit measure in size, its base and height measure is a double-digit measure. (The numbers are one or two numbers apart in the Number of Digits in x and Number of Digits in $\sqrt{\ }$ columns.) ex. 3 – 2 = 1 or 4 – 2 = 2

If a square is a five or six-digit measure in size, its base and height measure is a triple-digit measure. (The numbers are the two or three numbers apart in the Number of Digits in x and Number of Digits in $\sqrt{\ }$ columns.) 5 – 3 = 2 or 6 – 3 = 3

If a square is a seven or eight-digit measure in size, its base and height measure is a four-digit measure. (The numbers are the three or four numbers apart in the Number of Digits in x and Number of Digits in $\sqrt{\ }$ columns.) 7 – 4 = 3 or 8 – 4 = 4

If a square is a nine-digit measure in size, its base and height measure is a five-digit measure. (The numbers are four numbers apart in the Number of Digits in x^2 and Number of Digits in columns.) 9 – 5 = 4

2. Use the pattern that was discovered to predict.

3. Students should know how many digits your answer should contain, so if your answer doesn't contain this correct number of digits, you know your calculation is not correct.

Name _____ **Date** _____

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Student Worksheet

If you know the area of a square and need to find the dimension of the base or height, the key on the *fx-260* calculator can be used. Square root ($\sqrt{\ }$) tells you what number multiplied by itself gives you the indicated value. Since the base and height of a square have equal measure, the area is the product of a number times itself.

If the area of a square is 9 square units, what is the length of its base?

Enter: **9** **SHIFT** $\sqrt{\ }$. The calculator displays 3.

A square with a base or height measure of 3 units has an area of 9 square units.

Use your calculator to find the square root (base or height measure) for each square. For 1-5, use graph paper to create the squares equal to their numerical values. Label their base and height measurements; then complete the table.

	x^2	$\sqrt{\ }$	Number of Digits in x^2	Number of Digits in $\sqrt{\ }$
1.	**4**			
2.	**9**	**3**		
3.	**16**			
4.	**25**	**5**		
5.	**64**			
6.	**81**	**9**		
7.	**100**			
8.	**169**	**13**		
9.	**625**	**25**		
10.	**2025**	**45**		
11.	**8100**	**90**		
12.	**10,000**	**100**		
13.	**30,625**			
14.	**271,441**	**521**		
15.	**490,000**			
16.	**3,508,129**			
17.	**4,481,689**	**2117**		
18.	**25,806,400**			
19.	**81,000,000**			
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Student Worksheet (continued)

1. When comparing the information in the columns of the chart, what pattern do you notice?

_____

_____

_____

_____

_____

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2. Is there a way to estimate the number of digits in a square root?

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_____

3. How would knowing this pattern help you if you did not have a calculator to determine the square root of a number?

_____

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