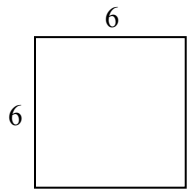
Find the Square Root…

Overview	Math Concepts	Materials
Students who understand the basic concept of square roots learn how to evaluate expressions and equations that have rational and irrational solutions. Students also explore solutions to equations and investigate the differences between exact and approximate solutions using the calculator.	• expressions and equations • roots • approximation • rational and irrational numbers • real and nonreal numbers • operations • domain and range	• TI-30XS MultiView™

Activity

Begin by reviewing the basic concept of square roots with students.



When thinking of squares of numbers, finding the area of a square should come to mind. A square has four congruent sides, x; therefore its area is x^2. For example, each side in the square below is 6 units long; therefore the area of the square is 36 units^2.

Now review how to work backward to find the square root of a number.

If you are given that the area of a square is x^2, you can find the length of each side, x, by taking the square root of x^2. For example, given a square with an area of 81 square inches, you can find the length of one side of the square by taking the square root of 81. Since $\sqrt{81} = 9$, the length of each side of this square is 9 inches.

Give the students an example for them to try so they see how squares and square roots are related.

Now try this: Find the length of each side of a square clubhouse if $3m^2$ of carpet would cover the floor. Round your answer to two decimal places.

Follow these steps:

1. Press 2nd [√‾].
2. Press 81 enter.

Follow these steps:

1. Press 2nd [√‾].
2. Press 3 enter.
3. Press ◄► to toggle between exact and approximate values.

Find the Square Root…

Ask the students what will happen if you try to take the square root of a negative number. Is that possible? Ask them what number, when multiplied by itself, would be a negative. Since the product of two positive numbers is a positive number and the product of two negative numbers is a positive number, there is no instance within the set of real numbers in which a number squared would be negative.

Can a square have a negative area? What would that mean? Try finding the square root of –100 on your TI-30XS MultiView. What happens? Why?

This leads to a discussion regarding the square root of a negative number and the domain and range of the square root function. The domain of the square root function $y = \sqrt{x}$ is x: $x \geq 0$.

Now introduce the opposite of a square root. Since we treat radicals as grouping symbols, anything under a radical gets computed *first* using the order of operations. Therefore, taking the opposite of a square root is entirely different than taking the square root of a negative number.

While $\sqrt{-100}$ wasn't a real number, what about $-\sqrt{100}$? Can you explain the difference?

Note: $\sqrt{-100}$ is not a real number, but it does belong to the set of complex numbers. Advanced students may be introduced to this set.

The students must understand irrational numbers and how to simplify these radicals, both exactly and approximately. As seen, the TI-30XS MultiView can toggle between exact and approximate answers.

You are hired to paint a large square on the wall of a museum to be used as a backdrop for artwork. You are given enough paint to cover 440 ft^2. What is the largest square you can paint?

Use the calculator's output to discuss the fact that the square can be slightly smaller than 21 ft by 21 ft, at most, since $\sqrt{440} \approx 20.98$.

Follow these steps:

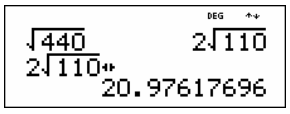
1. Press [2nd] [$\sqrt{\ }$].
2. Press –100 [enter].
3. The calculator should display:

Follow these steps:

1. Press [(–)].
2. Press [2nd] [$\sqrt{\ }$].
3. Press 100 [enter].

Follow these steps:

1. Press [2nd] [$\sqrt{\ }$].
2. Then press 440 [enter].
3. Press [◄►] to toggle between exact and approximate values.
4. The calculator should display:



Find the Square Root…

Name _____

Date _____

Directions: Calculate each of the problems below. First, estimate the answer, then use the TI-30XS MultiView™ scientific calculator. All answers should be rounded to two decimal places. Match the answer with the corresponding letter to reveal the answer to the riddle on the next page.

Problems with a  should be calculated using mental math rather than the calculator.

1. $-\sqrt{49}$
   (a) 7
   (b) –7
   (c) –49
   (d) 49

2. $\sqrt{(49)^2}$
   (a) ±7
   (b) –7
   (c) ±49
   (d) 49

3. Find the length of a side of a square with an area of 71 units^2.
   (a) ≈ 8.43
   (b) ≈ 8.5
   (c) 7
   (d) 7.1

4. $\sqrt{50.41}$
   (a) (5)(2)
   (b) 8
   (c) 7.1
   (d) ±7

5. $-2\sqrt{49}$
   (a) –14
   (b) –7
   (c) $7\sqrt{2}$
   (d) 14

6. $\sqrt{(5)^2}$
   (a) ±5
   (b) 25
   (c) –5
   (d) 5

7. $(\sqrt{49})(\sqrt{4})$
   (a) 98
   (b) $7\sqrt{2}$
   (c) 14
   (d) 28

8. $\pm\sqrt{25}$
   (a) 5
   (b) ±5
   (c) $5 \pm \sqrt{2}$
   (d) 25

9. Find the opposite of the square root of 64.
   (a) –64
   (b) 8
   (c) –8
   (d) 64

10. $x^2 = 49$
    (a) 7.1
    (b) 7
    (c) ±7
    (d) –7

11. $\sqrt{19}$
    (a) ≈ 4.36
    (b) 19
    (c) 4
    (d) ±4

12. $-\sqrt{72.25}$
    (a) –8.5
    (b) 8.5
    (c) ≈ 4.36
    (d) ≈ –4.14

13. $\sqrt{(49 \cdot 2)}$
    (a) $7\sqrt{2}$
    (b) 49
    (c) 14
    (d) 98

14. $\sqrt{(3 \cdot 4)^2}$
    (a) 48
    (b) 11.56
    (c) 144
    (d) 12

15. Find the area of a square with sides $5\sqrt{2}$ units long.
    (a) 25
    (b) ±5
    (c) 50
    (d) ≈ 7.07

16. $12\sqrt{144}$
    (a) 12
    (b) –144
    (c) 144
    (d) ≈ 44.9

17. $\sqrt{32}$
    (a) 16
    (b) 8
    (c) $4\sqrt{2}$
    (d) ±4

18. $3 + \sqrt{16}$
    (a) 12
    (b) ≈ 4.36
    (c) 7
    (d) 4

19. Which number is a perfect square?
    (a) 32
    (b) –36
    (c) 4
    (d) 8

20. $\pm\sqrt{(2 \cdot 8)}$
    (a) ≈ 11.3
    (b) 4
    (c) ±4
    (d) 16

Find the Square Root…

Name _____

Date _____

What do you find at the bottom of a shape tree?

$\overline{4}$ $\overline{9}$ $\overline{7}$ $\overline{10}$ $\overline{2}$ $\overline{8}$ $\overline{12}$ $\overline{5}$ $\overline{14}$ $\overline{20}$ $\overline{15}$ $\overline{13}$ $\overline{18}$ $\overline{1}$ $\overline{17}$ $\overline{11}$ $\overline{19}$ $\overline{3}$ $\overline{6}$ $\overline{16}$

–7 A	$7\sqrt{2}$ Q	±5 N	12 H	±4 E	50 S	8.42 O	144 T	11.56 S
7 U	5 O	49 I	–8.5 D	28 E	–14 T	14 U	4.36 E	98 C
7.1 Y	$4\sqrt{2}$ R	–8 O	4 R	±7 F	25 H	48 E	8 P	–36 M

Find the Square Root…

Answer Key

1. $-\sqrt{49}$
   (b) -7
2. $\sqrt{(49)^2}$
   (d) 49
3. $\sqrt{71}$
   (a) ≈ 8.42
4. $\sqrt{50.41}$
   (c) 7.1
5. $-2\sqrt{49}$
   (a) -14
6. $\sqrt{(5)^2}$
   (d) 5
7. $\sqrt{49}\ \sqrt{4}$
   (c) 14
8. $\pm\sqrt{25}$
   (b) ± 5
9. Find the opposite of the square root of 64.
   (c) -8
10. $x^2 = 49$
    (c) ± 7
11. $\sqrt{19}$
    (a) ≈ 4.36
12. $-\sqrt{72.25}$
    (a) -8.5
13. $\sqrt{49 \cdot 2}$
    (a) $7\sqrt{2}$
14. $\sqrt{(3 \cdot 4)^2}$
    (d) 12
15. Find the area of a square with sides $5\sqrt{2}$ units long.
    (c) 50
16. $12\sqrt{144}$
    (c) 144
17. $\sqrt{32}$
    (c) $4\sqrt{2}$
18. $3 + \sqrt{16}$
    (c) 7
19. Which number is a perfect square?
    (c) 4
20. $\pm\sqrt{2 \cdot 8}$
    (c) ± 4

What do you find at the bottom of a shape tree?

Riddle solution: You find the square root.