Name _____ Date _____

Existence and Uniqueness of Square and Cube Roots

Find the positive value of x that makes each equation true. Check your solution.

1. $x^2 = 225$
   a. Explain the first step in solving this equation.

   b. Solve and check your solution.

2. $x^3 = 512$

3. $x^2 = 361^{-1}$

4. $x^3 = 1000^{-1}$

Find the positive value of x that makes each equation true. Check your solution.

1. What positive value of x makes the following equation true: $x^2 = 289$? Explain.

2. A square shaped park has an area of 400 ft^2. What are the dimensions of the park? Write and solve an equation.

3. A cube has a volume of 64 in^3. What is the measure of one of its sides? Write and solve an equation.

4. What positive value of x makes the following equation true: $125 = x^3$? Explain.

5. $x^2 = 441^{-1}$ Find the positive value of x that makes the equation true.
   a. Explain the first step in solving this equation.
   b. Solve and check your solution.

6. $x^3 = 125^{-1}$ Find the positive value of x that makes the equation true.

7. The area of a square is 196 in^2. What is the length of one side of the square? Write and solve an equation, then check your solution.

8. The volume of a cube is 729 cm^3. What is the length of one side of the cube? Write and solve an equation, then check your solution.

9. What positive value of x would make the following equation true: $19 + x^2 = 68$?

Find the positive value of x that makes each equation true. Check your solution.

1. $x^2 = 225$

   a. **Explain the first step in solving this equation.**

   The first step is to take the square root of both sides of the equation.

   b. **Solve and check your solution.**

$$x^2 = 225$$
$$\sqrt{x^2} = \sqrt{225}$$
$$x = \sqrt{225}$$
$$x = 15$$

Check:

$$15^2 = 225$$
$$225 = 225$$

2. $x^3 = 512$

$$x^3 = 512$$
$$\sqrt[3]{x^3} = \sqrt[3]{512}$$
$$x = \sqrt[3]{512}$$
$$x = 8$$

Check:

$$8^3 = 512$$
$$512 = 512$$

3. $x^2 = 361^{-1}$

$$x^2 = 361^{-1}$$
$$\sqrt{x^2} = \sqrt{361^{-1}}$$
$$x = \sqrt{361^{-1}}$$
$$x = \sqrt{\frac{1}{361}}$$
$$x = \frac{1}{19}$$
$$x = 19^{-1}$$

Check:

$$(19^{-1})^2 = 361^{-1}$$
$$19^{-2} = 2536$$
$$\frac{1}{19^2} = 361^{-1}$$
$$\frac{1}{361} = 361^{-1}$$
$$361^{-1} = 361^{-1}$$

4. $x^3 = 1,000^{-1}$

$$x^3 = 1,000^{-1}$$
$$\sqrt[3]{x^3} = \sqrt[3]{1,000^{-1}}$$
$$x = \sqrt[3]{1,000^{-1}}$$
$$x = \sqrt[3]{\frac{1}{1,000}}$$
$$x = \frac{1}{10}$$
$$x = 10^{-1}$$

Check:

$$(10^{-1})^3 = 1,000^{-1}$$
$$10^{-3} = 1,000^{-1}$$
$$\frac{1}{10^3} = 1,000^{-1}$$
$$\frac{1}{1,000} = 1,000^{-1}$$
$$1,000^{-1} = 1,000^{-1}$$

Find the positive value of x that makes each equation true. Check your solution.

1. **What positive value of x makes the following equation true: $x^2 = 289$? Explain.**

$$x^2 = 289$$
$$\sqrt{x^2} = \sqrt{289}$$
$$x = \sqrt{289}$$
$$x = 17$$

Check:

$$17^2 = 289$$
$$289 = 289$$

To solve the equation, I need to find the positive value of x so that when it is squared, it is equal to 289. Therefore, I can take the square root of both sides of the equation. The square root of x^2, $\sqrt{x^2}$, is x because $x^2 = x \cdot x$. The square root of 289, $\sqrt{289}$, is 17 because $289 = 17 \cdot 17$. Therefore, $x = 17$.

2. **A square shaped park has an area of 400 ft^2. What are the dimensions of the park? Write and solve an equation.**

$$x^2 = 400$$
$$\sqrt{x^2} = \sqrt{400}$$
$$x = \sqrt{400}$$
$$x = 20$$

Check:

$$20^2 = 400$$
$$400 = 400$$

The square park is 20 ft. in length and 20 ft. in width.

3. **A cube has a volume of 64 in^3. What is the measure of one of its sides? Write and solve an equation.**

$$x^3 = 64$$
$$\sqrt[3]{x^3} = \sqrt[3]{64}$$
$$x = \sqrt[3]{64}$$
$$x = 4$$

Check:

$$4^3 = 64$$
$$64 = 64$$

The cube has a side length of 4 in.

4. **What positive value of x makes the following equation true: $125 = x^3$? Explain.**

$$125 = x^3$$
$$\sqrt[3]{125} = \sqrt[3]{x^3}$$
$$\sqrt[3]{125} = x$$
$$5 = x$$

Check:

$$125 = 5^3$$
$$125 = 125$$

To solve the equation, I need to find the positive value of x so that when it is cubed, it is equal to 125. Therefore, I can take the cube root of both sides of the equation. The cube root of x^3, $\sqrt[3]{x^3}$, is x because $x^3 = x \cdot x \cdot x$. The cube root of 125, $\sqrt[3]{125}$, is 5 because $125 = 5 \cdot 5 \cdot 5$. Therefore, $x = 5$.

5. $x^2 = 441^{-1}$ **Find the positive value of x that makes the equation true.**

a. **Explain the first step in solving this equation.**

The first step is to take the square root of both sides of the equation.

b. **Solve and check your solution.**

$$x^2 = 441^{-1}$$
$$\sqrt{x^2} = \sqrt{441^{-1}}$$
$$x = \sqrt{441^{-1}}$$
$$x = \sqrt{\frac{1}{441}}$$
$$x = \frac{1}{21}$$
$$x = 21^{-1}$$

Check:

$$(21^{-1})^2 = 441^{-1}$$
$$21^{-2} = 441^{-1}$$
$$\frac{1}{21^2} = 441^{-1}$$
$$\frac{1}{441} = 441^{-1}$$
$$441^{-1} = 441^{-1}$$

6. $x^3 = 125^{-1}$ **Find the positive value of x that makes the equation true.**

$$x^3 = 125^{-1}$$
$$\sqrt[3]{x^3} = \sqrt[3]{125^{-1}}$$
$$x = \sqrt[3]{125^{-1}}$$
$$x = \sqrt[3]{\frac{1}{125}}$$
$$x = \frac{1}{5}$$
$$x = 5^{-1}$$

Check:

$$(5^{-1})^3 = 125^{-1}$$
$$5^{-3} = 125^{-1}$$
$$\frac{1}{5^3} = 125^{-1}$$
$$\frac{1}{125} = 125^{-1}$$
$$125^{-1} = 125^{-1}$$

7. **The area of a square is 196 in^2. What is the length of one side of the square? Write and solve an equation, then check your solution.**

Let x represent the length of one side of the square.

$$x^2 = 196$$
$$\sqrt{x^2} = \sqrt{196}$$
$$x = \sqrt{196}$$
$$x = 14$$

Check:

$$14^2 = 196$$
$$196 = 196$$

The length of one side of the square is 14 in.

8. The volume of a cube is 729 cm^3. What is the length of one side of the cube? Write and solve an equation, then check your solution.

Let x represent the length of one side of the cube.

$$x^3 = 729$$
$$\sqrt[3]{x^3} = \sqrt[3]{729}$$
$$x = \sqrt[3]{729}$$
$$x = 9$$

Check:

$$9^3 = 729$$
$$729 = 729$$

The length of one side of the cube is 9 cm.

9. What positive value of x would make the following equation true: $19 + x^2 = 68$?

$$19 + x^2 = 68$$
$$19 - 19 + x^2 = 68 - 19$$
$$x^2 = 49$$
$$x = 7$$

The positive value for x that makes the equation true is 7.