

3.2 Perfect Squares, Perfect Cubes, and Their Roots

Lesson Focus

Identify perfect squares and perfect cubes, then determine square roots and cube roots

Rubik's Cube

The edge length of the Rubik's cube is 3 units.

What is the area of one face of the cube? Why is this number a *perfect square*?

What is the volume of the cube? This number is called a **perfect cube**.

Why do you think it has this name?

Worlds Fastest Rubik's Cube



Perfect Numbers

Perfect Square – a number where the square root is a whole number

Ex. 9

Perfect Cube – a number where the cube root is a whole number

Ex. 27

Square root is denoted by:

$$\sqrt[2]{9} = 3$$

or

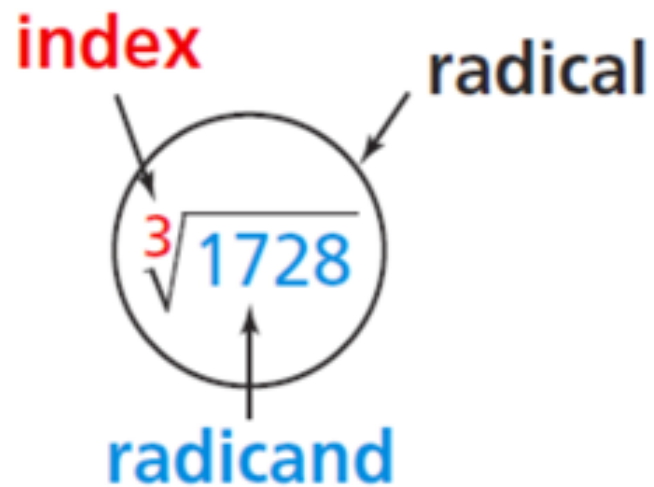
$$\sqrt{9} = 3$$

Cube root is denoted by:

$$\sqrt[3]{27} = 3$$

Roots

Roots look like:

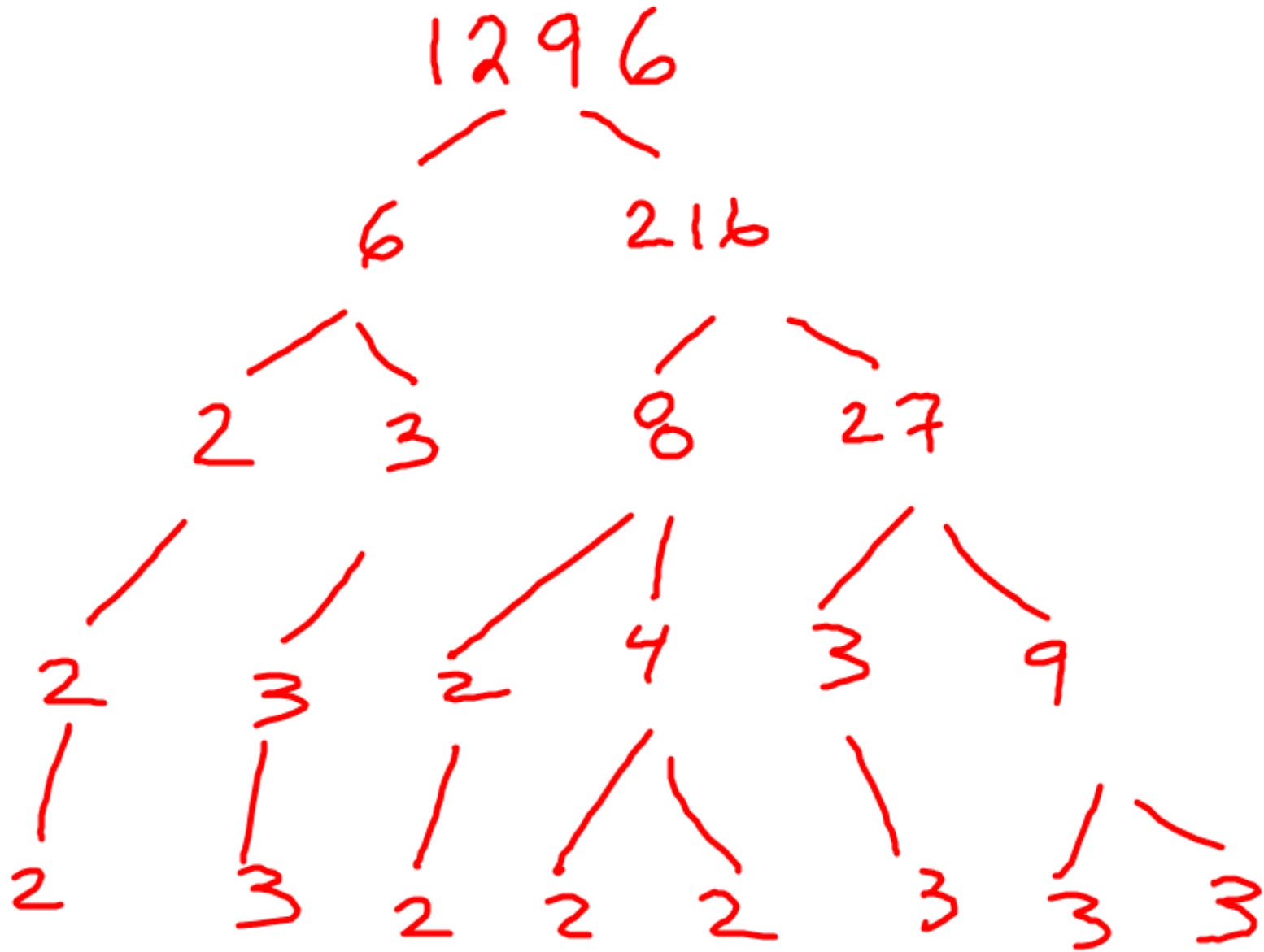


Determining Roots

Break a number down to its prime factors

Use the prime factors to determine the roots

Ex: Determine the square root of 1296

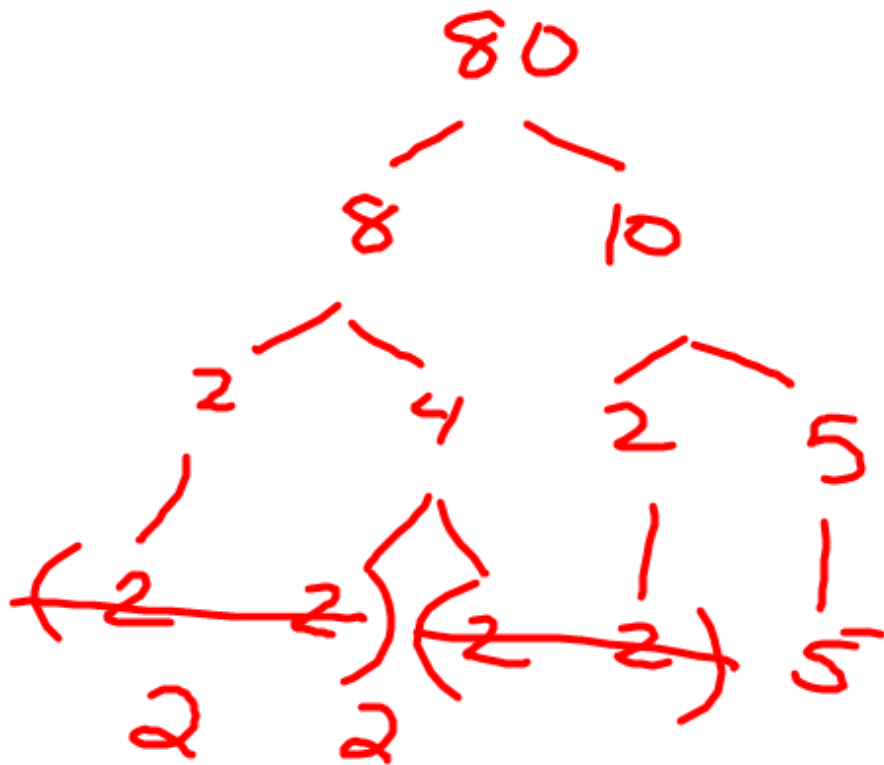


$$= (2 \cdot 2) \cdot (2 \cdot 2) \cdot (3 \cdot 3) \cdot (3 \cdot 3)$$

$$2 \cdot 2 \cdot 3 \cdot 3 = \textcircled{36}$$

$$\sqrt{80}$$

$$= 4\sqrt{5}$$



Example – Your Turn

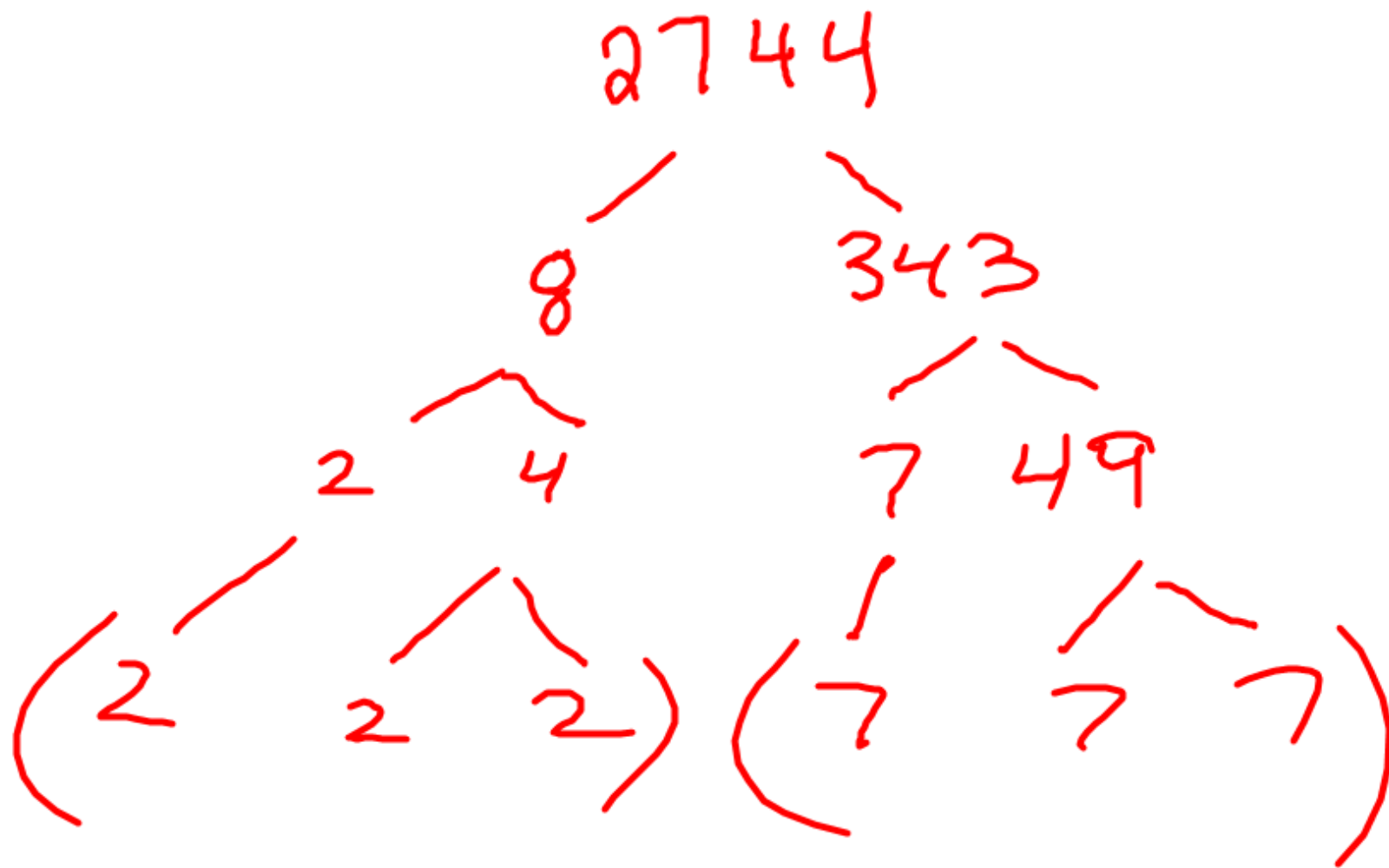
Determine the square root of 1764.

Example

Determine the cube root of 1728.

Example – Your Turn

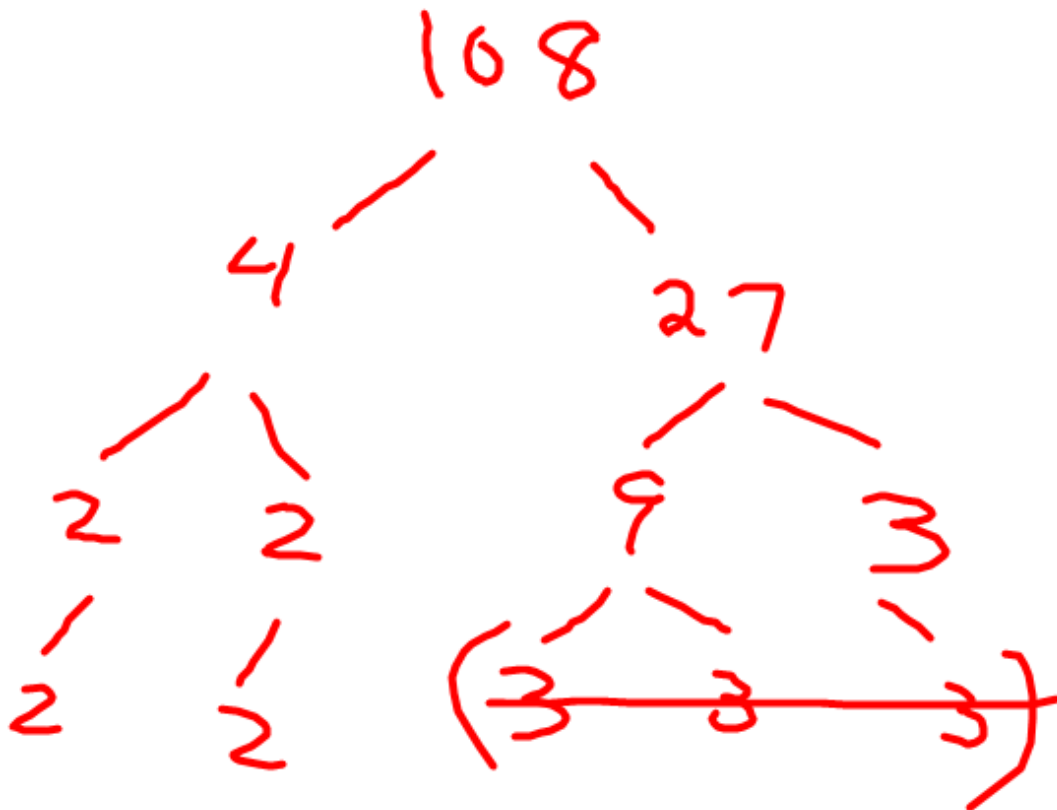
Determine the cube root of
2744.



2. $7 \circled{=} 14$

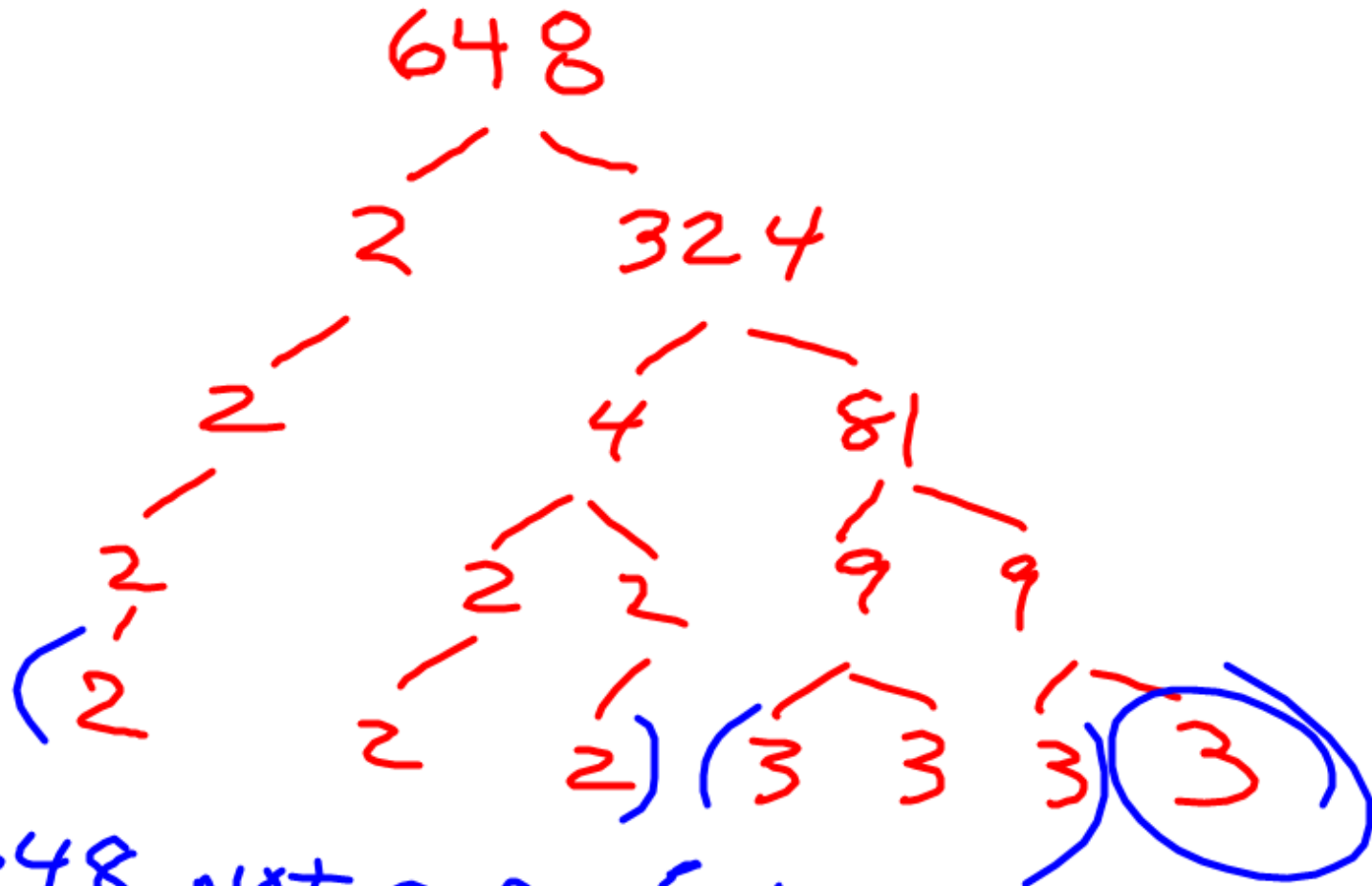
$$\sqrt[3]{108}$$

$$\sqrt[3]{4}$$



Example

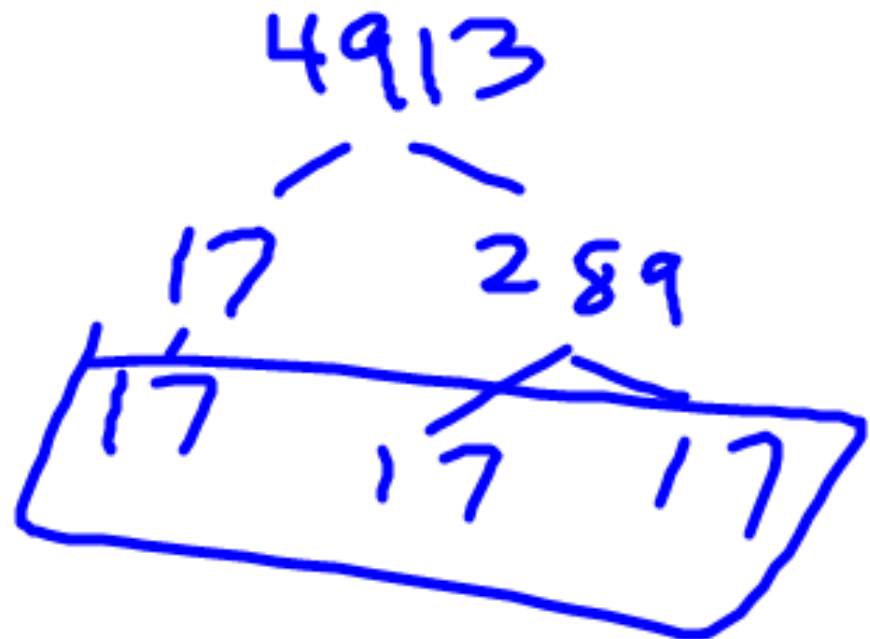
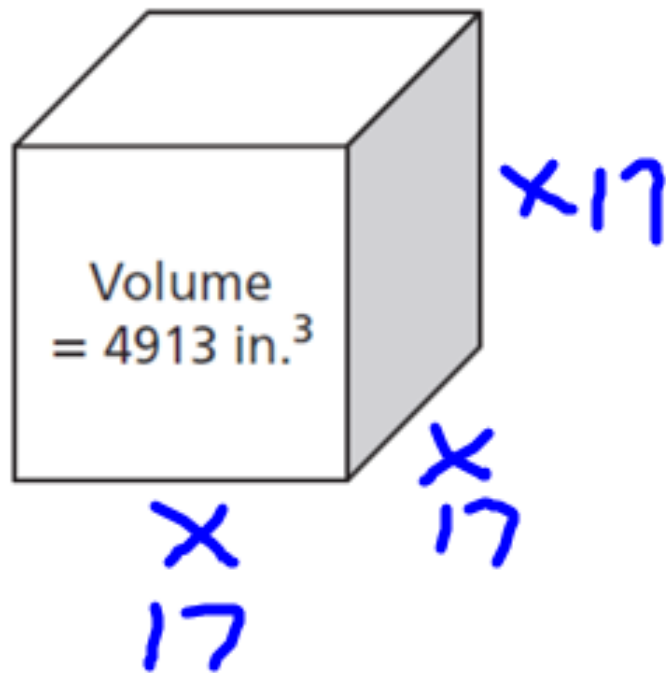
Show that 648 is not a perfect cube.



648 not a perfect cube as a prime factor of 3 remains.

Example – Extend

A cube has volume 4913 cubic inches. What is the surface area of the cube?



Area one face cube

$$17 \text{ in} \times 17 \text{ in} = 289 \text{ in}^2$$

Total Surface Area

$$6(289) = 1734 \text{ in}^2$$

Homework

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4a,c,e, 5a,c,e, 6a,b,c, 11, 17*

Extra Practice

- 1) Determine the smallest number that 5400 should be multiplied by to produce a perfect cube.**
- 2) Find the smallest number that 192000 should be divided by to produce a perfect cube.**