FMP10 Name: _____
Date: _____

Unit 2: Exponents & Radicals

2.2 Square & Cube Roots

Perfect Square: A number that can be expressed as the product of two equal factors. ex. $16 = 4 \times 4$

Square Root: One of two equal factors of a number.
ex. $\sqrt{49} = 7$

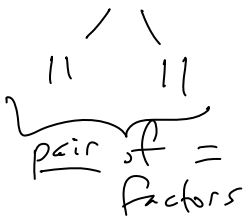
Perfect Cube: A number that is the product of three equal factors. ex. $8 = 2 \times 2 \times 2$

Cube Root: One of three equal factors of a number.
ex. $\sqrt[3]{64} = 4$

Prime factorization (factor tree) can be used to determine if a number is a perfect square or cube.

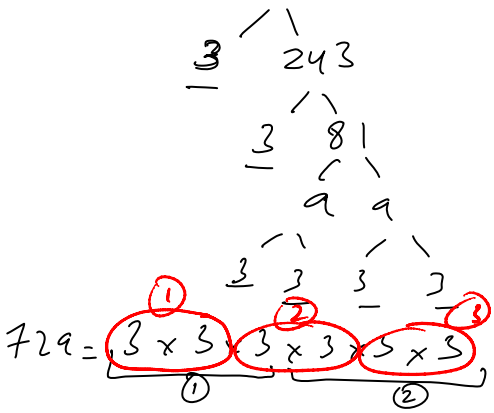
Ex.
Determine if each number is a perfect square, perfect cube, both, or neither:

a) 121



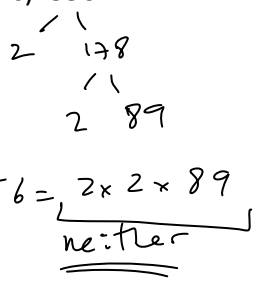
∴ perfect square

b) 729



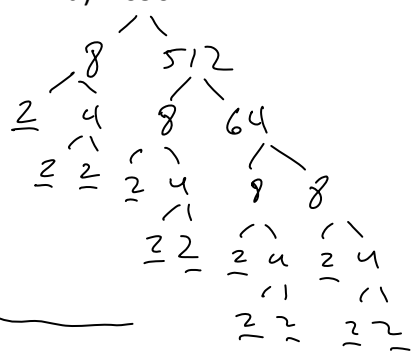
perfect square because 2 equal factor sets

c) 356



$356 = 2 \times 2 \times 89$
neither

d) 4096



perfect cube because 3 equal factor sets

$\sqrt[3]{4096} = 2 \times 2 \times 2 \times 2 = 16$
perfect cube

$4096 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$

perfect square ✓

$\sqrt{4096} = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 64$

$\sqrt[4]{4096} = 2 \times 2 \times 2 = 8$

$2 \times 2 \times 89 \times 89 = 2 \times 89 \times 2 \times 89$
perfect square

$2\sqrt{12}$

Ex.

Evaluate, with the aid of a calculator if necessary:

a) $\sqrt{324}$ $= 18$

b) $\sqrt[3]{13824}$ $= 24$

c) $\sqrt{\frac{25}{361}} = \frac{\sqrt{25}}{\sqrt{361}}$ $= 5/19$

d) $\sqrt[3]{175616}$ $= 56$

e) $\sqrt{36x^2}$ $= 6x$

f) $\sqrt[3]{8q^3}$ $= 2q$

g) $\sqrt[2]{961z^6}$ $6 \div 2$ $= 31z^3$

$* (z^3)^2 = z^6$

h) $\sqrt[3]{512m^{12}}$ $12 \div 3$ $= 8m^4$

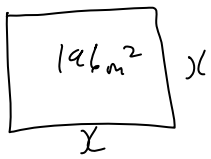
$+ \sqrt[6]{m^{12}} = m^2$

i) $\sqrt[3]{\frac{27x^9}{1000y^{15}}} = \frac{3x^3}{10y^5}$

k) $\sqrt{\frac{100q^{10}u^{12}}{169x^{18}}} = \frac{10q^5u^6}{13x^9}$

Ex.

a) A floor mat for gymnastics is a square with an area of 196 m^2. What is its side length?

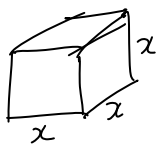


$x^2 = 196$

$x = \sqrt{196}$

$= \boxed{14\text{ m}}$

b) The volume of a cubic box is 27 000 in.^{3} Determine its side length.



$x^3 = 27000$

$x = \sqrt[3]{27000}$

$= \boxed{30\text{ in}}$

Practice: pg. 158/ # 1→10, 14, 16→18