

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

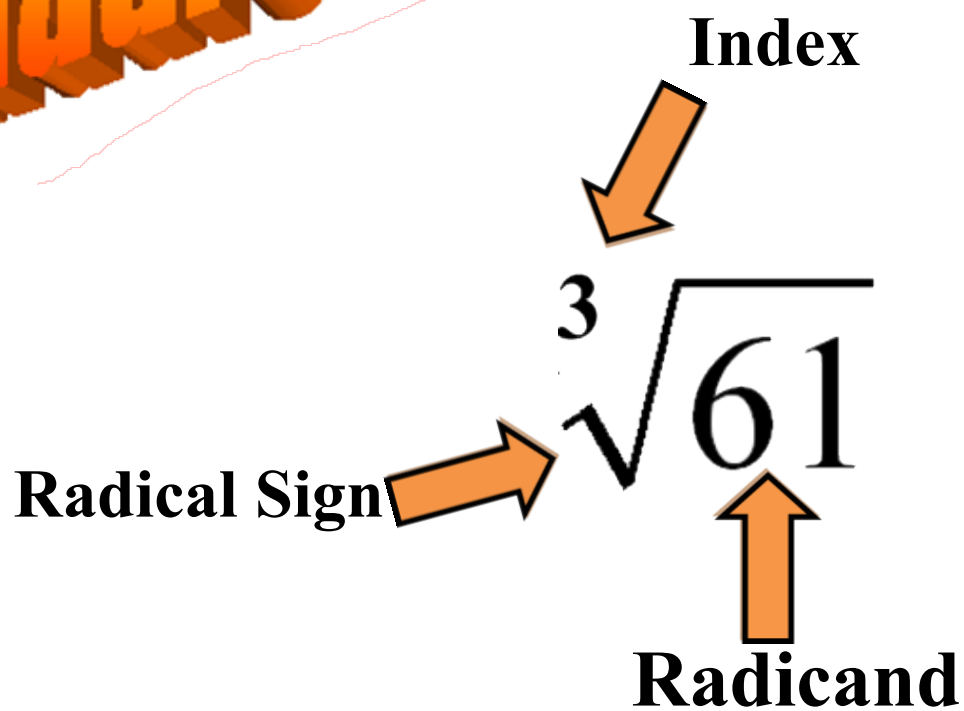
$$\sqrt[5]{243}$$



**Roots &
Powers**

$$\left(\frac{1}{4}\right)^{-3}$$

Radicals



Let's Check Your Understanding!

1. What is the index of $\sqrt[5]{13}$

5

2. What is the radicand of $\sqrt[7]{24}$

24

3. Explain the meaning of the index.

It determines what root you take.

4. Write 2 as a square root, a cube root, and a fourth root.

$$\sqrt{4} = 2$$

$$\sqrt[3]{8} = 2$$

$$\sqrt[4]{16} = 2$$

Mixed Radical

$$2\sqrt{3}$$

← two times by the square root of 3

A number is in front of the radical sign. “**Mixture**”

Entire Radical

$$\sqrt{54}$$

Everything is **entirely** under the radical sign.

Calculate $\sqrt{75}$

$$\sqrt{75} \approx 8.66$$

**Your answer is irrational,
therefore lets simplify!!!**

Use Prime Factorization !!

Simplify $\sqrt{75}$ = $\sqrt{3 \cdot \underline{5 \cdot 5}}$

Entire Radical \rightarrow $= 5\sqrt{3}$ ← Mixed Radical

Index is 2

Simplify $\sqrt{63} = \sqrt{\underline{3 \cdot 3} \cdot 7}$
 $= 3\sqrt{7}$

Simplify $\sqrt[3]{1080}$ = $\sqrt[3]{\underbrace{2 \cdot 2 \cdot 2}_{\text{sets of 3}} \cdot 5 \cdot \underbrace{3 \cdot 3 \cdot 3}_{\text{sets of 3}}}$

Index is 3 look for sets of 3

$$= 2 \cdot 3 \sqrt[3]{5}$$
$$= 6 \sqrt[3]{5}$$

Simplify $\sqrt[3]{120}$ $= \sqrt[3]{2 \cdot 2 \cdot 3 \cdot 2 \cdot 5}$

$= \sqrt[3]{\underline{2 \cdot 2 \cdot 2} \cdot \underline{3 \cdot 5}}$

$= 2 \sqrt[3]{15}$

Try It Yourself!!!

Simplify:

a) $\sqrt{147}$

b) $\sqrt{80}$

c) $\sqrt{98}$

d) $\sqrt[3]{81}$

e) $\sqrt[3]{80}$

f) $\sqrt[3]{432}$

a) $\sqrt{147}$ b) $\sqrt{80}$ c) $\sqrt{98}$

a) $\sqrt{3 \times (7 \times 7)}$ b) $\sqrt{(2 \times 2) \times (2 \times 2) \times 5}$ c) $\sqrt{2 \times (7 \times 7)}$

$$7\sqrt{3}$$

$$2 \times 2\sqrt{5}$$

$$7\sqrt{2}$$

$$4\sqrt{5}$$

$$\text{d) } \sqrt[3]{81} \quad \text{e) } \sqrt[3]{80} \quad \text{f) } \sqrt[3]{432}$$

$$\text{d) } \sqrt[3]{\underbrace{3 \times 3 \times 3}_{\text{circled}} \times 3}$$

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

$$\text{e) } \sqrt[3]{\underbrace{2 \times 2 \times 2}_{\text{circled}} \times 2 \times 5}$$

$$2\sqrt[3]{2 \times 5}$$

$$2\sqrt[3]{10}$$

$$\text{f) } \sqrt[3]{\underbrace{2 \times 2 \times 2}_{\text{circled}} \times 2 \times \underbrace{3 \times 3 \times 3}_{\text{circled}}}$$

$$2 \times 3\sqrt[3]{2}$$

$$6\sqrt[3]{2}$$

Write $3\sqrt{12}$ as an entire radical

$$\begin{aligned} \underline{3}\sqrt{12} &= \sqrt{3 \cdot 3 \cdot 12} \\ &= \sqrt{108} \end{aligned}$$

Write $2\sqrt[3]{6}$ as an entire radical

$$\begin{aligned} \underline{2}\sqrt[3]{6} &= \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 6} \\ &= \sqrt[3]{48} \end{aligned}$$

Write $4\sqrt[4]{3}$ as an entire radical

$$\begin{aligned} \underline{4}\sqrt[4]{3} &= \sqrt[4]{4 \cdot 4 \cdot 4 \cdot 4 \cdot 3} \\ &= \sqrt[4]{768} \end{aligned}$$

Try It Yourself!!!

a) $6\sqrt{2}$ b) $4\sqrt[3]{7}$ c) $3\sqrt[4]{11}$

Try It Yourself!!!

a) $6\sqrt{2}$

$$\sqrt{2 \times 6 \times 6}$$

$$\sqrt{72}$$

or $\sqrt{2 \times 36}$

$$\sqrt{72}$$

b) $4\sqrt[3]{7}$

$$\sqrt[3]{7 \times 4 \times 4 \times 4}$$

$$\sqrt[3]{448}$$

$$\sqrt[3]{64 \times 7}$$

$$\sqrt[3]{448}$$

c) $3\sqrt[4]{11}$

$$\sqrt[4]{11 \times 3 \times 3 \times 3 \times 3}$$

$$\sqrt[4]{891}$$

$$\sqrt[4]{11 \times 81}$$

$$\sqrt[4]{891}$$

Homework

Page 218 #4 efgh

#5 efgh

#11 efgh

#12 defg

#14

#15

Answers on
page 486.

Questions from homework

Try these to get started!

$$3\sqrt{20}$$

$$3\sqrt{\underline{2 \cdot 2} \cdot 5}$$

$$3 \cdot 2\sqrt{5}$$

$$6\sqrt{5}$$

$$5\sqrt[3]{48}$$

$$5\sqrt[3]{\underline{2 \cdot 2 \cdot 2} \cdot 2 \cdot 3}$$

$$5 \cdot 2\sqrt[3]{2 \cdot 3}$$

$$10\sqrt[3]{6}$$

$$10\sqrt{729}$$

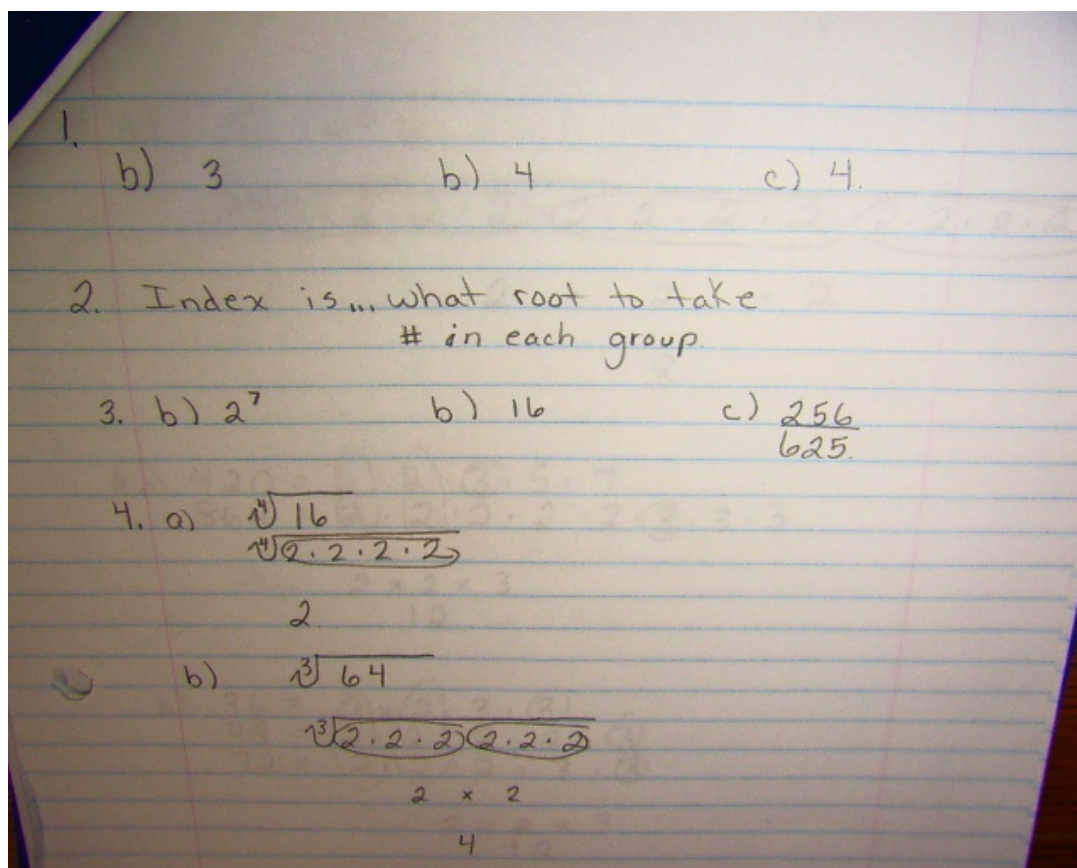
$$10\sqrt{\underline{3 \cdot 3} \cdot \underline{3 \cdot 3} \cdot \underline{3 \cdot 3}}$$

$$10 \cdot 3 \cdot 3 \cdot 3$$

$$270$$

729 is a perfect square!

Homework



$$4. a) \sqrt[4]{16}$$
$$\sqrt[4]{2 \cdot 2 \cdot 2 \cdot 2}$$

2

$$b) \sqrt[3]{64}$$

$$\sqrt[3]{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2}$$

2 × 2

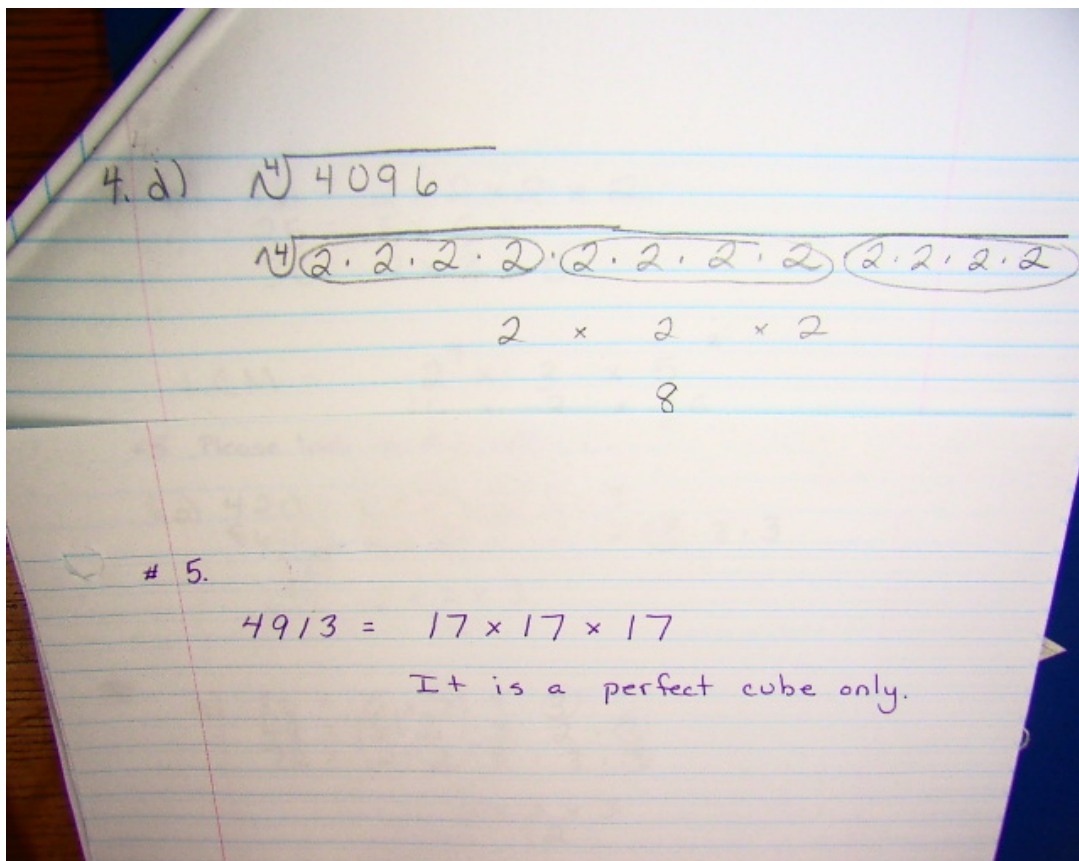
4

$$c) \sqrt[3]{8000}$$

$$\sqrt[3]{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 5 \cdot 5 \cdot 5}$$

2 × 2 × 5

20



$$6. a) \begin{aligned} 420 &= 2 \cdot 2 \cdot 3 \cdot 5 \cdot 7 \\ 864 &= 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 3 \end{aligned}$$

$$2 \times 2 \times 3$$

$$12$$

$$b) \begin{aligned} 36 &= 2 \times 2 \cdot 3 \cdot 3 \\ 48 &= 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \\ 72 &= 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \end{aligned}$$

$$2 \times 2 \times 3$$

$$12$$


$$7. a) \begin{aligned} 12 &= 2 \times 2 \times 3 \\ 40 &= 2 \times 2 \times 2 \times 5 \end{aligned}$$

$$\text{LCM} = \frac{2^3}{8} \times 3 \times 5$$

$$120$$

7. b) $16 = 2 \times 2 \times 2 \times 2$
 $25 = 5 \times 5$
 $30 = 2 \times 3 \times 5$

LCM = $\frac{2^4 \times 3 \times 5^2}{16 \times 3 \times 25}$
1200

8.  $V = 74088 \text{ cm}^3$
 $\sqrt[3]{74088}$

SA = $L \times W$
 $= 42 \times 42$
 $= 1764$
 $\frac{\times 6 \text{ sides.}}{10584 \text{ cm}^2}$

9. $\frac{5400 \text{ cm}^2}{6}$
 900 cm^2

$$\sqrt{900} = \sqrt{2 \times 2 \times 5 \times 5 \times 3 \times 3}$$
$$= 2 \times 5 \times 3$$
$$= 30$$

$V = L \times W \times H$
 $= 30 \times 30 \times 30$
 $= 27000$

10. $48 = 2 \times 2 \times 2 \times 2 \times 3$
 $60 = 2 \times 2 \times 3 \times 5$
 $84 = 2 \times 2 \times 3 \times 7$

$2 \times 2 \times 3$
 12

11. a) $4 \overline{) 12}$
 $\sqrt{12 \times 4 \times 4}$
 $\sqrt{192}$

b) $5 \overline{) 5}$
 $\sqrt{5 \times 5 \times 5}$
 $\sqrt{125}$

11. a) $4\sqrt{12}$
 $\sqrt{12 \times 4 \times 4}$
 $\sqrt{192}$

b) $5\sqrt{5}$
 $\sqrt{5 \times 5 \times 5}$
 $\sqrt{125}$

c) $7\sqrt{11}$
 $\sqrt{11 \times 7 \times 7 \times 7}$
 $\sqrt{3773}$

d) $3\sqrt{10}$
 $\sqrt{10 \times 3 \times 3 \times 3 \times 3 \times 3}$
 $\sqrt{2430}$

12. a) $\sqrt[4]{243}$
 $\sqrt[4]{\underbrace{3 \times 3 \times 3 \times 3} \times 3}$
 $3 \sqrt[4]{3}$

b) $5 \sqrt[3]{48}$
 $5 \sqrt[3]{\underbrace{2 \times 2 \times 2} \times 2 \times 3}$
 $10 \sqrt[3]{6}$

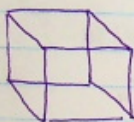
c) $\sqrt[3]{1080}$
 $\sqrt[3]{\underbrace{2 \times 2 \times 2} \times \underbrace{3 \times 3 \times 3} \times 5}$
 $6 \sqrt[3]{5}$

$$12.d) \sqrt[5]{2592}$$

$$\sqrt[5]{\underbrace{2 \times 2 \times 2 \times 2 \times 2}_{2^5} \times 3 \times 3 \times 3 \times 3}$$

$$2 \sqrt[5]{81}$$

13.

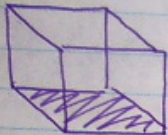


$$V = 1080 \text{ cm}^3$$

$$\sqrt[3]{1080}$$

$$\sqrt[3]{\underbrace{2 \times 2 \times 2}_{2^3} \times \underbrace{3 \times 3 \times 3}_{3^3} \times 5}$$

$$6 \sqrt[3]{5}$$

14.  $SA = 37800 \text{ cm}^2$

Area of One Side $\rightarrow \frac{37800}{6} = 6300 \text{ cm}^2$

$$\sqrt{6300}$$
$$\sqrt{2 \times 2 \times 3 \times 3 \times 5 \times 5 \times 7}$$
$$30\sqrt{7}$$

(16) LCM problem

$$8 \rightarrow 2 \cdot 2 \cdot 2 \rightarrow 2^3$$

$$14 \rightarrow 2 \cdot 7 \rightarrow 2 \cdot 7$$

$$\begin{aligned} \text{LCM} &= 2^3 \cdot 7 \\ &= 8 \cdot 7 \\ &= 56 \end{aligned}$$

56 days will pass
before they do their
chores on the same
day again!