⑩ A cube has a surface area of $13824\,m^2$. Calculate the volume of the cube.

(i) Find the Area:

$$\text{Area} = \frac{SA}{6} = \frac{13824}{6}$$

$$\text{Area} = 2304\,m^2$$

(ii) Find the length

$$l = \sqrt{2304}$$

$$l = 2\times2\times2\times2\times2\times2\times2\times2\times3\times3$$

$$l = 2\times2\times2\times2\times3$$

$$l = 48\,m$$

(iii) Volume $= l \times l \times l$

$= 48\times48\times48$

$= 110592\,m^3$

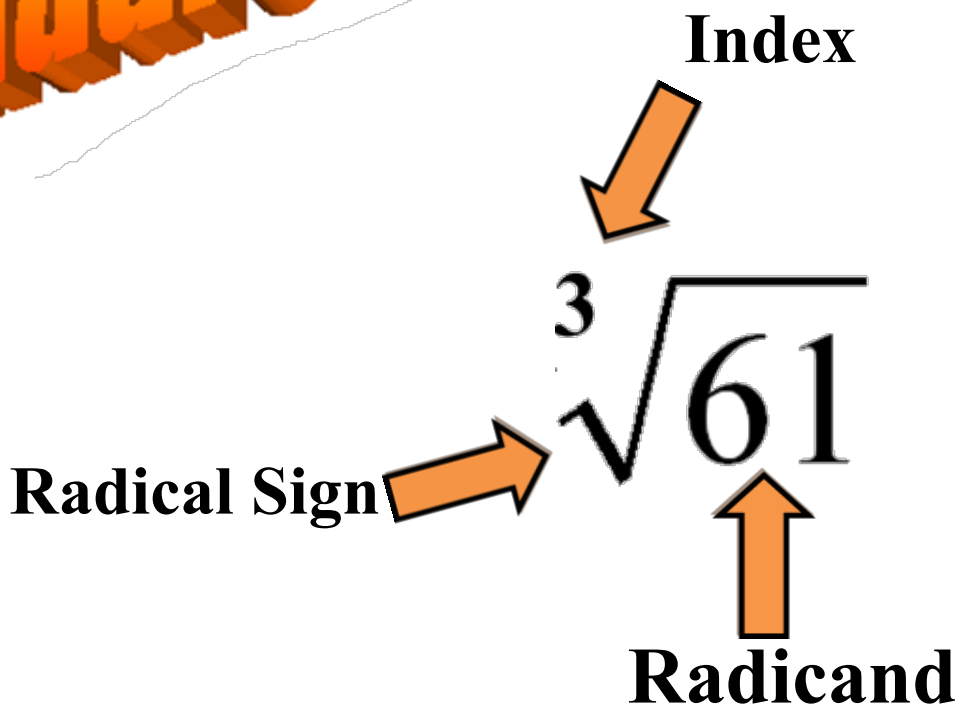
$\sqrt[3]{27}$

$\sqrt[5]{243}$

# Roots & Powers


$(1/4)^{-3}$

# Radicals



ERASE FOR ANSWERS

# 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.**

The index tells what root you are taking. Tells the size of your groupings

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

| Square | Cube | Fourth |
|---|---|---|
| $\sqrt{2\times2}$ | $\sqrt[3]{2\times2\times2}$ | $\sqrt[4]{2\times2\times2\times2}$ |
| $\sqrt{4}$ | $\sqrt[3]{8}$ | $\sqrt[4]{16}$ |

index = 2

# Mixed & Entire Radicals !!

## Mixed Radical

$2\sqrt{3}$

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

---

## Entire Radical

$\sqrt{54}$

Everything is entirely under the radical sign.

# Calculate $\sqrt{75}$

$\sqrt{75} = 8.660254038\ldots$

What do you notice?

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

**Simplify** $\sqrt{75}$

**Use Prime Factorization !!**

# Prime Factorization

**Simplify** $\sqrt{75}$ Entire

$$\sqrt{75} = \sqrt{3 \times 5 \times 5}$$

$$= 5\sqrt{3}$$ Mixed

**Simplify** $\sqrt{63}$ (Entire)

$\sqrt{63} = \sqrt{3 \times 3 \times 7}$

$= 3\sqrt{7}$ (mixed)

**Simplify** $\sqrt[3]{1080}$ Entire

$\sqrt[3]{1080} = \sqrt[3]{2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 5}$

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

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

# Simplify $\sqrt[3]{120}$

Entire

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

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

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

Mixed

# Try It Yourself!!!

**Simplify:** Entire → Mixed

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

**d)** $\overline{81}$ **e)** $\overline{80}$ **f)** $\overline{432}$

**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)** $\sqrt{2 \times 7 \times 7}$

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

$4\sqrt{5}$

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

**d)** $\sqrt[3]{3 \times 3 \times 3 \times 3}$

$3\sqrt[3]{3}$

**e)** $\sqrt[3]{2 \times 2 \times 2 \times 2 \times 5}$

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

$2\sqrt[3]{10}$

**f)** $\sqrt[3]{2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3}$

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

$6\sqrt[3]{2}$

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

$3\sqrt{12}$ Mixed

$\sqrt{12 \times 3 \times 3}$

$\sqrt{108}$ Entire

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

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

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

$= \sqrt[3]{48}$ Entire

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

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

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

$\sqrt[4]{768}$ Entire

$4\sqrt[4]{3}$

$4^4 = 256$

$\sqrt[4]{3 \times 256}$

$\sqrt[4]{768}$

# Try It Yourself!!!

Mixed → Entire

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

# Try It Yourself!!!

| a) $6\sqrt{2}$ | b) $4\sqrt[3]{7}$ | c) $3\sqrt[4]{11}$ |
|---|---|---|
| $\sqrt{2 \times 6 \times 6}$ | $\sqrt[3]{7 \times 4 \times 4 \times 4}$ | $\sqrt[4]{11 \times 3 \times 3 \times 3 \times 3}$ |
| $\sqrt{72}$ | $\sqrt[3]{448}$ | $\sqrt[4]{891}$ |
| or $\sqrt{2 \times 36}$ | $\sqrt[3]{64 \times 7}$ | $\sqrt[4]{11 \times 81}$ |
| $\sqrt{72}$ | $\sqrt[3]{448}$ | $\sqrt[4]{891}$ |

# Homework

Page 218 #4 efgh

#5 efgh

#11 efgh

#12 defg

#14

#15