Radicals

$\sqrt{}$ $\longrightarrow$ square root

$\sqrt[3]{}$ $\longrightarrow$ cubed root

squared

2 → 4	
3 → 9	
4 → 16	
5 → 25	
6 → 36	
7 → 49	
8 → 64	
9 → 81	
10 → 100	
11 → 121	
12 → 144	
13 → 169	
14 → 196	
15 → 225	
16 → 256	
17 → 289	
18 → 324	
19 → 361	
20 → 400	

Simplify (Reduce)

Ex. 1 : $\sqrt{8} = \sqrt{4}\sqrt{2}$
$= 2\sqrt{2}$

Ex 2 : $\sqrt{98}$
$\sqrt{98} = \sqrt{49}\sqrt{2}$
$= 7\sqrt{2}$

Ex 3 : $\sqrt{32} = \sqrt{4}\sqrt{8}$
$= 2\sqrt{8}$
$= 2\sqrt{4}\sqrt{2}$
$= 2 \cdot 2\sqrt{2}$
$= 4\sqrt{2}$

$\sqrt{32} = \sqrt{16}\sqrt{2}$
$= 4\sqrt{2}$

Ex 4 : $\sqrt{112}$
$= \sqrt{16}\sqrt{7}$
$= 4\sqrt{7}$

$\sqrt{112}$
$= \sqrt{4}\sqrt{28}$
$= 2\sqrt{28}$
$= 2\sqrt{4}\sqrt{7}$
$= 2 \cdot 2\sqrt{7}$
$= 4\sqrt{7}$

Ex 5 : $\sqrt{108}$
$= \sqrt{9} \sqrt{12}$
$= 3 \sqrt{4} \sqrt{3}$
$= 3 \cdot 2 \sqrt{3}$
$= 6 \sqrt{3}$

Ex 6 : $\sqrt{75}$
$= \sqrt{25} \sqrt{3}$
$= 5 \sqrt{3}$

Ex 7 : $\sqrt{128}$
$= \sqrt{64} \sqrt{2}$
$= 8 \sqrt{2}$

$\sqrt{128}$
$= \sqrt{16} \sqrt{8}$
$= 4 \sqrt{4} \sqrt{2}$
$= 4 \cdot 2 \sqrt{2}$
$= 8 \sqrt{2}$

Radical : Variables

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

$$\sqrt{x^4} = x^2$$

$$\sqrt{x^6} = x^3$$

$$\sqrt{x^5} = \sqrt{x^4}\sqrt{x}$$
$$= \sqrt{x^2}\sqrt{x}$$

$$\sqrt{x^7} = \sqrt{x^6}\sqrt{x}$$
$$= x^3\sqrt{x}$$

$$\sqrt{x^{11} y^{10} z^{13}}$$
$$= \sqrt{x^{10}}\sqrt{x}\sqrt{y^{10}}\sqrt{z^{12}}\sqrt{z}$$
$$= x^5 y^5 z^6 \sqrt{xz}$$

Ex 1 : $\sqrt{12 a^3 b^2 c^5}$
$$= \sqrt{4}\sqrt{3}\sqrt{a^2}\sqrt{a}\sqrt{b^2}\sqrt{c^4}\sqrt{c}$$
$$= 2abc^2\sqrt{3ac}$$

Ex 2 : $\frac{1}{2}\sqrt{8x^3 y^2}$
$$= \frac{1}{2}\sqrt{4}\sqrt{2}\sqrt{x^2}\sqrt{x}\sqrt{y^2}$$
$$= \frac{1}{2}\cdot 2 \cdot x \cdot y\sqrt{2x}$$
$$= xy\sqrt{2x}$$

Ex 3 : $\frac{2}{3}\sqrt{4/9 x^5}$
$$= \frac{2}{3}\cdot\frac{2}{3}\sqrt{x^4}\sqrt{x}$$
$$= \frac{4}{9} x^2 \sqrt{x}$$

MULTIPLICATION

$$\sqrt{3}\sqrt{3} = 3$$
$$\sqrt{8}\sqrt{8} = 8$$

$$\sqrt{5}\sqrt{5} = 5$$
$$\sqrt{x}\sqrt{x} = x$$

Ex1. : $\sqrt{3}\sqrt{6}$ METHOD 1

$$\sqrt{3}\sqrt{6}$$
$$= \sqrt{\cancel{3}}\sqrt{\cancel{3}}\sqrt{2}$$
$$= 3\sqrt{2}$$

METHOD 2

$$\sqrt{3}\sqrt{6}$$
$$= \sqrt{18}$$
$$= \sqrt{9}\sqrt{2}$$
$$= 3\sqrt{2}$$

Ex2 : $\sqrt{3}\sqrt{18}\sqrt{6}\sqrt{2}$
$$= \sqrt{3}\sqrt{3}\sqrt{6}\sqrt{6}\sqrt{2}$$
$$= 3 \cdot 6\sqrt{2}$$
$$= 18\sqrt{2}$$

$$\sqrt{3}\sqrt{18}\sqrt{6}\sqrt{2}$$
$$= \sqrt{3}\sqrt{9}\sqrt{2}\sqrt{3}\sqrt{2}\sqrt{2}$$
$$= 3 \cdot 2 \cdot 3\sqrt{2}$$
$$= 18\sqrt{2}$$

Ex3 : $\sqrt{3a^3b^3c}\sqrt{18a^3bc^2}\sqrt{4b}$
$$= \sqrt{3}\sqrt{9}\sqrt{2}\sqrt{4}\sqrt{a^5b^5c^3}$$
$$= 3 \cdot 2\sqrt{2}\sqrt{3}\sqrt{a^4}\sqrt{a}\sqrt{b^4}\sqrt{b}\sqrt{c^2}\sqrt{c}$$
$$= 6a^2b^2c\sqrt{6abc}$$

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$$= 6a^2b^2c\,\sqrt{6abc}$$