

* Square root, cube root, 4th root

* Opposite

* Subtraction
division
Roots

* Square Roots when
solved is a whole number

Perfect Squares

$$1^2 = 1$$

$$2^2 = 4$$

$$3^2 = 9$$

$$4^2 = 16$$

$$5^2 = 25$$

$$6^2 = 36$$

$$7^2 = 49$$

$$8^2 = 64$$

$$9^2 = 81$$

$$10^2 = 100$$

$$11^2 = 121$$

$$12^2 = 144$$

$$13^2 = 169$$

$$14^2 = 196$$

$$15^2 = 225$$

$$20^2 = 400$$

- No
- * Perfect Squares
 - * Fractions
 - * denominator $\frac{1}{\sqrt{2}}$

- Simplify
- * Create a factor Tree
 - * Circle all Prime Factors
 - * Radical
 - * Pairs
 - * 1
 - * Multiply

Prime: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29

Prime Factorization

1. 54

$$\begin{array}{c} 27, 2 \\ \wedge \\ 1, 54 \\ \wedge \\ 9, 6 \\ \wedge \\ 18, 3 \\ \wedge \\ 3, 3, 3, 2 \\ \boxed{3^3 \cdot 2} \end{array}$$

2. 98 = 7² · 2 7² · 2
 49 2 (7²)(2)
 7 7

3. $\sqrt{45} = \sqrt{3 \cdot 3 \cdot 5} = 3\sqrt{5}$

$$\begin{array}{c} 9 \cdot 5 \\ \wedge \\ 3 \cdot 3 \end{array}$$

$\sqrt{9} \sqrt{5}$
 $3\sqrt{5}$

4. $-\sqrt{98} = -\sqrt{7 \cdot 7 \cdot 2} = -7\sqrt{2}$

$$\begin{array}{c} 49 \cdot 2 \\ \wedge \\ 7 \cdot 7 \end{array}$$

$\sqrt{98} = \sqrt{49 \cdot 2}$
 $7\sqrt{2}$

5. $\sqrt{48} = \sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 3} = 4\sqrt{3}$

$$\begin{array}{c} 6 \cdot 8 \\ \wedge \quad \wedge \\ 2 \cdot 3 \quad 4 \cdot 2 \\ \wedge \quad \wedge \\ 2 \cdot 2 \quad 2 \cdot 2 \end{array}$$

$\sqrt{36} = 6$
 $\sqrt{16} \cdot \sqrt{3} = 4\sqrt{3}$

6. $2\sqrt{45} = 2\sqrt{9 \cdot 3 \cdot 5} = 2 \cdot 3\sqrt{5} = 6\sqrt{5}$

$$\begin{array}{c} 9 \cdot 5 \\ \wedge \\ 3 \cdot 3 \end{array}$$

7. $\sqrt{20} = \sqrt{2 \cdot 2 \cdot 5} = 2\sqrt{5}$

$$\begin{array}{c} 4 \cdot 5 \\ \wedge \\ 2 \cdot 2 \end{array}$$

8. $4\sqrt{40} = 4\sqrt{2 \cdot 2 \cdot 2 \cdot 5} = 8\sqrt{10}$

$$\begin{array}{c} 4 \cdot 10 \\ \wedge \quad \wedge \\ 2 \cdot 2 \quad 2 \cdot 5 \end{array}$$

- 9. $-3\sqrt{11}$
- 10. $6\sqrt{3}$
- 11. $5\sqrt{5}$
- 12. $2\sqrt{3}$
- 13. $10\sqrt{2}$
- 14. $5\sqrt{2}$

11) $\sqrt{125} = \sqrt{5 \cdot 5 \cdot 5} = 5\sqrt{5}$

$\sqrt{108}$

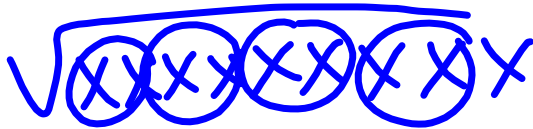
$$\begin{array}{c} 12 \cdot 9 \\ \wedge \quad \wedge \\ 4 \cdot 3 \quad 3 \cdot 3 \\ \wedge \quad \wedge \\ 2 \cdot 2 \quad 3 \cdot 3 \end{array}$$

$3\sqrt{12}$
 $\sqrt{2 \cdot 2 \cdot 3 \cdot 3 \cdot 3}$
 $6\sqrt{3}$

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



$\sqrt{x^9} = x^4 \sqrt{x}$



10. $\sqrt{a^3 b^4} = ab^2 \sqrt{a}$



11. $\sqrt{18c^5 d^4}$

$\begin{matrix} & & \wedge & & \\ & 9 & & 2 & \\ & \wedge & & \wedge & \\ 3 & & 3 & & \end{matrix}$

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

$3c^2 \sqrt{2c}$