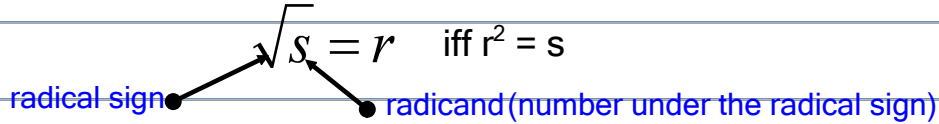


# 5.3 Solve Quadratics by Square Roots

## I. Square Root of Positive Number

A number  $r$  is a square root of  $s$  if  $r^2 = s$



A positive number has TWO square roots:  $\sqrt{s}$  and  $-\sqrt{s}$

$\sqrt{100} = 10$ , since  $10^2 = 100$

$\sqrt{100} = -10$ , since  $(-10)^2 = 100$

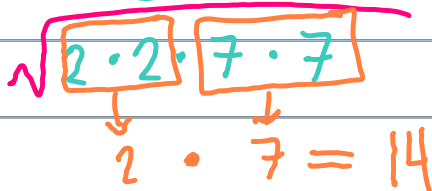
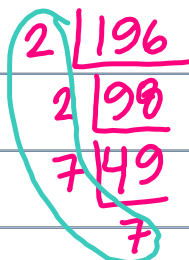
To simplify a radical (if you do not know the root/answer), factor the radicand using prime factors.

prime factors: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, etc.

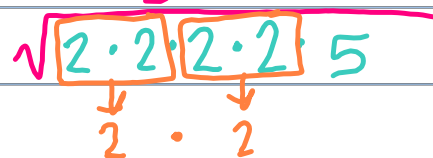
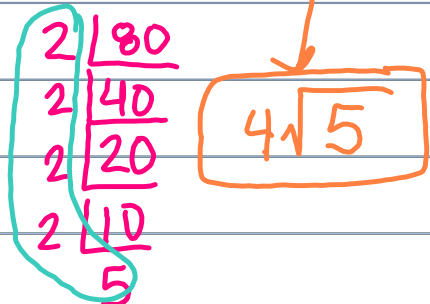
EXAMPLES:  $\sqrt{\#} \leftarrow$  radicand

196 = radicand

1.  $\sqrt{196}$



2.  $\sqrt{80}$



## KEY CONCEPT

For Your Notebook

Properties of Square Roots ( $a > 0, b > 0$ )

Product Property  $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$

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

Quotient Property  $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

Example  $\sqrt{\frac{2}{25}} = \frac{\sqrt{2}}{\sqrt{25}} = \frac{\sqrt{2}}{5}$

A square root is simplified when:

- 1) the radicand has **NO** perfect square factors other than 1,
- 2) the radicand is **NOT** a fraction, and
- 3) **NO** radical is in the denominator. *bottom*

3.  $\sqrt{(x+5)^2}$

$\sqrt{(x+5)(x+5)}$

$x+5$

6.  $\sqrt{(x-4)^2}$

$\sqrt{(x-4)(x-4)}$

$x-4$

4.

$\sqrt{3} \cdot \sqrt{75} = \sqrt{3 \cdot 75} = \sqrt{225}$

$$\begin{array}{r} 3 \overline{)75} \\ 5 \overline{)25} \\ \underline{5} \end{array}$$

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

$3 \cdot 5 = 15$

7.

$\sqrt{6} \cdot \sqrt{21}$

$\sqrt{2 \cdot 3 \cdot 3 \cdot 7}$

$3\sqrt{14}$

5.

$\sqrt{\frac{4}{81}} = \frac{\sqrt{4}}{\sqrt{81}} = \frac{2}{9}$

8.

$\frac{\sqrt{7}}{\sqrt{16}} = \frac{\sqrt{7}}{4}$

## II. Rationalize Denominator Containing Square Root

To rationalize transforms a fraction to an equivalent form with **NO** radical in the denominator.

Steps:

1. Reduce the fraction, if possible.  
Reduce like parts: radicand to radicand;  
coefficient to coefficient
2. Multiply top and bottom by the square root in the denominator.
3. Simplify top and bottom. Reduce again, if possible.

### EXAMPLES:

$$9. \frac{1}{\sqrt{2 \cdot \sqrt{2}}} = \frac{1\sqrt{2}}{2}$$

$$11. \frac{\sqrt{12} \div 6}{\sqrt{18} \div 6} = \frac{\sqrt{2} \cdot \sqrt{3}}{\sqrt{3} \cdot \sqrt{3}} = \frac{\sqrt{6}}{3}$$

$$10. \frac{6 \cdot \sqrt{3}}{\sqrt{3 \cdot \sqrt{3}}} = \frac{6\sqrt{3}}{3\sqrt{3}} = \frac{2\sqrt{3}}{1} = 2\sqrt{3}$$

$$12. \frac{\sqrt{64}}{\sqrt{16}} = \frac{8}{4} = 2$$

## Attachments

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PRACTICE WORKSHEET Square Roots and Quad Equations.doc

Worksheet Simplify Square Roots.doc