1-3
Squares and Square Roots

Vocabulary

* Square Root - a number that you can multiply by itself to get the number under the radical.
  Ex. $\sqrt{121} = \pm 11$
* Principal square root - the positive root.
* Radical symbol - $\sqrt{36}$ ← symbol
* Radicand - the number inside the radical symbol. Ex. $\sqrt{144}$ ← 144 is the radicand.
* Perfect square - A number that has integers as its square root.

Examples:

$\sqrt{36} = \pm 6$
$\sqrt{100} = \pm 10$
$\sqrt{25} = \pm 5$
$\sqrt{4} = \pm 2$
$\sqrt{81} = \pm 9$
$\sqrt{121} = \pm 11$
$\sqrt{144} = \pm 12$

$\sqrt{64} = \pm 8$
$\sqrt{9} = \pm 3$
$\sqrt{169} = \pm 13$
$\sqrt{49} = \pm 7$

For example: 49 is a perfect square because $7^2 = 49$

Simplifying Roots

$\sqrt{7+5} = \sqrt{12} = \sqrt{4 \cdot 3} = 2\sqrt{3}$

$\sqrt{19-3} = \sqrt{16} = \pm 4$

$\sqrt{6+9} = \sqrt{9} = \pm 3$

$\sqrt{25+11} = \sqrt{36} = \pm 6$

$\sqrt{99+22} = \sqrt{121} = \pm 11$

$\sqrt{45-20} = \sqrt{25} = \pm 5$

$\sqrt{20} = \sqrt{4 \cdot 5} = \sqrt{4} \cdot \sqrt{5}$
$= 2\sqrt{5}$

$\sqrt{4-5} = \sqrt{-1}$ imaginary number - not real

$\sqrt{90} = \sqrt{9 \cdot 10} = \sqrt{9} \cdot \sqrt{10}$
$= 3\sqrt{10}$

$\sqrt{\frac{25}{4}} = \pm\frac{5}{2}$ $\quad \sqrt{\frac{36}{16}} = \pm\frac{6}{4} \div 2 = \boxed{\pm\frac{3}{2}}$

$\sqrt{\frac{169}{225}} = \boxed{\pm\frac{13}{15}}$

Estimate each square root by identifying which two whole numbers it falls between.

$\sqrt{47} \rightarrow \overset{=6}{\sqrt{36}} \quad \sqrt{47} \quad \overset{=7}{\sqrt{49}}$

The $\sqrt{47}$ is between 6 and 7, but closer to 7.

Steps:

1) Find the perfect square lower than the radicand.
2) " " higher than the radicand.
3) Determine which two whole #'s it is between.