Introduction to Exponents and Roots

Square Root: A number that you can multiply by itself to get the number under the radical.

Principal square root: the positive root

Radical symbol: $\sqrt{}$

Radicand: The expression under the radical symbol.

Perfect Square: The square of an integer.
Ex. $6^2 = 36$ (36 is a perfect square)

Example1: $7^2 = (7)(7) = 49$, so 7 is a square root of 49. $\sqrt{49} = 7$

Example2: $(-4)^2 = (-4)(-4) = 16$
$\sqrt{16} = \pm 4$

Squares and Square Roots are OPPOSITES!

1) $11^2 = 121$,
so $\sqrt{121} = \underline{\pm 11}$.
2) $6^2 = \underline{36}$,
so $\sqrt{36} = \underline{\pm 6}$.
3) $10^2 = \underline{100}$, so $\underline{10}$ is a square root of $\underline{100}$.
4) $4^2 = \underline{16}$, so $\underline{4}$ is a square root of $\underline{16}$.
5) $9^2 = 81$, so $\underline{9}$ is a square root of $\underline{81}$.
6) $(-3)^2 = \underline{9}$,
so $\sqrt{9} = \underline{\pm 3}$.

6) $\sqrt{36} = \pm 6$

7) $\sqrt{100} = \pm 10$

8) $\sqrt{25} = \pm 5$

9) $\sqrt{4} = \pm 2$

10) $\sqrt{81} = \pm 9$

11) $\sqrt{121} = \pm 11$

12) $\sqrt{\frac{9}{16}} = \frac{\sqrt{9}}{\sqrt{16}} = \frac{\pm 3}{4}$

13) $\sqrt{\frac{81}{100}} = \frac{\sqrt{81}}{\sqrt{100}} = \frac{9}{10}, \frac{-9}{10}$

14) $-\sqrt{49}$
$= (-1)\sqrt{49}$
$= (-1)(7)$
$= \boxed{-7}$

Cube Roots

Example 1: $3 \times 3 \times 3 = 27$, so the cube root of 27 is 3.

Example 2: $4 \times 4 \times 4 = 64$, so the cube root of 64 is 4.

1) $\sqrt[3]{8} = 2$, because $2 \cdot 2 \cdot 2 = 8$.

2) $\sqrt[3]{343} = 7$, because $7 \cdot 7 \cdot 7 = 343$.

3) $\sqrt[3]{125} = 5$, because $5 \cdot 5 \cdot 5 = 125$.

4) $(-2)^3 = (-2)(-2)(-2)$
$(4)(-2) = \boxed{-8}$

5) $-(3)^3 = (-1)(3)^3$
$(-1)(27)$
$= \boxed{-27}$

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Estimating a Square Root

Method 1: Estimate by finding the two closest squares.

Steps:

1) Find the perfect square below the radicand.
2) Find the perfect square above the radicand.
3) Name the two integers that the radicand is between.

$\sqrt{63} = \approx 8$

$\sqrt{49}\ \sqrt{63}\ \sqrt{64}$ (=7, =8) * $\sqrt{63}$ is closer to $\sqrt{64}$, which is 8.

$\sqrt{95} = \approx 10$

$\sqrt{81}\ \sqrt{95}\ \sqrt{100}$ (=9, =10) * $\sqrt{95}$ is closer to $\sqrt{100}$, which is 10.

Method 2: Using a calculator. Use the square root function of your calculator

2nd x^2

$\sqrt{63} = 7.93725\ldots$

$\sqrt{95} = 9.74679\ldots$

What is the value of $\sqrt{34}$ to the nearest integer?

$\sqrt{25}\ \sqrt{34}\ \sqrt{36}$ (=5, =6)

$\sqrt{34}$ is closest to 6.

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What is the value of $\sqrt{53}$ to the nearest integer?

$\sqrt{49}$ $\sqrt{53}$ $\sqrt{64}$

$=7$ $=8$

4 11

$\sqrt{53}$ is closest to 7.

* $\sqrt{53}$ is closer to $\sqrt{49}$, which is 7.