Number systems

Natural Numbers

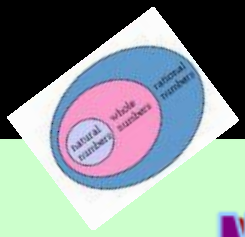
Whole Numbers

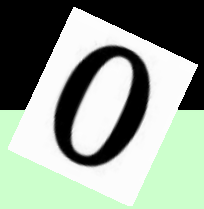
Integers

Rational

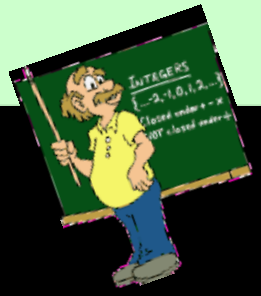
Irrational

Real





Natural Numbers, Whole Numbers and Integers



Natural Numbers

Natural numbers are the numbers we use everyday for counting.

$$N\{1,2,3,4,5,\ldots.\}$$

Whole Numbers

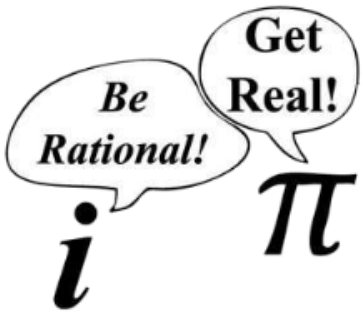
The set of whole numbers includes zero, as well as all the natural numbers

$W \{0, 1, 2, 3, 4, 5, \ldots\}$

Intergers

Integers are whole numbers and their opposites.

I {-3, -2, -1, 0, 1, 2,....}



Rational or Irrational ??

Irrational Numbers

Irrational Numbers can not be written as a fraction m/n, where n ≠ 0. It is represented by a decimal that does not terminate or repeat.

Examples : $\sqrt{26} = 5.099019514.....$

$\sqrt[4]{15} = 1.967989671.....$

$\sqrt[3]{10} = 2.15443469.....$

They go on forever with no pattern!!

Rational Numbers

Any number that can be written in the form m/n, where n ≠ 0.
Rational numbers terminate or repeat.

$4/5 = 0.8$

$1/3 = 0.3333\ldots = 0.\overline{3}$

$\sqrt{25} = 5$

Rational Numbers

$\sqrt[3]{27}$

$\sqrt{64}$

$\sqrt{\frac{9}{64}}$

$\sqrt{25}$

0.5

0.8^2

$\sqrt{100}$

Irrational Numbers

$\sqrt{1/3}$

$\sqrt[3]{9}$

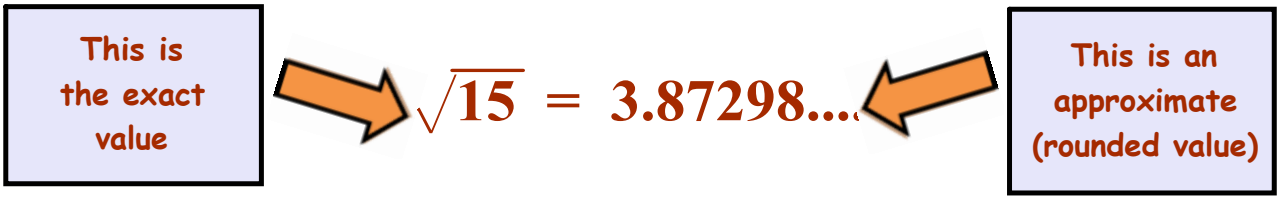
$\sqrt{0.24}$

$\sqrt[4]{12}$

$\frac{\sqrt{18}}{3}$

Irrational Radicals

When an irrational number is written as a radical, the radical is the exact value of the irrational number.



Rational Radicals

Radicals that are square roots of perfect squares, cube roots of perfect cubes, and so on are rational numbers.

$\sqrt[3]{8} = 2$ $\quad \sqrt[4]{256}$ $\quad \sqrt{16/25}$

What about $\sqrt{0.04}$?

Let's Check Your Understanding!

Tell whether each number is rational or irrational.

a) $\sqrt{49/16}$ **b)** $\sqrt[3]{-30}$ **c)** 1.21

d) $-3/5$ **e)** $\sqrt[3]{8/27}$

Ordering Irrational Numbers

Use a number line to order these numbers from least to greatest

$$\sqrt[3]{13},\ \sqrt{18},\ \sqrt{9},\ \sqrt[4]{27},\ \sqrt[3]{-5}$$

$$\begin{array}{ccc} \sqrt[3]{8} & \sqrt[3]{13} & \sqrt[3]{27} \\ \downarrow & \downarrow & \downarrow \\ 2 & ? & 3 \end{array}$$

Estimate = 2.3

$$\begin{array}{ccc} \sqrt[3]{-1} & \sqrt[3]{-5} & \sqrt[3]{-8} \\ \downarrow & \downarrow & \downarrow \\ -1 & ? & -2 \end{array}$$

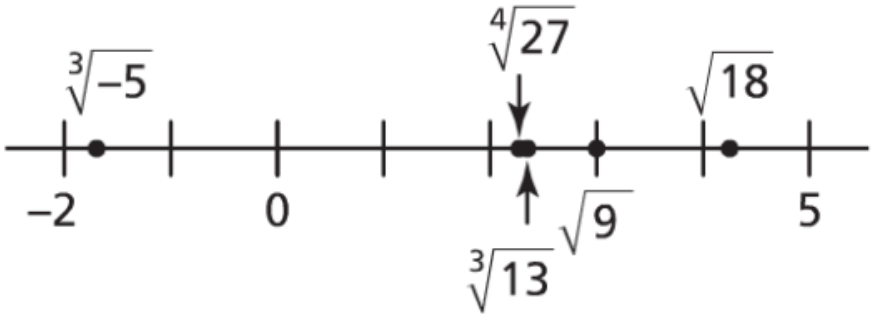
Estimate = -1.6

$$\begin{array}{ccc} \sqrt[4]{16} & \sqrt[4]{27} & \sqrt[4]{81} \\ \downarrow & \downarrow & \downarrow \\ 2 & ? & 3 \end{array}$$

Estimate = 2.2

$$\begin{array}{ccc} \sqrt{16} & \sqrt{18} & \sqrt{25} \\ \downarrow & \downarrow & \downarrow \\ 4 & ? & 5 \end{array}$$

Estimate = 4.2



From least to greatest: $\sqrt[3]{-5}, \sqrt[4]{27}, \sqrt[3]{13}, \sqrt{9}, \sqrt{18}$