

Module 1.A : Number systems, Order of operations, and Applications

Learning Objectives

1. Classify a number into the correct number system.
2. Order numbers from smallest to largest.
3. Perform a calculation using order of operations.
4. Perform basic operations with fractions.
5. Solve an application word problem involving integers.
6. Apply percents to solve a word problem.

SECTION 1 : Classify a number into the correct number system.

Natural or Counting Numbers = $\{1, 2, 3, \dots\} = N$

Whole Numbers = $\{0, 1, 2, 3, \dots\} = W$

Integers = $\{\dots, -3, -2, -1, 0, 1, 2, 3, \dots\} = Z$

Note that the Natural and Whole Numbers are included in the Integers.

Rational Numbers or Fractions = $\left\{ \frac{p}{q} \mid p \text{ and } q \text{ are integers, } q \neq 0 \right\} = Q$

Note that the Integers are included in the Rational Numbers, since for example $13 = \frac{13}{1}$.

Similarly all numbers with terminating or repeating decimals are Rational Numbers:

$$2.0625 = 2\frac{1}{16} = \frac{33}{16}$$

$$0.\bar{6} = 0.66666\dots = \frac{2}{3}$$

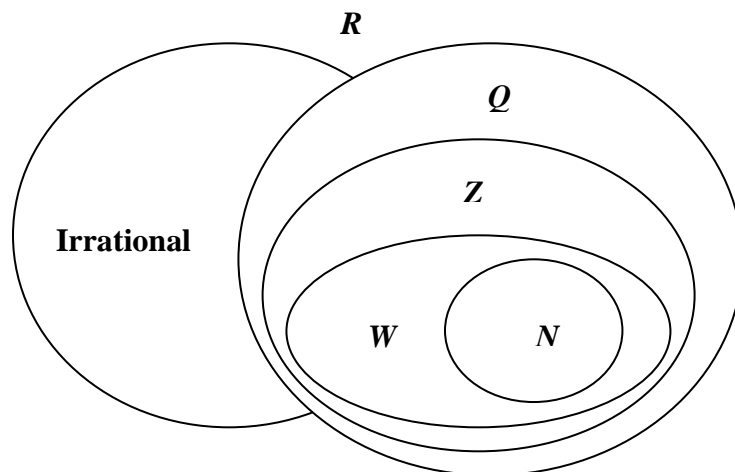
$$1.7\overline{162} = 1.7162162162\dots = \frac{127}{74}$$

Irrational Numbers is the set of non-repeating (also non-terminating) decimals, like

$$\pi = 3.1415926535\dots \text{ or } \sqrt{2} = 1.4142135623\dots$$

Real Numbers (including all of the above) = R

Inclusion Diagram:



EXERCISE 1

Classify the numbers as members of the following set or sets:

A. Natural Numbers B. Whole Numbers C. Integers D. Rationals E. Irrationals

$$\pi, -3, \frac{1}{3}, \sqrt{6}, 0, 2, 0.\bar{3}, -\frac{1}{9}, 100, \sqrt{7}$$

SOLUTION

A. 2, 100

B. 0, 2, 100

C. -3, 0, 2, 100,

D. -3, $\frac{1}{3}$, 0, 2, $0.\bar{3}$, $-\frac{1}{9}$, 100,

E. π , $\sqrt{6}$, $\sqrt{7}$

SECTION 2 Order the numbers from smallest to largest.

The inequality symbol is a quick means of expressing this order.

We say a is **greater than** b but we can write either $b < a$ or $a > b$.

The inequality symbol always points to the smaller quantity:

Larger Number $>$ Smaller Number

Smaller Number $<$ Larger Number

Inequality Symbol	Verbal Description	Example
$a > b$	a is greater than b	$-2 > -3$
$a < b$	a is less than b	$-4 < 2$
$a \geq b$	a is greater than or equal to b	$3 \geq 3$
$a \leq b$	a is less than or equal to b	$4 \leq 4$

EXERCISE 2

Order the numbers from smallest to largest. $-3, \frac{-2}{3}, \frac{1}{4}, \frac{-3}{2}, 2, \frac{1}{6}, \frac{2}{7}$

SOLUTION

$$-3, \frac{-3}{2}, \frac{-2}{3}, \frac{1}{6}, \frac{1}{4}, \frac{2}{7}, 2 \quad \text{since} \quad -3 < \frac{-3}{2} < \frac{-2}{3} < \frac{1}{6} < \frac{1}{4} < \frac{2}{7} < 2$$

MODULE 1.A - ASSESSMENT

_____1. Classify the numbers as members of the integers.

(i) π , (ii) $-\frac{1}{4}$, (iii) $\sqrt{5}$, (iv) 0, (v) $0.\bar{1}$

A (i) and (iv) only **B** all except (i) **C** (iii) and (iv) only
D (iv) only **E** I do not know

_____2. Classify the numbers as members of the rational numbers.

(i) π , (ii) $-\frac{1}{4}$, (iii) $\sqrt{5}$, (iv) 0, (v) $0.\bar{1}$

A all except (iii) **B** all except (i) and (iii) **C** (ii) and (iv) only
D (iv) only **E** I do not know

_____3. Order the numbers from smallest to largest. $-\frac{1}{4}, 2, \frac{-2}{5}, \frac{3}{4}, -2, \frac{1}{3}$

A $-\frac{1}{4}, \frac{-2}{5}, -2, \frac{1}{3}, \frac{3}{4}, 2$ **B** $-2, \frac{-2}{5}, \frac{-1}{4}, \frac{1}{3}, \frac{3}{4}, 2$ **C** $-2, \frac{-2}{5}, \frac{-1}{4}, \frac{3}{4}, \frac{1}{3}, 2$
D $-2, \frac{-1}{4}, \frac{-2}{5}, \frac{1}{3}, \frac{3}{4}, 2$ **E** I do not know