DEPARTMENT OF EDUCATION (S)
Government of Manipur

CHAPTER 1

INTEGERS

NOTES:

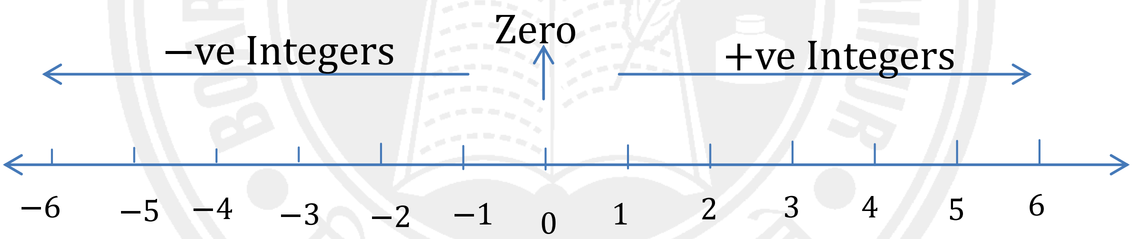
1. **Natural Number**: The numbers1,2,3,4,5,…………..are called **natural numbers.**
2. Whole **Number**: The numbers 0,1,2,3,4, 5,……………are called **whole numbers.**
   - I. All the natural numbers are positive numbers.
   - II. All the natural numbers are included in the whole number system.
   - III. The numbers obtained on putting minus sign before the natural numbers are called the negative numbers.
   - IV. **Zero** is neither positive nor negative.

INTEGERS

The group of positive and negative numbers with 0 together is called the integers.

e.g :… … … ., $-5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, \ldots \ldots \ldots$

The number systems of natural numbers, whole numbers and integers can be put on the number line.



PROPERTIES OF ADDITION AND SUBTRACTION OF INTEGERS:

1. **CLOSURE UNDER ADDITION** :
   For any two integers $a$and b,$a + b$ is an integer.
   e.g. $2 + 3 = 5$ is an integer .

2. CLOSURE UNDER SUBTRACTION:

For any two integers $a$and , $a - b$is an integer.

e.g.$5 - 3 = 2$is an integer.

3. COMMUTATIVE PROPERTY:

For any two integers $a$and b, then $a + b = b + a$.

e.g.$2 + 3 = 3 + 2$

4. **ASSOCIATIVE PROPERTY**:

For any integers a,b and c, then $a + (b + c) = (a + b) + c$.

e.g. $2 + (3 + 4) = (2 + 3) + 4$.

5. **ADDITIVE IDENTITY:**

The sum of an integer and zero is always the number itself.

e.g.$5 + 0 = 5$.

MULTIPLICATION OF INTEGERS

1. Multiplication of two **positive** integers is **positive**.
   i.e. $2 \times 3 = 6$.
2. Multiplication of a **positive** and a **negative** integer is always**negative**.
   e.g. $2 \times (-3) = -6$.
3. **Multiplication** of two **negative** integers is always **positive**.
   e.g. $-5 \times (-4) = 20$.

4. CLOSURE UNDER MULTIPLICATION

For any two integers a and $b$then $a \times b = ab$ is an integer.

e.g. $2 \times 3 = 6$ is an integer.

5. COMMUTATIVE UNDER MULTIPLICATION:

For any two integers a and b then $a \times b = b \times a$

e.g. $4 \times 5 = 5 \times 4$.

6. **MULTIPLICATION BY ZERO** :

The product of an integer and zero is always zero.

e.g. $2 \times 0 = 0$.

7. **MULTIPLICATIVE IDENTITY** :

The product of an integer and 1 is always the number itself.

e.g. $5 \times 1 = 5$.

8. ASSOCIATIVITY OF MULTIPLICATION:

For any three integers$a$,$b$and c. The product of three integers does not depend upon the grouping of integers.

i.e.,$(a \times b) \times c = a \times (b \times c)$

e.g., $(2 \times 3) \times 4 = 2 \times (3 \times 4)$.

9. **DISTRIBUTIVEPROPERTY** :

For any three integers a, b and c.

$a \times (b + c) = a \times b + a \times c$

And, $a \times (b - c) = a \times b - a \times c$

DIVISION OF INTEGERS

Rules of division of integers

Rule1. When we divide a negative integer by a positive integer, we divide them as whole numbers and put a minus sign (–) before the quotient.

Rule2. When we divide a positive integer by a negative integer, we divide them as whole numbers and put a minus sign (–) before the quotient.

Rule3. When we divide a negative integer by a negative integer, we divide them as whole numbers and put a positive sign (+) before the quotient.

Properties of division of numbers

1. Division is not commutative. i.e., $a \div b \neq b \div a$.
2. For any integer a, $a \div 0$ is meaningless.
3. For any $a \neq 0$, $0 \div a = 0$.
4. For any a, $a \div 1 = a$.
5. For any a, $a \div (-1) = -a$.
6. Division is not associative. i.e., $a \div (b \div c) \neq (a \div b) \div c$.