CLASS-7

LESSSON-1 INTEGERS

(This PDF Based on NCERT Book)

INTEGERS(पूर्णांक)- In mathematics, an integer is a whole number that doesn't have a fractional or decimal part.

Ex- All Positive whole number 1,2,3,4,…..

All Negative whole number -1,-2,-3,-4,……

TYPE OF INTEGERS-

1. Positive Integers(धनात्मक पूर्णांक)
2. Negative Integers(ऋणात्मक पूर्णांक)

POSITIVE INTEGERS- In Positive integers, All whole number are positive.

Just like 1,2,3,4,5,……..

NEGATIVE INTEGERS- In Negative integers , All whole number are negative.

Just like -1,-2,-3,-4,-5,……..

PROPERTIES OF ADDTION AND SUBTRACTION OF INTEGERS (पूर्णांक को जोड़ने और घटाने का गुण)–

1. Some Properties of Addition-

- **Closure property(संवृत गुण)**: The sum of any two integers is always an integer.

Ex- -5+3= -2

- **Commutative Property(क्रमविनिमय गुण):** The order in which you add two integers does not change the sum.
  - **Formula:** a+b=b+a
  - **Ex:** 4+(−7)=−3 and (−7)+4=−3.
- **Associative Property(साहचर्य गुण):** The way you group three or more integers for addition does not affect the sum.
  - **Formula:** (a+b)+c=a+(b+c)
  - **Ex:** (2+3)+5=5+5=10 and 2+(3+5)=2+8=10.
- **Additive Identity(योज्य तत्समक):** Adding zero to any integer gives the same integer. Zero is the additive identity for integers.
  - **Formula:** a+0=a
  - **Ex:** −9+0=−9.

2. Properties of Subtraction of Integers

Subtraction of integers is different from addition and has fewer properties.

- **Closure Property(संवृत गुण):** The difference between any two integers is always an integer.
  - **Ex:** $8-3=5$ and $3-8=-5$. In both cases, the result is an integer.
- **Subtraction is NOT Commutative(घटाव क्रमविनिमय नहीं होते है):** Changing the order of the numbers in subtraction changes the result.
  - **Formula:** $a-b \neq b-a$ (unless $a=b$)
  - **Ex:** $5-2=3$, but $2-5=-3$. Since $3 \neq -3$, subtraction is not commutative.
- **Subtraction is NOT Associative(घटाव साहचर्य नहीं होते है):** The way you group numbers for subtraction changes the result.
  - **Formula:** $(a-b)-c \neq a-(b-c)$
  - **Ex:** $(10-5)-2=5-2=3$, but $10-(5-2)=10-3=7$. Since $3 \neq 7$, subtraction is not associative

MULTIPLICATION OF INTEGERS(पूर्णांकों का गुणनखंड)-.

Rule 1: Multiplying Integers with the Same Sign(समान चिन्हों का गुणनखंड):

When you multiply two integers that have the **same sign** (either both positive or both negative), the product is always **positive**.

- **Positive × Positive = Positive**
  - **Ex-:** $5 \times 4=20$
- **Negative × Negative = Positive**
  - **Ex-:** $-5 \times -4=20$

Rule 2: Multiplying Integers with Different Signs(अलग अलग चिन्हों का गुणनखंड):

When you multiply two integers that have **different signs** (one positive and one negative), the product is always **negative**.

- **Positive × Negative = Negative**
  - **Ex-:** $5 \times -4=-20$
- **Negative × Positive = Negative**
  - **Ex-:** $-5 \times 4=-20$

Multiplying More Than Two Integers(दो से अधिक पूर्णांकों का गुणनखंड):

When you have to multiply more than two integers, you can use this simple trick:

- Count the number of **negative signs**.
- If the number of negative signs is **even** (like 2, 4, 6, etc.), the final product will be **positive**.
  - **Ex-:** $(-2) \times (-3) \times 4=6 \times 4=24$ (There are 2 negative signs, which is an even number.)
- If the number of negative signs is **odd** (like 1, 3, 5, etc.), the final product will be **negative**.
  - **Ex-:** $(-2) \times (-3) \times (-4)=6 \times (-4)=-24$ (There are 3 negative signs, which is an odd number.)

PROPERTIES OF MULTIPLICATION OF INTEGERS(पूर्णांकों के गुणनखंड के गुण):

1. Closure Property(संवृत गुण):

The product of any two integers is always an integer.

- **Ex-:** $5\times(-3)=-15$. Both 5 and -3 are integers, and their product, -15, is also an integer.

2. Commutative Property(क्रमविनिमय गुण):

Changing the order of the integers you multiply does not change the product.

- **Formula:** $a\times b=b\times a$
- **Ex-:** $4\times(-6)=-24$ and $(-6)\times4=-24$.

3. Associative Property(साहचर्य गुण):

The way you group three or more integers for multiplication does not affect the product.

- **Formula:** $(a\times b)\times c=a\times(b\times c)$
- **Ex-:** $(2\times3)\times5=6\times5=30$ and $2\times(3\times5)=2\times15=30$.

4. Multiplicative Identity(गुणात्मक तत्समक):

Multiplying any integer by **1** gives the same integer. The number 1 is the multiplicative identity for integers.

- **Formula:** $a\times1=a$
- **Ex-:** $-10\times1=-10$.

5. Distributive Property(वितरण गुण):

Multiplication distributes over addition. This means that multiplying a number by a sum is the same as multiplying each number in the sum individually and then adding the products.

- **Formula:** $a\times(b+c)=(a\times b)+(a\times c)$
- **Ex-:** $3\times(4+5)=3\times9=27$.
- **Using the property:** $(3\times4)+(3\times5)=12+15=27$. The results are the same.

6. Multiplicative Property of Zero(शून्य का गुणात्मक गुण):

Multiplying any integer by **0** always gives a product of 0.

- **Formula:** $a\times0=0$
- **Ex-:** $-7\times0=0$.

DIVISION OF INTEGER(पूर्णांकों का विभाजन):

1. When the Signs are the Same(जब समान चिन्ह हो तो)

If the two integers you are dividing have the **same sign** (both positive or both negative), the result will always be **positive**.

- **Positive ÷ Positive = Positive**
  - **Ex-:** $12 \div 4 = 3$
- **Negative ÷ Negative = Positive**
  - **Ex-:** $(-12) \div (-4) = 3$

2. When the Signs are Different(जब अलग-अलग चिन्ह हो तो)

If the two integers you are dividing have **different signs** (one positive and one negative), the result will always be **negative**.

- **Positive ÷ Negative = Negative**
  - **Ex-:** $12 \div (-4) = -3$
- **Negative ÷ Positive = Negative**
  - **Ex-:** $(-12) \div 4 = -3$

Important Points About Division(विभाजन के बारे मे महत्वपूर्ण बिन्दु)

- **Division by Zero is Undefined:** You can never divide any number by zero. The result is **undefined**.
  - **Ex-:** $5 \div 0$ has no solution.
- **Dividing Zero:** When you divide zero by any non-zero integer, the result is always zero.
  - **Ex-:** $0 \div 7 = 0$

Properties of Division(विभाजन के गुण):

Unlike multiplication and addition, division has very few properties:

- **Closure Property(संवृत गुण):** The set of integers is **not closed** under division. This means that when you divide one integer by another, the result is not always an integer.
  - **Ex-:** $5 \div 2 = 2.5$, which is not an integer.
- **Commutative Property(क्रमविनिमय गुण):** Division is **not commutative**. Changing the order of the numbers changes the result.
  - **Ex-:** $10 \div 2 = 5$, but $2 \div 10 = 0.2$.
- **Associative Property(साहचर्य गुण):** Division is **not associative**. Changing the grouping of the numbers changes the result.
  - **Ex-:** $(24 \div 4) \div 2 = 6 \div 2 = 3$, but $24 \div (4 \div 2) = 24 \div 2 = 12$.