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Grade 07: Maths
Chapter Notes
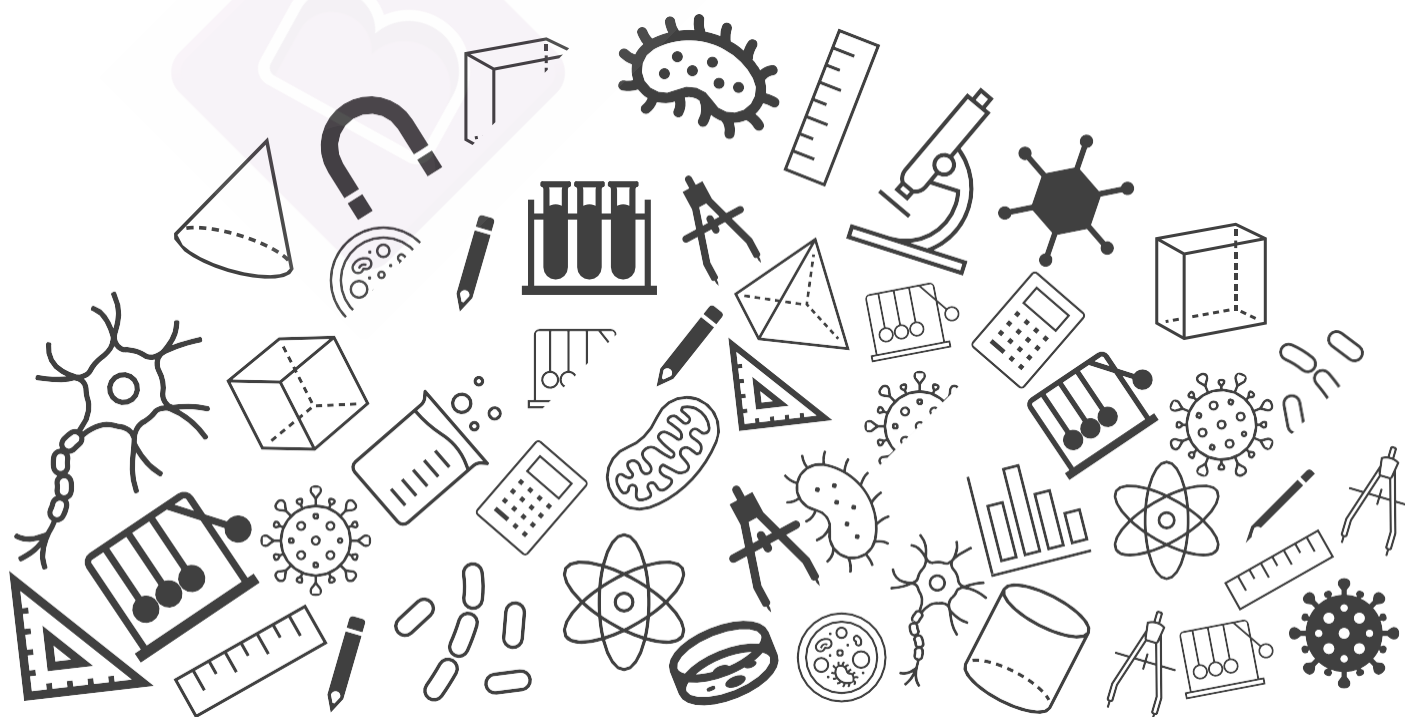
BYJU'S Classes

Chapter Notes

Integers

Grade 07

Topics to be Covered

1. Properties of Addition and Subtraction of Integers

- 1.1. Closure under Addition
- 1.2. Closure under Subtraction
- 1.3. Commutative Property
- 1.4. Associative Property
- 1.5. Additive Identity
- 1.6. Additive Inverse

2. Multiplication of Integers

- 2.1. Multiplication of a Positive and a Negative Integer
- 2.2. Multiplication of two Negative Integers

5. Properties of Multiplication of Integers

- 3.1. Closure under Multiplication
- 3.2. Commutativity of Multiplication
- 3.3. Multiplication by Zero
- 3.4. Multiplicative Identity
- 3.5. Associativity for Multiplication
- 3.6. Distributive Property

4. Division of Integers

- 4.1. Rules of division of integers
- 4.2. Properties of division of integers
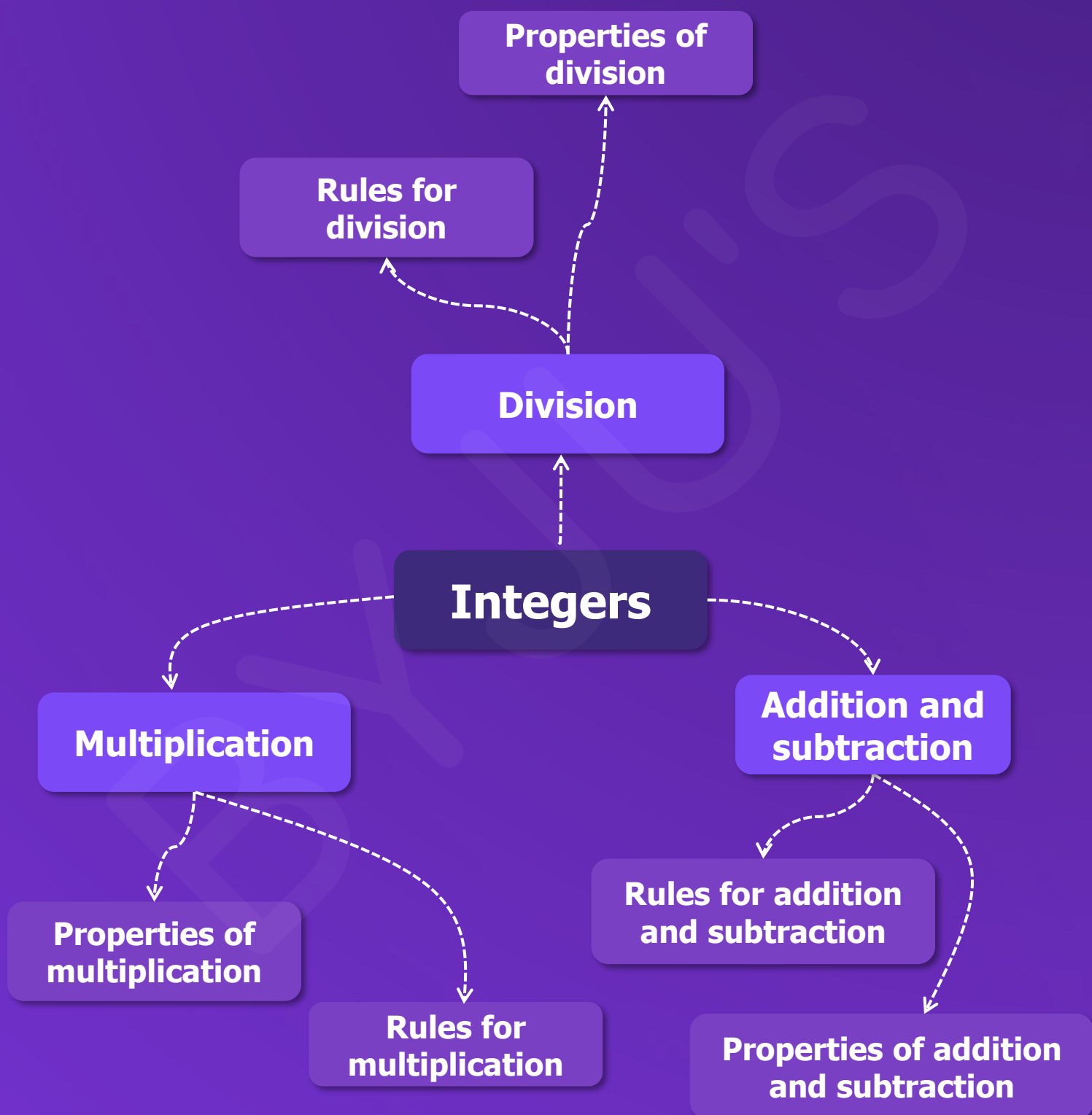
1. Properties of Addition and Subtraction of Integers

1.1. Closure under Addition

Integers are closed for addition. If a and b are integers, then a + b is also an integer.

> 7 + 1 = 8, which is an integer

1.2. Closure under Subtraction

Integers are closed for subtraction. If a and b are integers, then a − b is also an integer.

> 7 − 9 = −2, which is an integer

1.3. Commutative Property

The result of the addition of two integers is always the same regardless of their order. **Addition is commutative for integers**, but **subtraction is not commutative**.

> a + b = b + a

> a - b ≠ b - a

Example: 5 + (− 6) = −1 = (− 6) + 5
Subtraction is not commutative for integers.
Example:
5 − (−3) = 5 + 3 = 8 but (−3) − 5 = − 3 − 5 = − 8

1. Properties of Addition and Subtraction of Integers

1.4. Associative Property

It is the property of numbers which states that the way in which three or more numbers are grouped does not change the sum of these numbers.
The associative property **holds true for only addition**. It **does not hold true** for **subtraction**.

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

$$a - (b - c) \neq (a - b) - c$$

For example:
$(-5) + [(-3) + (-2)] = [(-5) + (-3)] + (-2)$
$(-5) - [(-3) - (-2)] \neq [(-5) - (-3)] - (-2)$

1.5. Additive Identity

The property states that when a number is added to zero it will give the same number. **Zero** is called the **identity element** (also known as additive identity).

$$a + 0 = a = 0 + a$$

1.6. Additive Inverse

An additive inverse of a number is defined as the value, which on adding to the original number results in zero.

$$a + (-a) = 0$$

Here, -a is the additive inverse of a.

2. Multiplication of Integers

2.1. Multiplication of a Positive and a Negative Integer

Multiplication of one positive and one negative integer gives the result as a negative integer.

$$a \times (-b) = (-a) \times b = -(a \times b)$$

For example: $3 \times (-4) = -12$ which is a negative integer.

2.2. Multiplication of two Negative Integers

Multiplication of two negative integers gives the result as a positive integer.

$$(-a) \times (-b) = a \times b$$

For example: $(-10) \times (-12) = +120 = 120$

3. Properties of Multiplication of Integers

3.1. Closure under Multiplication

When two integers are multiplied, the result is also an integer. Thus, integers are closed under multiplication.

> If a and b are integers, then
> a × b is also an integer.

For example: (−20) × (−5) = 100, which is an integer.

3.2. Commutative Property

The result of the multiplication of two integers is always the same regardless of their order. This property is called commutative property.
Multiplication is commutative for integers.

> a × b = b × a

For example: 3 × (−4) = −12 = (−4) × 3

3.3. Multiplication by Zero

The product of an integer and zero is zero.

> a × 0 = 0 × a = 0

For example: (−3) × 0 = 0

3. Properties of Multiplication of Integers

3.4. Multiplicative Identity

1 is the multiplicative identity for integers.

$$a \times 1 = 1 \times a = a$$

Example: $(-3) \times 1 = -3$
$1 \times 5 = 5$

3.5. Associativity for Multiplication

The associative property states that the product of three or more numbers does not change if they are grouped in a different way.

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

Example: $[(-3) \times (-2)] \times 5 = (-3) \times [(-2) \times 5]$

3.6. Distributive Property

The distributive property holds true for multiplication over addition.
It states that for any three integers a, b and c:

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

Example:
$(-8) \times [(-2) + (-1)] = [(-8) \times (-2)] + [(-8) \times (-1)]$

4. Division of Integers

4.1. Rules of Division of Integers

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

$$(-a) \div b = -(a \div b), \text{ where } b \neq 0$$

Example: $(-12) \div 3 = -(12 \div 3) = -4$

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

$$a \div (-b) = (-a) \div b = -(a \div b), \text{ where } b \neq 0$$

Example: $12 \div (-3) = (-12) \div 3 = -(12 \div 3) = -4$

3. When we divide a negative integer by a negative integer, we first divide them as whole numbers and then put a positive sign (+).

$$(-a) \div (-b) = a \div b, \text{ where } b \neq 0$$

Example: $(-12) \div (-3) = 12 \div 3 = 4$

4.2. Properties of Division of Integers

1. The closure property **does not** hold for division of integers.

> $3 \div 4 = 0.75$, which is not an integer

2. Commutative property **does not** hold for division of integers.

> $3 \div 4 \neq 4 \div 3$

3. Associative property **does not** hold for division of integers.

> $(12 \div 3) \div 4 \neq 12 \div (3 \div 4)$

4. For any integer a,

> (a) $a \div 0$ is not defined
> (b) $a \div 1 = a$