ODM EDUCATIONAL GROUP
Changing your Tomorrow

REAL NUMBERS

INTRODUCTION

SUBJECT : MATHEMATICS
CHAPTER NUMBER: 01
CHAPTER NAME : REAL NUMBERS

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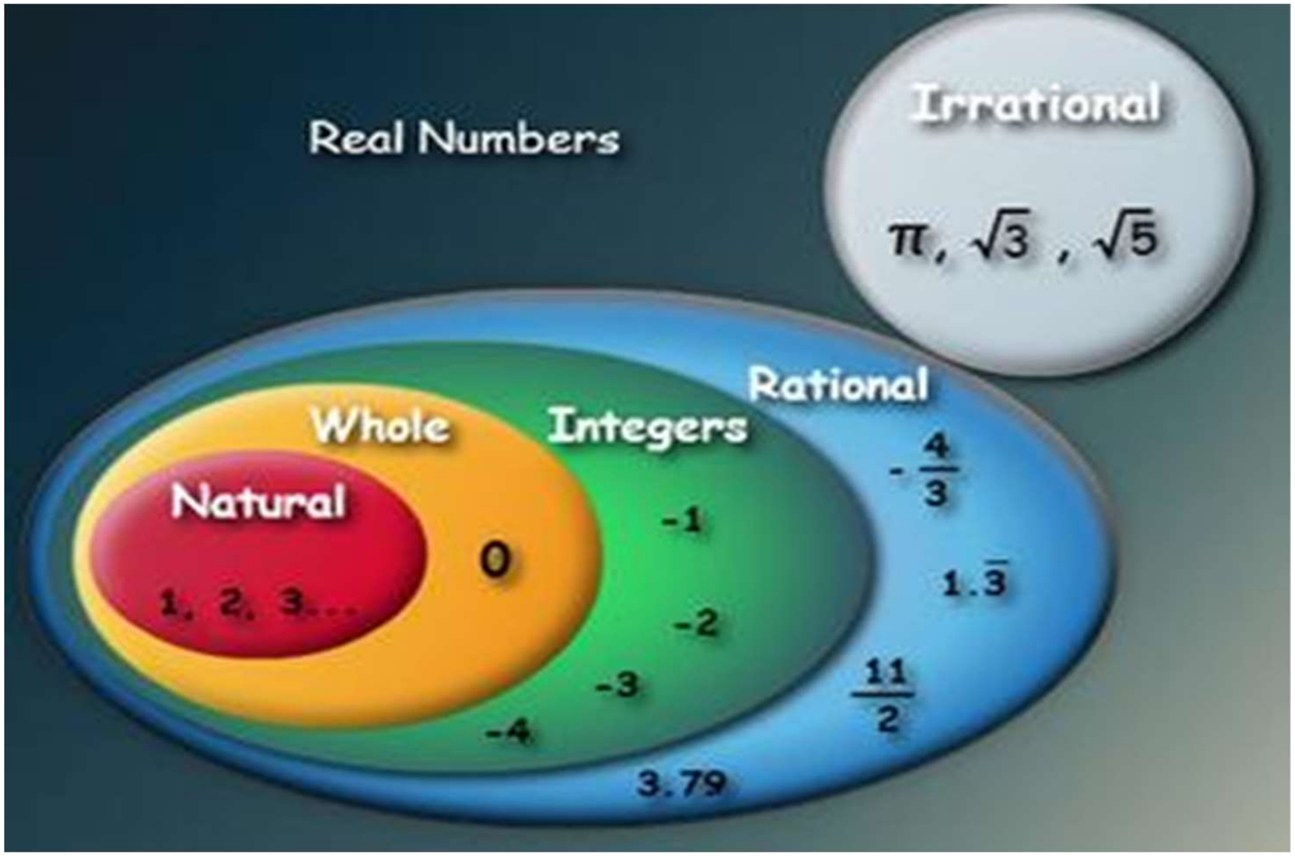
Learning outcome

- Students will be able to define Lemma and Euclid’s Division Lemma

- Students will be able to express the relationship among dividend, divisor, quotient and remainder

- Students will be able to formulate numbers in algebraic form and solve analytical problems using Euclid’s Division Lemma

Lets know more about real numbers



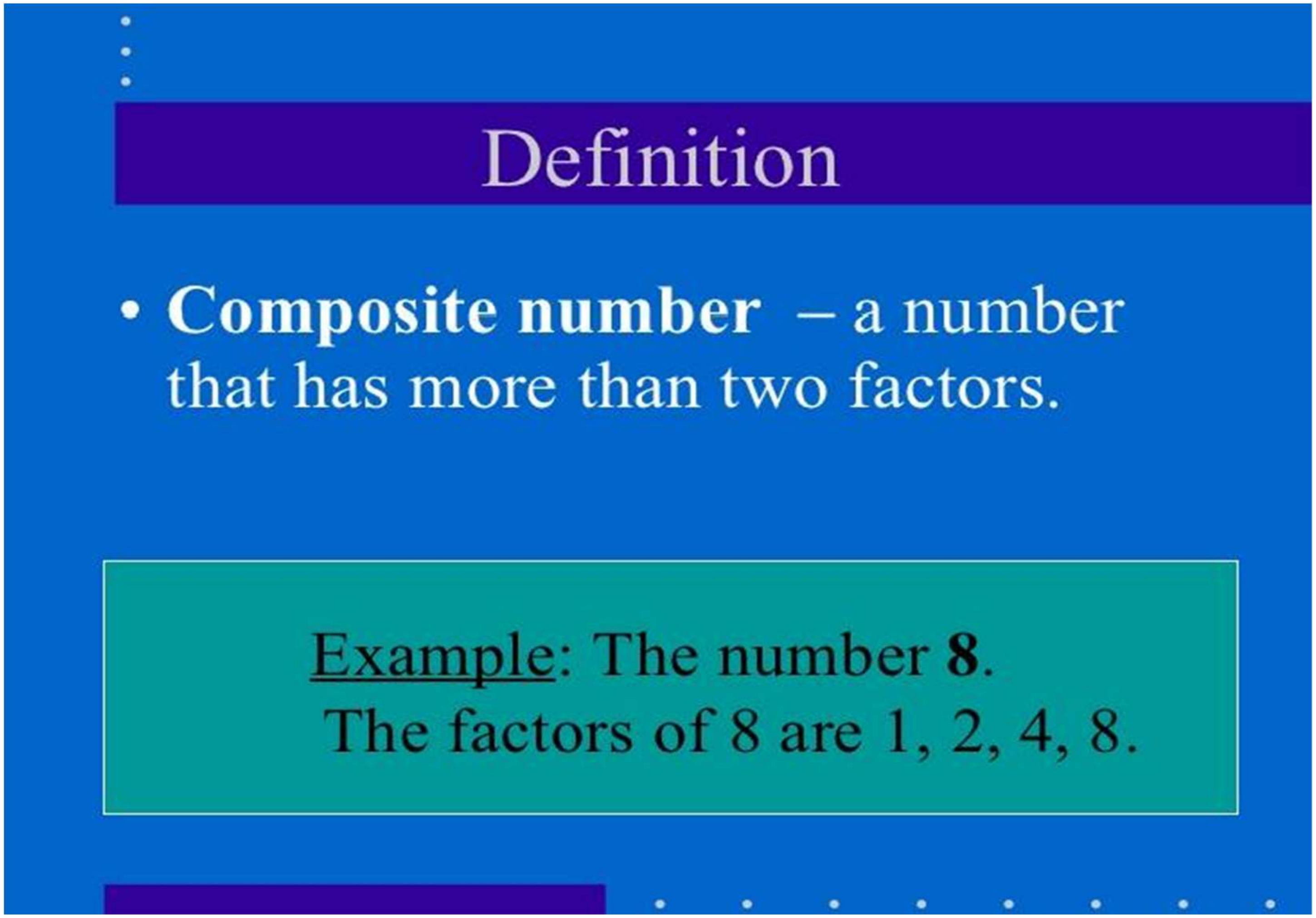
Rational Numbers & Irrational numbers

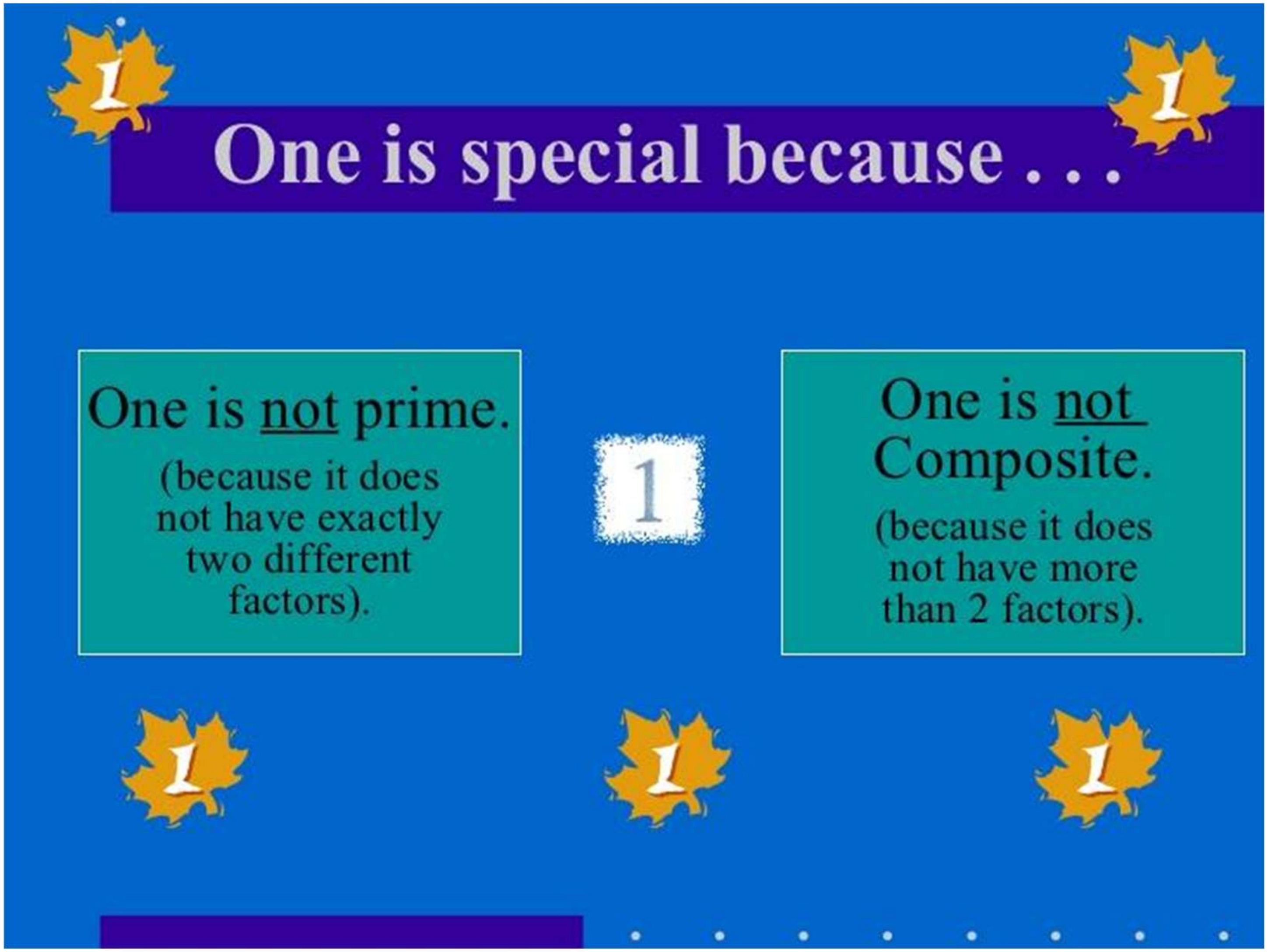
- Rational Number is defined as any number that can be represented in the form of p/q where p &q are integers and q ≠ 0. On the other hand, we can also say that any fraction fits into the category of Rational Numbers if both p, q are integers and the denominator is not equal to zero.
- Example.2,2/3,2.345. etc
- **Irrational number** is defined as any number that can not be represented in the form of p/q where p &q are integers and q ≠ 0
- example. √2, √5,2.2301245…..etc

DEFINITION

Prime Number – a number that has only two factors, itself and 1.

Example -7 is prime because it has only two factors 7 and 1.


Definition
• **Composite number** – a number that has more than two factors.
Example: The number **8**.
The factors of 8 are 1, 2, 4, 8.


One is special because . . .
One is not prime.
(because it does not have exactly two different factors).
1
One is not Composite.
(because it does not have more than 2 factors).

Definition of Even Numbers:

Integers which are divisible by 2 are known as **even numbers**

Ex: 8, 14, 16, 50, 62,…

Definition of Odd Numbers:

In contrast, to even numbers, integers which are not divisible by 2 are known as odd numbers.

Ex: 13, 21, 65, 77, 49,…

General Representation of Odd and Even numbers

In general format, every Even number can be written in the form of **(2n),** whereas, every odd number can be written in the form of

(2n-1) or **(2n + 1),** where n is a natural number. In case of integers, these can be represented as 2k and 2k + 1 or 2k – 1, where k is any positive integer.

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Relationship between the divisor and remainder using example or puzzle of page2

https://www.youtube.com/watch?v=v4sbiC5sRzw

A lemma is a proven statement used for proving another statement.

Theorem 1.1 (Euclid's Division Lemma) : Given positive integers a and b, there exist unique integers q and r satisfying $a = bq + r, 0 \le r < b$.

Show that every positive even integer is of the form 2q, and that every positive odd integer is of the form 2q + 1, where q is some integer.

Solution : Let a be any positive integer and b = 2. Then, by Euclid's lemma,

$a = 2q + r$, for some integer $q \geq 0$, and $r = 0$ or $r = 1$,

because $0 \leq r < 2$. So, $a = 2q$ or $2q + 1$. If a is of the form 2q, then a is an even integer.

Also, a positive integer can be either even or odd. Therefore, any positive odd integer is of the form $2q + 1$.

Show that any positive odd integer is of the form 4q + 1 or 4q + 3, where q is some integer.

Solution : Let us start with taking a, where a is a positive odd integer. We apply the division algorithm with a and b = 4.

Since $0 \leq r < 4$, the possible remainders are 0, 1, 2 and 3.

That is, a can be 4q, or 4q + 1, or 4q + 2, or 4q + 3, where q is the quotient.

However, since a is odd, a cannot be 4q or 4q + 2 (since they are both divisible by 2).

Therefore, any odd integer is of the form 4q + 1 or 4q + 3.

Home assignment

- Ex. 1.1 Q. No. 2
- 1. Show that only one out of a, a+2 and a+4 is divisible by 3
- 2. Prove that for any odd natural number "n", n^2-1 is divisible by 8
- 3.Prove that product of 3 consecutive natural numbers is divisible by 6
- Prove that n^3-n is divisible by 6 for any positive integer n

THANKING YOU

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