

☆ Notion about numbers:

1. **Natural numbers:**

Write down numbers that you use for counting the number of pages of a book or any other thing we use:

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Ex1: Consider the set of numbers {1,2,3,4,5,...}.

a) Trace a number line and place the above numbers on it.

.....

b) What do you notice about the position of these numbers on the number line?

.....

Ex2: Consider the following equations: 1) $x + 3 = 5$ 2) $2x + 5 = 3$

a) Solve equation-1 for x in the set \mathbb{N} .

.....

.....

b) If you are only familiar with the set of natural numbers, then can you find a value of x that satisfies equation-2? Show your work.

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c) What suggestions would you make to have a solution for equation-2?

.....



2. **Integers:**

As you noticed, from the above example that some equations of the form $x + a = b$, where $a \neq b$ belong to \mathbb{N} cannot be solved in the set \mathbb{N} .

Ex3: What type of numbers would you use to represent the following situations?

- Temperature below zero. - Down slopes. - Value that verifies: $x + 3 = 2$
- Places below ground floor - Loss.

.....

➤ So we will extend the set \mathbb{N} to the set of integers \mathbb{Z} , which stands for **Zahlen**.

➤ The set of integers consists of numbers such as:



Ex4: Describe the set of integers in terms of natural numbers.....

Conclusions: 1) The set of integers is denoted by: $\mathbb{Z} = \{\dots -3, -2, -1, 0, 1, 2, 3, \dots\}$.

Ex5: Solve the following equations in \mathbb{Z} :

➤ $x^2 - 4 = 0$

➤ $2x + 3 = 0$

3. Rational numbers:

\mathbb{Z} , is insufficient to solve some equations of the form $ax + b = 0$, where a & b belong to \mathbb{Z} .

So, we will extend the set \mathbb{Z} into the set of **rational** numbers.

Example: $\frac{2}{3}, -\frac{4}{5}, \frac{2}{1}, \frac{1}{3}$, are rational numbers.

Conclusions:

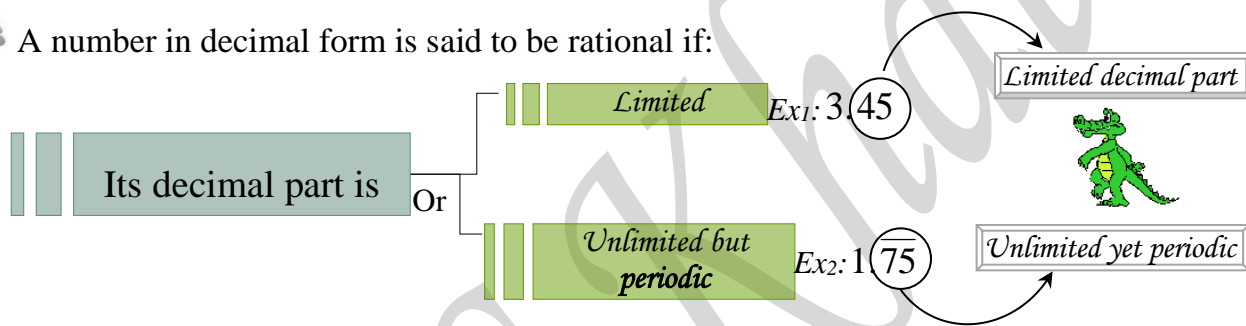
- 1) The set of rational numbers is denoted by: $Q = \left\{ \dots -\frac{1}{3}, -\frac{1}{2}, -1, 0, \frac{1}{3}, \frac{3}{2}, \frac{35}{4} \dots \right\}$.
- 2) A number is rational if that can be written in the **ratio** form, $\frac{a}{b}$, where a & b are **integers** such that $b \neq 0$.

A rational number can be written in decimal form.

Decimal form of a rational number:



A number in decimal form is said to be rational if:



4. Irrational numbers:

1) Determine the measure of the diagonal of the rectangle $ABCD$ of dimensions 3cm & 4cm .

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2) Calculate the exact value of the diagonal of a square whose side is 3cm .

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3) Find the length of the diagonal in decimal form:

4) Are the above numbers rational numbers? Justify.

Note that: Such numbers are called **irrational** numbers.

5) Give three or more examples of irrational numbers:

6) Complete the following Venn diagram with the suitable terms to determine the relation among different subsets of real numbers (Natural numbers, integers, decimal numbers, ...)

Give examples.

Real Numbers

