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## Whole Numbers: Definition and Difference between Whole Numbers and Natural Numbers

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The whole numbers are the part of the number system in which it includes all the positive integers from 0 to infinity. These numbers exist in the number line; hence they are all real numbers. All the whole numbers are real numbers but not all the real numbers are whole numbers. Natural numbers along with ' 0 ' are called whole numbers. The examples are: $0,11,25,36$, etc.

- Whole Numbers and Natural Numbers
- Natural Numbers
- Difference between natural and whole numbers
- Real numbers


## Whole Numbers Definition

The whole numbers are the number without fractions and it is a collection of positive integers and zero. It is represented as " $W$ " and the set of numbers are $\{0,1,2,3,4,5,6,7,8,9 \ldots\}$

These numbers are positive including zero and do not include fractional or decimal parts $\left(\frac{3}{4}, 2.2\right.$ and5.3 $)$ are not whole numbers) . Addition, Subtraction, Multiplication and Division operations are possible with the whole numbers.

## The Real Number system



## Whole Numbers Properties

The properties of whole numbers are based on arithmetic operations such as addition, subtraction, division and multiplication. Two whole numbers if added or multiplied will give a whole number itself. Subtraction of two whole numbers may not result in whole numbers, i.e.. it can be an integer too. Also, division of two whole numbers results in getting a fraction in some cases. Now let us see some more properties here;

## Closure Property

They can be closed under addition and multiplication, i.e.. , if and are two whole numbers then $x \times y$ or $x+y$ is also a whole number.

## Commutative Property of Addition and Multiplication

The sum and product of two whole numbers will be the same whatever the order they are added or multiplied in, i.e.., if x and y are two whole numbers $x+y=y+x \operatorname{and} x \times y=y \times x$

## Additive Identity

When a whole number is added to 0 , its value remains unchanged, i.e.. , if x is a whole number then $x+0=0+x=x$

## Multiplicative Identity

When a whole number is multiplied by 1, its value remains unchanged, i.e.. , if x is a whole number then $x \times 1=x=1 \times x$

## Associative Property

When whole numbers are being added or multiplied as a set, they can be grouped in any order, and the result will be the same, i.e.. if $\mathrm{x}, \mathrm{y}$ and z are whole numbers then $x+(y+z)=(x+y)+z$ and $x \times(y \times z)=(x \times y) \times z$

## Distributive Property

If $\mathrm{x}, \mathrm{y}$ and z are three whole numbers, the distributive property of multiplication over addition is $x \times(y+z)=(x \times y)+(x \times z)$, similarly, the distributive property of multiplication over subtraction is $x \times(y-z)=(x \times y)-(x \times z)$

## Multiplication by Zero

When a whole number is multiplied to 0 , the result is always 0 , i.e.. , $x \times 0=0 \times x=0$

## Division by Zero

Division of a whole number by o is not defined, i.e.. , if x is a whole number then ${ }_{\frac{x}{0}}$ is not defined.

## Difference between Whole Numbers and Natural Numbers

| Difference Between whole numbers \& Natural Numbers |  |
| :--- | :--- |
| Whole Numbers | Natural Numbers |
| Whole Numbers: $\{0,1,2,3,4,5,6 \ldots\}$. | Natural Numbers: $\{1,2,3,4,5,6 \ldots\}$ |
| Counting starts from 0 | Counting starts from 1 |
| All whole numbers are not natural numbers | All-Natural numbers are whole numbers |
| Difference between Whole Numbers and Natural Numbers |  |

Below figure will help us to understand the difference between the whole number and natural numbers:


## Can Whole Numbers be Negative?

The whole number can't be negative!
As per definition: $\{0,1,2,3,4,5,6,7, \ldots$ till positive infinity $\}$ are whole numbers. There is no place for negative numbers.

## Is 0 a Whole Number?

The set of numbers contains all-Natural Numbers, along with Zero. So yes, 0 (zero) is not only a whole number but the first whole number.

## Whole Numbers Examples

Example 1: Are $100,227,198,4321$ whole numbers?
Solution: Yes. 100, 227, 198, 4321 are all whole numbers.
Example 2: Solve $10 \times(5+10)$ using the distributive property.
Solution: The whole numbers have following distributive properties: $x \times(y+z)=(x \times y)+(x \times z)$

$$
\begin{aligned}
& 10 \times(5+10)=(10 \times 5)+(10 \times 10) \\
& =50+100 \\
& =150
\end{aligned}
$$

This implies $10 \times(5+10)=150$
Example 3: Solve $12+(5+15)$ using the Associative properties.
Solution:
The whole numbers have following Associative properties:

$$
x+(y+z)=(x+y)+z
$$

Comparing value,

$$
x=12, y=5, z=15
$$

$$
x+(y+z)
$$

Put the value of $\mathrm{x}, \mathrm{y}$, and z

$$
\begin{aligned}
& =12+(5+15) \\
& =12+20 \\
& =32 \\
& (x+y)+z
\end{aligned}
$$

Put the value of $\mathrm{x}, \mathrm{y}$, and z

$$
\begin{aligned}
& =(12+5)+15 \\
& =17+15 \\
& =32
\end{aligned}
$$

This is implying $x+(y+z)=(x+y)+z=12+(5+15)+(12+5)+15=32$

## Frequently Asked Questions on Whole Numbers

## Define Whole Numbers

The numbers are defined as the positive numbers including zero. The whole number does not contain any decimal or fractional part. It means that it represents the whole thing without pieces. The set of whole numbers is mathematically represented as:

$$
W=(0,1,2,3,4,5, \ldots\}
$$

## Can Whole Numbers be Negative?

No, the whole numbers cannot be negative. The whole numbers start from $0,1,2,3, \ldots$ and so on. All the natural numbers are considered as whole numbers, but all the whole numbers are not natural numbers. Thus, the negative numbers are not considered as whole numbers.

## What Are the Properties of Whole Numbers?

The properties of whole numbers are: Whole numbers are closed under addition and multiplication The addition and multiplication of two numbers is commutative The addition and multiplication of whole numbers is associative It obeys the distributive property of multiplication over addition The additive identity of whole numbers is 0 The multiplicative identity of whole numbers is 1

