THIRUTHANGAL NADAR COLLEGE

(Belongs to the Chennaivazh Thiruthangal Hindu Nadar Uravinmurai Dharma Fund)

Selavayal, Chennai-51.

A Self-Financing Co-educational College of Arts & Science

Affiliated to the University of Madras

Accredited with 'B' Grade by NAAC

An ISO 9001: 2015 Certified Institution

NAME OF THE DEPARTMENT : MATHEMATICS

SUBJECT : BUSINESS MATHEMATICS

TOPIC : ARITHMETIC PROGRESSION

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Introduction Of Progression

- A Progression is a sequence or series of numbers in which they are arranged in a particular order such that the relation between the consecutive terms of series or sequence is always constant.

- In a progression, it is possible to obtain the n_{th} term of the series.

- In mathematics, there are 3 types of progressions:

1. **Arithmetic Progression(AP)**

1. **Geometric Progression(GP)**

1. **Harmonic Progression(HP)**

Introduction Of **Arithmetic Progression**

 An **Arithmetic progression (AP)** or **arithmetic sequence** is a sequence of numbers such that the difference between the consecutive terms is constant.

 For instance, the sequence 5, 7, 9, 11, 13, 15, . . . is an arithmetic progression with a common difference of 2.

 A finite portion of an arithmetic progression is called a **finite arithmetic progression** and sometimes just called an arithmetic progression.

The sum of a finite arithmetic progression is called an **arithmetic**

Formula For **Arithimetic Progression**

Nth term of an arithmetic progression

$$T_n = a + (n-1)d$$

So,

1st term, $T1 = a + (1-1)d$

2nd term, $T2 = a + (2-1)d$

3rd term, $T3 = a + (3-1)d$

$\vdots$

$$S_n = \frac{n}{2}[2a + (n-1)d]$$

S_n $\longrightarrow$ Sum of a term of A.P.

a $\longrightarrow$ First form of A.P.

d $\longrightarrow$ Common difference

n $\longrightarrow$ Number of terms

The Use Of Arithmetic Progression In Daily Life

- Arithmetic progression can be applied   in real life by analyzing a certain pattern, for example, AP used in straight line depreciation.

- AP used in prediction   of any sequence like when someone is waiting for a cab. Assuming that the traffic is moving at a constant speed he/she can predict when the next cab will come.

- AP used in Pyramid-like patterns, where objects are changing in a constant manner and many more.

Introduction Of **Geometric Progression**

 In mathematics, a **Geometric Progression**, also known as a *Geometric Sequence*, is a sequence of non-zero numbers where each term after the first is found by multiplying the previous one by a fixed, non-zero number called the *common ratio*.

 For example, the sequence 2, 6, 18, 54, ... is a geometric progression with common ratio 3.

 Similarly 10, 5, 2.5, 1.25, ... is a geometric sequence with common ratio 1/2.

Formula For Geometric Progression

Geometric Sequence

A geometric sequence has a common ratio.

The formula for the nth term is

$$a_n = ar^{n-1}$$

where a_n = n^{th} term of the sequence

a = first term of the sequence

r = common ratio

The Use Of Geometric Progression In Daily Life

- In real life, Geometric Progression happens whenever each agent of a system acts independently and is fixed. I am just trying to show that we actually see a lot of sequences and series every day in our daily life.

- Will give you some examples these are:

A population growth in which each people decide not to have another kid based on the current population then population growth each year is geometric.
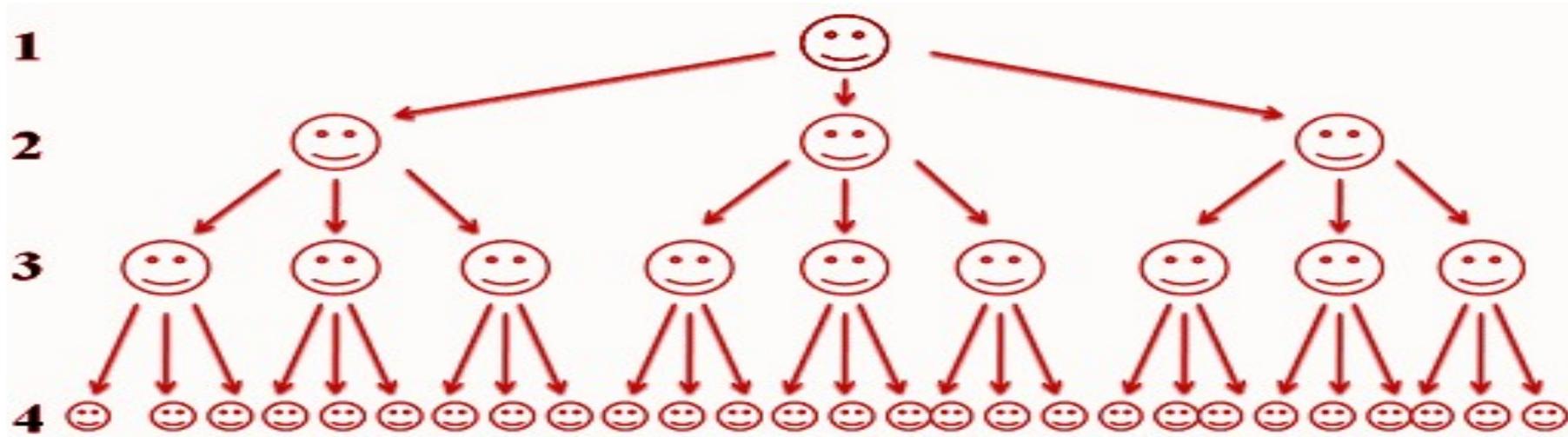
- Each radioactive independently disintegrates   so each will have its fixed decay rate so it's also geometric

Introduction Of **Harmonic Progression**

 In mathematics, a **Harmonic Progression** (or **Harmonic Sequence**) is a progression   formed by taking the reciprocals of an arithmetic progression.

 Equivalently, a **sequence is a harmonic progression** when each term is the harmonic mean of the neighboringterms.

Formula For **Harmonic Progression**

Harmonic Progression:

$$\frac{1}{5},\ \frac{1}{10},\ \frac{1}{15},\ \frac{1}{20},$$

T_n of the HP is ..... $\dfrac{1}{a + (n-1)d}$

The Use Of Harmonic Progression In Daily Life

- Learning about pattern and sequence is not just very important in Maths but real life too. Can you imagine watching a film without a plot or series of related events and just see random scenes? So, the script writer has to ensure a series of related events or sequences of scenes in which the film would be created so that it makes sense to the audience.

- The harmonic formulae can also be used by scientists to conclude the value of their experiments. For example, to establish the degree at which water boils each time the temperature is changed with the same value.

- It is also used in the music industry to establish theories on sounds and to closely study them.

- The concept of Harmonics is also used in electrical gadgets or electrical machines and generation of power.