



Arithmetic Progression



$$T_n = a + [n - 1]d$$

Module-1/5

LET US UNDERSTAND
WHAT IS AN
ARITHMETIC PROGRESSION FIRST.
LET ME GIVE SOME EXAMPLES
AND SOME COUNTER EXAMPLES.
OBSERVE THE SERIES CAREFULLY.

APs

- 2,4,6,8,.....
- -2,-3,-4,-5.....
- 10,9,8,7,6,.....
- 5,10,15,20,.....

NOT APs

- *2,3,2,3,2,3,.....
- *-2,-3,-5,-8,-12,...
- *1,2,3,5,8,.....
- *1,2,4,16,32,.....

IN THE FIRST COLUMN,
WE SEE THAT THE SEQUENCE
PROGRESSES IN A PARTICULAR
PATTERN .

IN THE SECOND COLUMN
WE DON'T SEE THE SAME
PATTERN.

IN THE FIRST COLUMN, WE
OBSERVE THAT THE DIFFERENCE
BETWEEN THE CONSECUTIVE
TERMS IS SAME/COMMON.
THIS IS KNOWN AS THE COMMON
DIFFERENCE OF THE
ARITHMETIC PROGRESSION.

CAN YOU TELL ME IF

5,5,5,5,.....

IS AN

ARITHMETIC PROGRESSION

OR NOT???

YES, IT IS!!!!!!!
BECAUSE THE
DIFFERENCE BETWEEN
THE CONSECUTIVE
TERMS
IS A CONSTANT "0"

LET US FORM AN AP WITH
THE FIRST TERM 3 AND THE
COMMON DIFFERENCE 4.

$$\text{first term}=3$$

$$\text{second term}=3+4=7$$

$$\text{third term}=7+4=11$$

HENCE OUR AP IS

3,7,11,15,19,.....

LET US DERIVE A
FORMULA FOR THE Nth TERM
OF AN AP WITH THE FIRST
TERM AS

'a'

AND THE COMMON
DIFFERENCE 'd'

THE FIRST TERM $a_1 = a$

$$a_2 = a + d = a + (2-1)d$$

$$a_3 = a + d + d = a + 2d = a + (3-1)d$$

$$a_4 = a + 2d + d = a + 3d = a + (4-1)d$$

similarly,

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



term position

$$a_n = a_1 + (n-1)d$$

n^{th} term

first term

common difference

Arithmetic Sequence

An arithmetic sequence has a common difference.

The formula for the n^{th} term is

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

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

a = first term of the sequence

d = common difference

NOW, LET'S FIND OUT THE
100TH TERM OF AN AP
WHOSE FIRST TERM IS -24
AND THE COMMON
DIFFERENCE IS 4.

$$a_n = -24 + (n - 1) \cdot 4$$

$$a_{100} = -24 + (100 - 1) \cdot 4$$

$$= -24 + (99) \cdot 4$$

$$= -24 + 396$$

$$a_{100} = 372 \quad \checkmark$$

LET US DO A FEW SUMS
OF OUR EXERCISE 5.1
OF THE CHAPTER
ARITHMETIC
PROGRESSION.

THE TAXI FARE AFTER EACH KM WHEN
THE FARE IS Rs.15 FOR THE FIRST KM
AND Rs.8 FOR EACH ADDITIONAL KM.

WILL IT FORM AN AP?

YES!!!!!!

HERE, THE FIRST TERM IS 15 AND THE
COMMON DIFFERENCE IS 8.

THE AMOUNT OF AIR
PRESENT
IN A CYLINDER WHEN A
VACUUM PUMP REMOVES
 $1/4^{\text{TH}}$ OF THE
AIR REMAINING IN THE
CYLINDER AT A TIME.

LET US A CYLINDER HAS 16 CUBIC
UNITS OF AIR.

REMOVING $1/4^{\text{TH}}$ MEANS
REMOVING 4 CUBIC UNITS OF AIR.

REMAINING IS 12 CUBIC UNITS.

REMOVING $1/4^{\text{TH}}$ AGAIN MEANS
3 CUBIC UNITS.

IS THE DIFFERENCE COMMON?

LOOK AT THE AP
 $\sqrt{2}, \sqrt{8}, \sqrt{18}, \sqrt{32}, \dots$

IS IT AN AP?

THIS CAN ALSO BE WRITTEN AS

$\sqrt{2}, 2\sqrt{2}, 3\sqrt{2}, 4\sqrt{2}, \dots$

THE FIRST TERM IS $\sqrt{2}$

AND THE DIFFERENCE IS ALSO $\sqrt{2}$.

HENCE, IT IS AN AP.

$1^2, 3^2, 5^2, 7^2, \dots$

CAN BE REWRITTEN AS

$1, 9, 25, 49, \dots$

CHECK IF IT IS AN AP?

THANK YOU!!!!!!