UDAAN

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Arithmetic Progression

Mathematics | Lecture – 04

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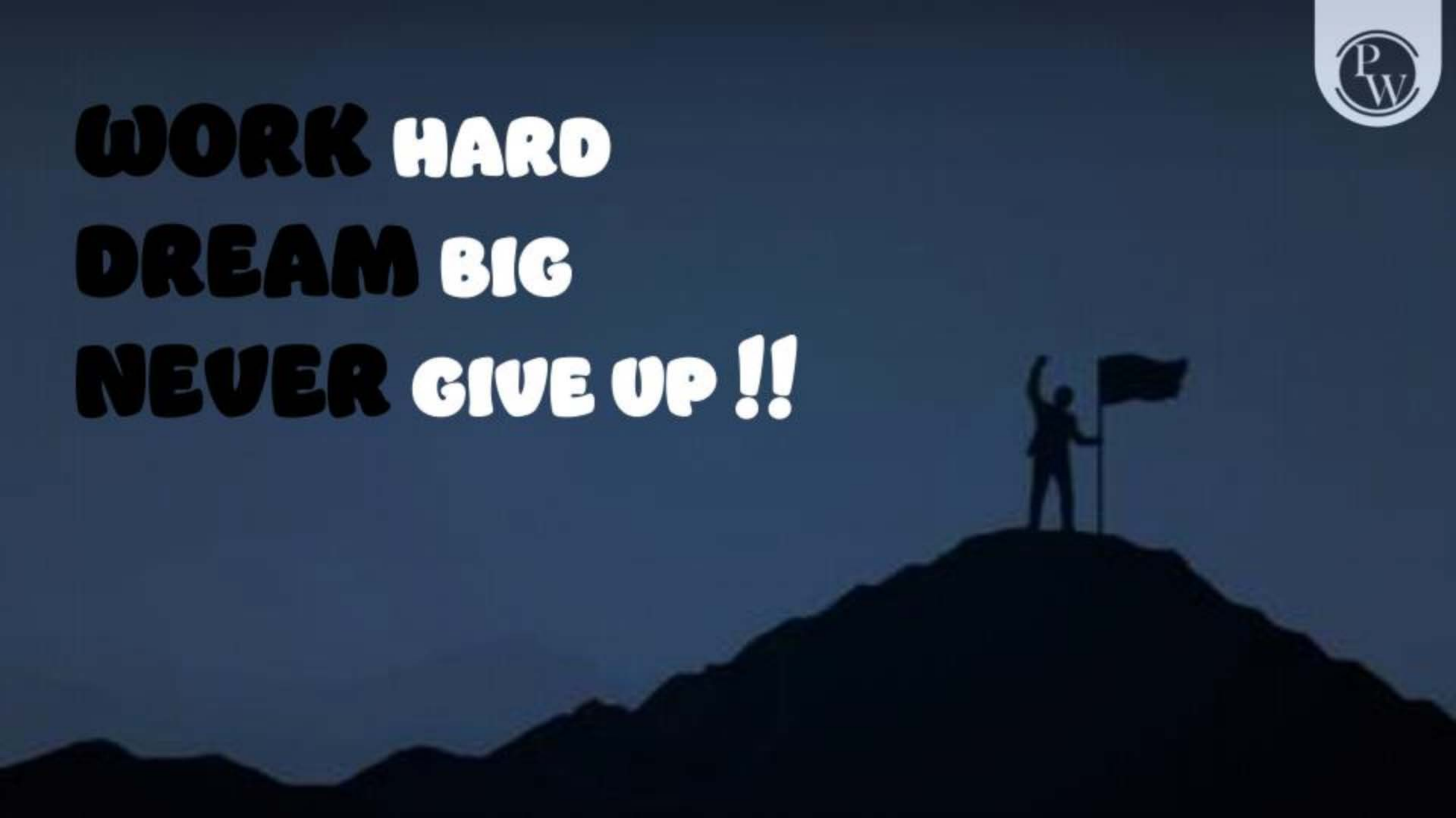
Topics

to be covered

1. Sum of n terms of an AP


WORK HARD
DREAM BIG
NEVER GIVE UP !!

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

n^{th} term.

$a_{pq} = a + (pq-1)d$

pq^{th} term

$a_m = a + (m-1)d$

m^{th} term.

$a_{m+n} = a + (m+n-1)d$

$(m+n)^{th}$ term.

Topic : General Term of an AP

#Q. If m times the m^{th} term of an Arithmetic Progression is equal to n times its n^{th} term and $m \neq n$, show that the $(m + n)^{th}$ term of the A.P. is zero.

[CBSE Term I, II, III, 2019]

$$m(a_m) = n(a_n)$$

$$m[a+(m-1)d] = n[a+(n-1)d]$$

$$m[a+md-d] = n[a+nd-d]$$

$$ma+m^2d-md = na+n^2d-nd$$

$$ma-na+m^2d-n^2d-md+nd=0$$

$$\boxed{a(m-n)+d(m^2-n^2)-d(m-n)=0}$$

To prove:

$$\boxed{a_{mn}=0}$$

$$a+(mn-1)d=0$$

$$a(m-n)+d(m^2-n^2)-d(m-n)=0$$

$$a(m-n)+d(m+n)(m-n)-d(m-n)=0$$

$$(m-n)\left[a+d(m+n)-d\right]=0$$

$$a+d(m+n)-d=0$$

$$a+(m+n-1)d=0$$

$$\boxed{a_{m+n}=0}$$ // H.P //

$\{m-n\neq 0$, Since $m\neq n\}$

Topic : General Term of an AP

#Q. Two AP's have the same common difference. The difference between their 100^{th} terms is 100, what is the difference between their 1000^{th} terms?

(I)	(II)
d	d
a	a'
a_{100}	a_{100}'
a_{1000}	a_{1000}'

$a_{100} - a_{100}' = 100$

$[a + 99d] - [a' + 99d] = 100$

$a + 99d - a' - 99d = 100$

$\boxed{a - a' = 100}$

$a_{1000} - a_{1000}' = ?$

$(a + 999d) - (a' + 999d)$

$a + 999d - a' - 999d$

$= a - a'$

$= 100$

Assertion and Reason

Direction: *In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as.*

(a) Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A).

(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(c) Assertion (A) is true·, but Reason (R) is false .

(d) Assertion (A) is false, but Reason (R) is true.

Topic : General Term of an AP

#Q. Assertion (A): If the n^{th} term of an AP is $7 - 4n$, then its common difference is -4.

Reason (R) : Common difference of an AP is given by $d = a_{n+1} - a_n$

$a_n = 7 - 4n$

$a_1 = 7 - 4(1) = 3$

$a_2 = 7 - 4(2) = -1$

$d = a_2 - a_1$

$= -1 - (3)$

$= -1 - 3$

$= -4$

$d = a_2 - a_1$

$d = a_{100} - a_{99}$

$d = a_{200} - a_{199}$

$d = a_{n+1} - a_n$

Topic : Sum to n terms of an A.P.

$S_{10}, S_{20}, S_{30}, S_{40}, S_{100}$

S_n = Sum of 'n' terms.

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

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

$$S_n = \frac{n}{2}[a+a_n]$$

$$S_n = \frac{n}{2}[a+l]$$

l → last term.

$S_{10} \rightarrow a_{100}$

$S_{200} \rightarrow a_{200}$

$S_n \rightarrow a_n$

Topic : General Term of an AP

#Q. Find the sum of 20 terms of the A.P. 1, 4, 7, 10, ...

$a = 1, d = 3$

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

$$S_{20} = \frac{20}{2}\left[2(1) + (20-1)3\right]$$

$$= 10\left[2 + 57\right]$$

$$S_{20} = 590$$

Topic : General Term of an AP

#Q. Find the sum of first 30 terms of an A.P. whose second term is 2 and seventh term is 22.

$S_{30} = ?$

$S_{30} = \frac{30}{2}[2a + 29d]$

$= 15[2(-2) + 29(4)]$

$= 15[-4 + 116]$

$= 15 \times 112$

$S_{30} = 1680$

$a_2 = 2, \quad a_7 = 22$

$a + d = 2, \quad a + 6d = 22$

$d = 2 - a$

$a + 6(2 - a) = 22$

$a + 12 - 6a = 22$

$-5a = 10$

$a = -2$

$d = 2 - (-2)$

$d = 4$

Topic : General Term of an AP

#Q. Find the sum of first 20 terms of an A.P., in which 3rd term is 7 and 7th term is two more than thrice of its 3rd term.

$a_3 = 7$, $a_7 = 2 + 3(a_3)$

$a_7 = 2 + 3(7)$

$\boxed{a_3 = 7 \ , \ a_7 = 23}$

$a + 2d = 7$, $a + 6d = 23$

$a + 2d = 7$

$a + 2(4) = 7$

$a = -1$

$a + 2d = 7$

$a + 6d = 23$

$-4d = -16$

$d = 4$

$S_{20} = \frac{20}{2}[2a + 19d]$

$= 10[2(-1) + 19(4)]$

$= 10[-2 + 76]$

$= 10 \times 74$

$\boxed{S_{20} = 740}$

Topic : General Term of an AP

#Q. If the n^{th} term of an A.P. is (2n + 1), find the sum of first n terms of the A.P.

[CBSE 2005]

$a_n = 2n+1$

$a_1 = 2(1)+1$

$a = a_1 = 3$

$a_2 = 2(2)+1$

$a_2 = 5$

$d = a_2 - a_1$

$d = 5 - 3$

$d = 2$

$S_n = ?$

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

$S_n = \frac{n}{2}[2(3)+(n-1)2]$

$= \frac{n}{2}[6+2n-2]$

$= \frac{n}{2}[2n+4]$

$S_n = n^2+2n$

Topic : General Term of an AP

#Q. In an A.P., the sum of first n terms is $\frac{3n^2}{2}+\frac{5n}{2}$. Find its 25th term.

[CBSE 2006C]

$S_n = \frac{3n^2}{2}+\frac{5n}{2}$

$n=1,\ S_1 = \frac{3(1)^2}{2}+\frac{5(1)}{2}$

$= \frac{3}{2}+\frac{5}{2}$

$S_1 = 4$

$a = a_1 = 4$

$n=2,\ S_2 = \frac{3(2)^2}{2}+\frac{5(2)}{2}$

$S_2 = \frac{12}{2}+\frac{10}{2}$

$S_2 = 11$

Sum of 2 terms.

$a_1+a_2 = 11$

$4+a_2 = 11$

$a_2 = 7$

$a_{25} = a+24d$

$a_2-a_1 = d$

$7-4 = d$

$3 = d$

$a_{25} = 4+24(3)$

$a_{25} = 76$

Ans//

Topic : General Term of an AP

#Q. If S_n, the sum of first n term of an AP is, is given by $S_n = 5n^2 + 3n$, find its n^{th} term. [CBSE 2009]

$S_n = 5n^2 + 3n$

$n=1,\ S_1 = 5(1)^2 + 3(1)$

$= 5+3$

$S_1 = 8$

$\boxed{a = a_1 = 8}$

$n=2,\ S_2 = 5(2)^2 + 3(2)$

$S_2 = 20+6$

$\boxed{S_2 = 26}$

$a_1 + a_2 = 26$

$8 + a_2 = 26$

$\boxed{a_2 = 18}$

$d = a_2 - a_1$

$d = 18 - 8$

$\boxed{d = 10}$

$a_n = ?$

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

$a_n = 8 + (n-1)10$

$= 8 + 10n - 10$

$a_n = 10n - 2$ Ans.

$= 2+2+2+2+2+2 \text{----} \text{10 times}$

$= 2 \times 10$

$= 2+2+2 \text{----} \text{100 times}$

$= 2 \times 100$

$= 2+2+2 \text{----} n \text{ times}$

$= 2n$ //

$S_n = a_1 + a_2 + a_3 + \ldots \ldots a_{(n-2)} + a_{(n-1)} + a_n$

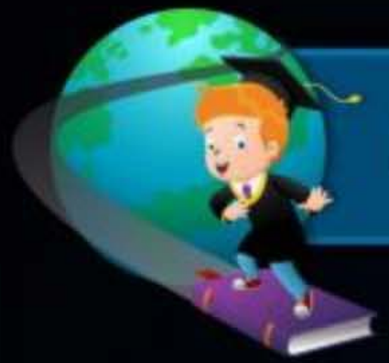
$S_n = a + a+d + a+2d + \ldots \ldots a+(n-3)d + a+(n-2)d + a+(n-1)d$ — (1)

$S_n = a+(n-1)d + a+(n-2)d + a+(n-3)d \ldots \ldots a+2d + a+d + a$ — (2)

(1) + (2)

$$2S_n = \underbrace{2a+(n-1)d} + \underbrace{2a+(n-1)d} + \underbrace{2a+(n-1)d} \ldots + \underbrace{2a+(n-1)d} + \underbrace{2a+(n-1)d} + \underbrace{2a+(n-1)d}$$

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



Homework

DPP

THANK YOU