UDAAN

2025

Arithmetic Progression

Mathematics | Lecture - 03

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Topics

to be covered

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

Most Important Questions on General Term of an A.P.


WORK HARD
DREAM BIG
NEVER GIVE UP !!

Topic : General Term of an AP

#Q. The next term of the A.P. : $\sqrt{6}, \sqrt{24}, \sqrt{54}$ is

$a_4 = ?$

A $\sqrt{60}$

B $\sqrt{96}$

C $\sqrt{72}$

D $\sqrt{216}$

$a = \sqrt{6}$

$d = a_2 - a_1$

$= \sqrt{24} - \sqrt{6}$

$= \sqrt{2\times2\times2\times3} - \sqrt{2\times3}$

$= 2\sqrt{6} - \sqrt{6}$

$= \boxed{\sqrt{6}}$

$a_4 = a + 3d$

$= \sqrt{6} + 3\sqrt{6}$

$\boxed{a_4 = 4\sqrt{6}}$

$= \sqrt{4\times4\times6}$

$a_4 = \sqrt{96}$

Topic : General Term of an AP

#Q. If five times the fifth term of an A.P. is equal to 8 times its eighth term, show that its 13th terms is zero.

To prove: $a_{13} = 0$

$a + 12d = 0$

$5(a_5) = 8(a_8)$

$5(a+4d) = 8(a+7d)$

$5a + 20d = 8a + 56d$

$-3a = 36d$

$a = \frac{36d}{-3}$

$\boxed{a = -12d}$

$a + 12d = 0$ H.P.

Topic : General Term of an AP

#Q. How many multiples of 4 lie between 10 and 250? [NCERT]

12, 16, 20 - - - - - - - - 248

Position pata karlo.

let $a_n = 248$

$a + (n-1)d = 248$

$12 + (n-1)4 = 248$

$(n-1)4 = 248 - 12$

$(n-1)4 = 236$

$n-1 = \frac{236}{4}$

$n-1 = 59$

$n = 60$

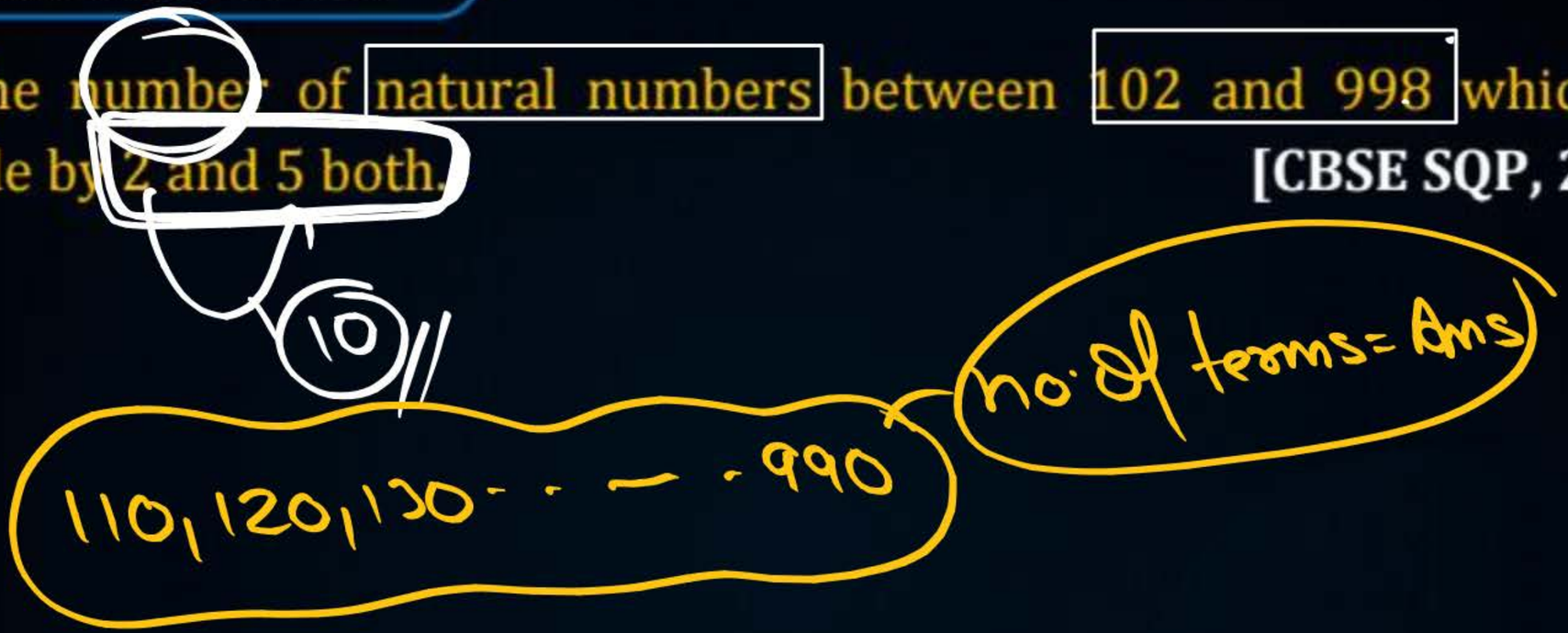
$a_n = 248$

$a_{60} = 248$

total terms = 60

Topic : General Term of an AP

#Q. Find the number of natural numbers between 102 and 998 which are divisible by 2 and 5 both. [CBSE SQP, 2018]



Topic : General Term of an AP

#Q. In the following APs, find the missing terms in the boxes :

(i) 2, □, 26

(ii) □, 13, □, 3

(iii) 5, □, □, $9\frac{1}{2}$

(iv) –4, □, □, □, □, 6

(v) □, **38**, □, □, □, **–22**

H.W

(v) $a_2 = 38$ ①

$a + d = 38$

$a_6 = -22$ ②

$a + 5d = -22$

(iii) $a = 5$, $a_4 = 9\frac{1}{2}$

$a + 3d = \frac{19}{2}$

$5 + 3d = \frac{19}{2}$

$3d = \frac{19}{2} - 5$

$3d = \frac{19-10}{2}$

$3d = \frac{9}{2}$

$d = \frac{3}{2}$

Topic : General Term of an AP

#Q. Find the middle term of the A.P. 13, 19, ..., 247

[CBSE,OD Set – III, 2020]

7, 13, 19 247

$a=7, d=6$

But $a_n = 247$

$a+(n-1)d = 247$

$7+(n-1)6 = 247$

$(n-1)6 = 240$

$n-1 = 40$

$n = 41$

$a_n = 247$

$a_{41} = 247$

no. of terms = 41

$n = 41 = \text{odd}$.

middle term $= \left(\frac{n+1}{2}\right)^{th}$

$= (21)$

$a_{21} = a+20d$

$= 7+20(6)$

$a_{21} = 127$

n = no. of terms

If n = odd.

middle term = $\left(\frac{n+1}{2}\right)^{th}$

Ex: 3, 7, 11, 15, 19, 23, 27, 31, 35, 39.

If n = even

middle terms. $\left(\frac{n}{2}\right)^{th}, \left(\frac{n}{2}+1\right)^{th}$

$n = 10$

$\left(\frac{n}{2}\right)^{th} > \left(\frac{n}{2}+1\right)^{th}$

5^{th} , 6^{th}

19 23

Topic : General Term of an AP

#Q. Find the middle term of the A.P. 213, 205, 197, ... 37.

[CBSE Delhi Board Term]

$a_n = 37$

$a + (n-1)d = 37$

$213 + (n-1)(-8) = 37$

$(n-1)(-8) = 37 - 213$

$(n-1)(-8) = -176$

$n-1 = \frac{176}{8}$

$n-1 = 22$

$n = 23$

$n = \text{odd} = 23.$

Middle term $= \left(\frac{n+1}{2}\right)^{th}$

$= 12^{th}$

$a_{12} = a + 11d$

$= 213 + 11(-8)$

$= 213 - 88$

$a_{12} = 125$

Topic : General Term of an AP

#Q. For what value of n, are the nth terms of two A.P.s 63, 65, 67, ... and 3, 10, 17, ... are equal ?

63, 65, 67 - - -

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

$= 63 + (n-1)2$

$= 63 + 2n - 2$

$a_n = 2n + 61$

3, 10, 17 - - - -

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

$= 3 + (n-1)7$

$= 3 + 7n - 7$

$a_n' = 7n - 4$

Since n^{th} terms of both AP's are equal, so

$a_n = a_n'$

$2n + 61 = 7n - 4$

$65 = 5n$

$n = 13$

Topic : General Term of an AP

#Q. An A.P. consists of 50 terms of which 3rd term is 12 and last term is 106. Find the 29th term. [CBSE SQP, 2018]

Total terms = 50

$a_3 = 12$

last term = 106

$a_{50} = 106$

To find: a_{29}

$= a + 28d$

$= 8 + 28(2)$

$a_{29} = 64$ // Ans//

$a + 2d = 12$

$a + 49d = 106$

$-47d = -94$

$d = \frac{-94}{-47}$

$d = 2$

$a + 2d = 12$

$a + 2(2) = 12$

$a = 8$

Topic : General Term of an AP

#Q. How many terms are there in an A.P. whose first and fifth terms are –14 and 2, respectively and the last term is 62.

$a = -14$, $a_5 = 2$

$a + 4d = 2$

$-14 + 4d = 2$

$4d = 16$

$d = 4$

let, $a_n = 62$

$a + (n-1)d = 62$

$-14 + (n-1)4 = 62$

$(n-1)4 = 76$

$n - 1 = 19$

$n = 20$

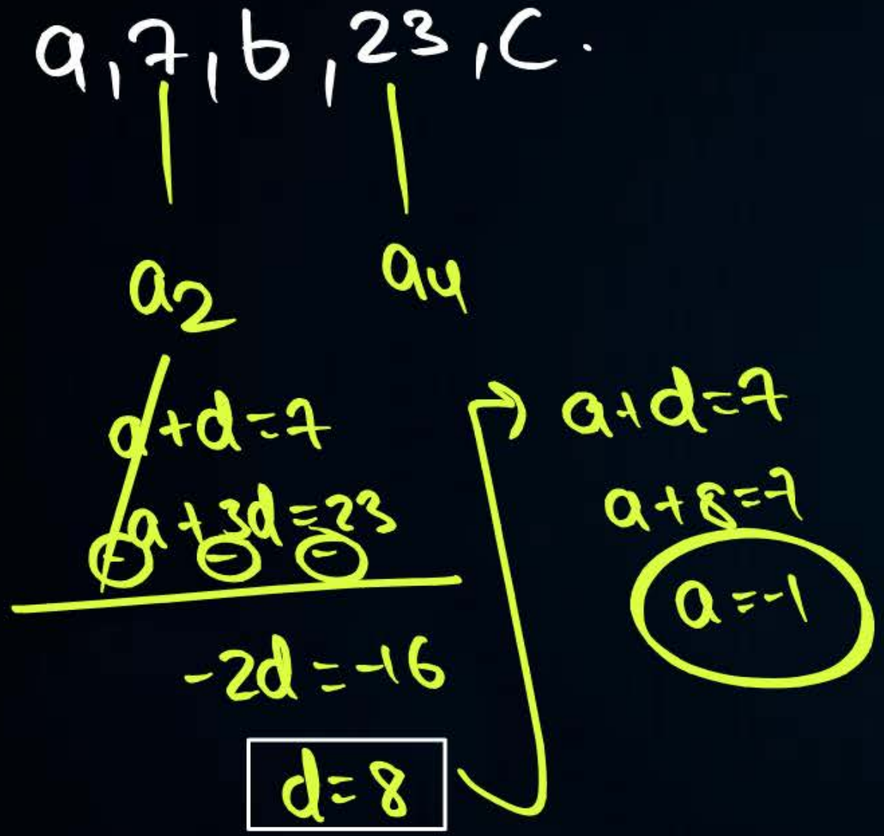
Since last term = 62 = a_{20}

∴ Total terms = 20.

Topic : General Term of an AP

#Q. Find the value of a, b and c such that the numbers a, 7, b, 23 and c are in A.P.

[CBSE Board Term – 2, 2015]



a=-1

a3=b

a+2d=b

-1+2(8)=b

15=b

a5=c

a4+d=c

23+8=c

31=c

Topic : General Term of an AP

#Q. The ninth term of an A.P. is equal to seven times the second term and twelfth term exceeds five times the third term. by 2. Find the first term and the common difference. [CBSE SQP, 2016]

$a_9 = 7(a_2)$ — (1)

$a_{12} - 5(a_3) = 2$ — (2)

$a+8d = 7(a+d)$

$a+8d = 7a+7d$

$-6a+d=0$

$(a+11d) - 5(a+2d) = 2$

$a+11d-5a-10d=2$

$-4a+d=2$

Topic : General Term of an AP

#Q. Which term of the A.P. : 65, 61, 57, 53 is the first negative term?

Example:

Let n^{th} term be the first negative term.

$a_n < 0$

$a + (n-1)d < 0$

$65 + (n-1)(-4) < 0$

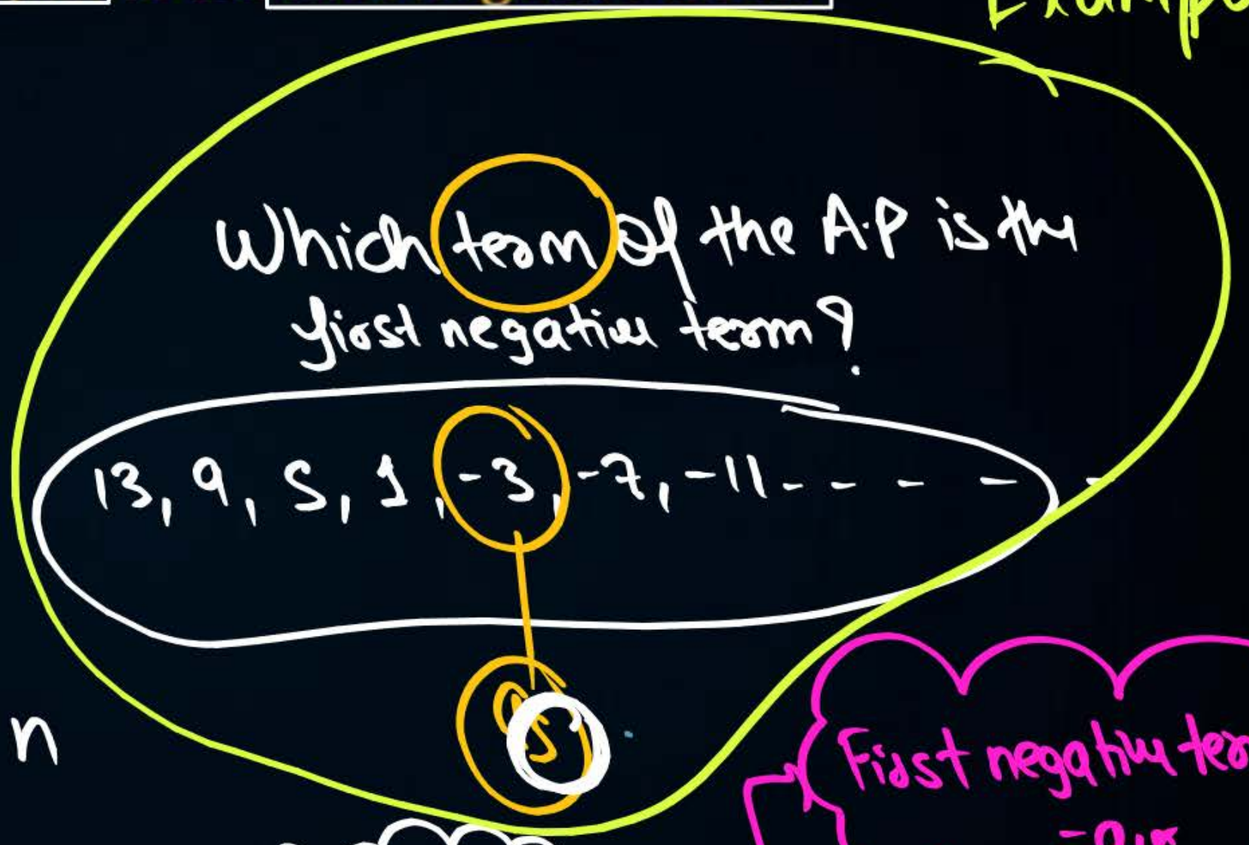
$65 - 4n + 4 < 0$

$69 < 4n$

$\frac{69}{4} < n$

$17.25 < n$

$18 = n$



First negative term = a_{18}

Topic : General Term of an AP

#Q. Which term of the A.P. $20, 19\frac{1}{4}, 18\frac{1}{2}, 17\frac{3}{4}, \ldots\ldots$ is the first negative term? (NCERT)

$a = 20$, $d = 19\frac{1}{4} - 20$

$= \frac{77}{4} - \frac{20}{1} = \frac{77-80}{4} = -\frac{3}{4}$

let, $a_n < 0$

$a + (n-1)d < 0$

$20 + (n-1)\left(-\frac{3}{4}\right) < 0$

$20 - \frac{3n}{4} + \frac{3}{4} < 0$

$20 + \frac{3}{4} < \frac{3n}{4}$

$\frac{83}{4} < \frac{3n}{4}$

$\frac{83 \times 4}{4 \times 3} < n$

$\frac{83}{3} < n$

$27 \cdot \ldots < n$

$n = 28$

$-3x-4>0$

$-3x>4$

$$x < \frac{4}{-3}$$

$a_{100} = a + (100-1)d$

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

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

(m^{th} term)

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

(mn^{th} term)

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

(p^{th} term)

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

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

Topic : General Term of an AP

#Q. If the p^{th} term of an A.P. is q and the q^{th} term is p, prove that its nth term is $p+q-n$ [CBSE 2008]

$a_p = q$

$a_q = p$

$a+(p-1)d = q$

$a+(q-1)d = p$

$a+(p-1)d = q$

$a+(q-1)d = p$

$(p-1)d - (q-1)d = q-p$

$d[p-1-q+1] = q-p$

$d(p-q) = q-p$

$d = \frac{q-p}{p-q}$

$d = -\frac{(p-q)}{(p-q)}$

$d = -1$

$a+(q-1)d = p$

$a+(q-1)(-1) = p$

$a-q+1 = p$

$a = p+q-1$

To prove:

n^{th} term $= p+q-n$

$a_n = p+q-n$

$a = p+q-1, \; d = -1$

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

$= p+q-1 + (n-1)(-1)$

$= p+q-1 - n+1$

$\boxed{a_n = p+q-n}$ //

Topic : General Term of an AP

#Q. If the m^{th} term of an A.P. be $1/n$ and n^{th} term be $1/m$, then show that its $(mn)^{th}$ term is 1.

$a_m = \frac{1}{n}$, $a_n = \frac{1}{m}$

To prove: mn^{th} term $= 1$

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

$a + (m-1)d = \frac{1}{n}$ ... (i)

$a + (n-1)d = \frac{1}{m}$ ... (ii)

(i) − (ii)

$(m-1)d - (n-1)d = \frac{1}{n} - \frac{1}{m}$

$d[m - 1 - n + 1] = \frac{m-n}{mn}$

$d(m-n) = \frac{m-n}{mn}$

$d = \frac{(m-n)}{mn(m-n)}$

$\boxed{d = \frac{1}{mn}}$

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

$a + (m-1)\frac{1}{mn} = \frac{1}{n}$

$a + \frac{m}{mn} - \frac{1}{mn} = \frac{1}{n}$

$a + \frac{1}{n} - \frac{1}{mn} = \frac{1}{n}$

$a = \frac{1}{n} - \frac{1}{n} + \frac{1}{mn}$

$\boxed{a = \frac{1}{mn}}$

$a_{mn} = 1$

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

$$= \frac{1}{mn} + (mn-1)\frac{1}{mn}$$

$$= \frac{1}{mn} + \frac{mn}{mn} - \frac{1}{mn}$$

$$= \frac{mn}{mn}$$

$a_{mn} = 1$

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]

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 100^{th} terms?

$d = a_2 - a_1$

$d = a_3 - a_2$

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

$d = a_{1000} - a_{999}$

$d = a_{500} - a_{499}$

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

$n+1-n$

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

Homework

NoDPP

THANK YOU