CLASS 10TH MID TERM

SCORE BOOSTER

ARITHMETIC PROGRESSION

ONE SHOT

MATHS

Definition

(Sequence)

2, 4, 8, 16, 32, 64 ... → (×2)

$1^3, 2^3, 3^3, \frac{64}{4^3}, \_\_\_$

1, 3, 5, 7, 9, 11 → AS

(+2) (+2) (+2) (+2) (+2) → Common diff (d)

17, 14, 11, 8, 5 → AS/AP

(−3) (−3) (−3) (−3) → d = −3

n^{th} term of an A. P. (a_n)

(general rule)

2, 4, 6, 8, 10 . . .

↳ first term = (a) = 2

$d = 6 - 4 = 2$

a_5 (5^{th} term) = 10

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

$a_{20} = a + (20-1)d = 2 + (19)2 = 2 + 38$

$= 40$

$4 \rightarrow a_2 = 2 + 2 = a + 1d$

$6 \rightarrow a_3 = 2 + 4 = a + 2d$

$8 \rightarrow a_4 = 2 + 6 = a + 3d$

$10 \rightarrow a_5 = 2 + 8 = a + 4d$

$\vdots$

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

Your Roadmap to Success

Stay on track with a structured schedule that covers every essential topic you need for mid-term success. Each class is designed to reinforce core concepts and provide ample practice to ensure you're fully prepared. Follow the timetable, access class PDFs, and watch video lessons—all at your own pace. Your journey to acing the exams starts here!

13th Sept 2024

Topic	PDF	Link
Real Numbers		
Life processes		

Download the class PDF now ! link in the description.

Q. Write the first 4 terms of the sequence defined by $a_n = 3n + 2$

$\Rightarrow a_n = 3n + 2$

$a_1 = 3(1) + 2 = 5$

$a_2 = 3(2) + 2 = 8$

$a_3 = 3(3) + 2 = 11$

$a_4 = 3(4) + 2 = 14$

$+3$, $+3$, $+3$ $\Rightarrow$ (A)

Q. For the following arithmetic progression write the common difference & eleventh term $-5, -1, 3, 7, \ldots\ldots$

$a_1 = -5 \quad a_2 = -1, \quad a_3 = 3$

$d = a_2 - a_1 = -1 - (-5)$
$= -1 + 5 = 4$

$d = a_3 - a_2 = 3 - (-1)$
$= 3 + 1 = 4$

$d = 4$

Q. The next term of the A.P. $\sqrt{3}, \sqrt{12}, \sqrt{27}, \ldots\ldots$

$\sqrt{3}, \sqrt{12}, \sqrt{27}$

$\Rightarrow \sqrt{3}, \sqrt{4\times3}, \sqrt{9\times3}$

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

$\rightarrow \sqrt{4^2\times3}$

$= \sqrt{16\times3}$

$= \sqrt{48}$

$d = a_2 - a_1 = 2\sqrt{3} - \sqrt{3}$

$= \sqrt{3}$

$a_4 = a_1 + 3d$

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

$= 4\sqrt{3}$

$= \sqrt{16\times3} = \sqrt{48}$

Q. Find the n^{th} term of the A.P. 13, 8, 3, -2, ...

$13, 8, 3, -2, \ldots$

$a = 13$

$d = a_2 - a_1 = 8 - 13 = -5$

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

$= 13 + (n-1)(-5)$

$= 13 - 5n + 5$

$\boxed{a_n = 18 - 5n}$

Q. How many terms are there in the A.P.?

7, 10, 13, ..., 43. ⟶ 13 terms

$a_n \rightarrow$ $n = ?$

$\Rightarrow a = 7, \quad d = a_2 - a_1$

$= 10 - 7 = 3$

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

$\Rightarrow 43 = 7 + (n-1)3$

$\Rightarrow 43 - 7 = (n-1)3$

$\Rightarrow \frac{36}{3} = n - 1 \Leftrightarrow 12 = n - 1$

$12 + 1 = n$

$n = 13$

Q. If the 9^{th} term of an A.P. is zero, then prove that 29^{th} term is double of 19^{th} term.

$\Rightarrow$ $a_9 = a + (9-1)d$

$= a + 8d$

$a_9 = 0$

$\boxed{a + 8d = 0}$

$\rightarrow \boxed{a = -8d}$

$a_{29} = a + (29-1)d$

$= a + 28d$

$a_{29} = -8d + 28d$

$\boxed{a_{29} = 20d}$ — (1)

$a_{19} = a + 18d$

$= -8d + 18d$

$\boxed{a_{19} = 10d}$ — (2)

from (1) & (2)

$\boxed{a_{29} = (a_{19}) \times 2}$

Q. How many numbers of two digits are divisible by 3?

30

→ no. of terms in AP(n) = ?

12, 15, 18, 21, ---- 99

↳ 30th term

$a = 12, \quad d = 3$

$a_n = 99$

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

$99 = 12 + (n-1)3$

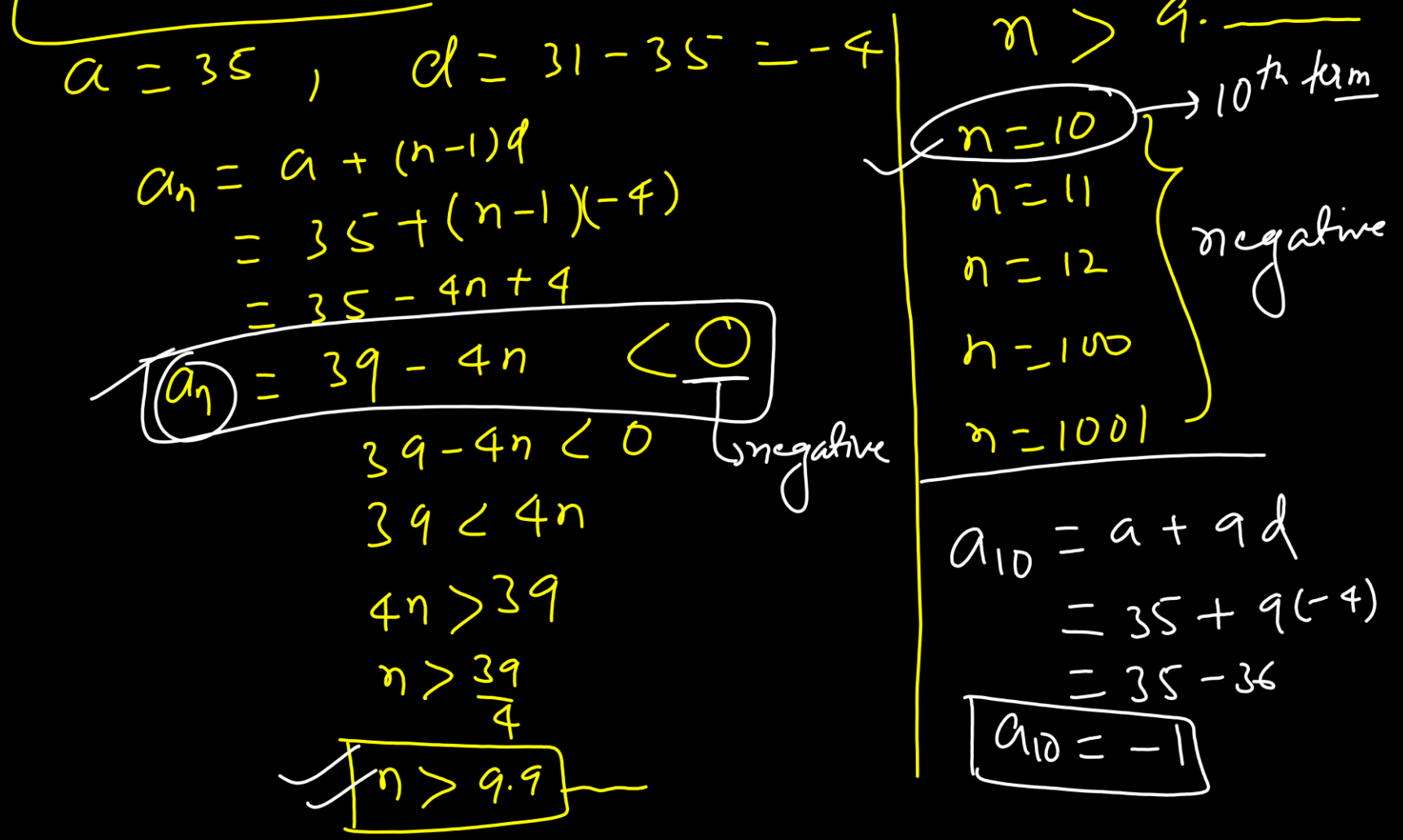
$99 - 12 = (n-1)3$

$\frac{87}{3} = n - 1$

$29 = n - 1 \Rightarrow n = 29 + 1$

$\boxed{n = 30}$

Q. Find the first negative term of the A.P. 35, 31, 29, ...



Q. Find the middle term(s) of the A.P. 7, 13, 19, ..., 241.

$\Rightarrow a = 7 \quad d = 6$

$a_n = 241$

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

$\Rightarrow 241 = 7 + (n-1)6$

$\Rightarrow 241 - 7 = (n-1)6$

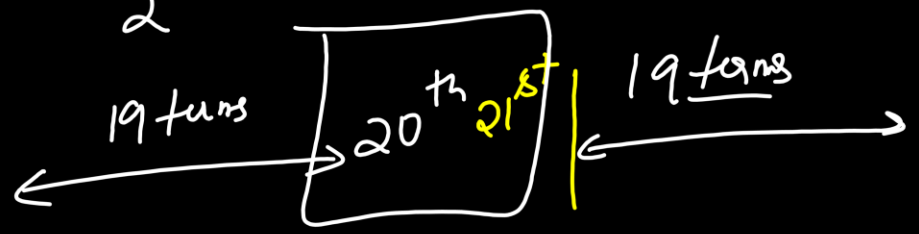
$\Rightarrow \frac{234}{6} = (n-1)$

$\Rightarrow 39 = n-1$

$\Rightarrow \boxed{n = 40}$ → even

2 middle terms

$\frac{n}{2} = \frac{40}{2} = 20$



$n = 20$

$a_{20} = a + 19d$

$= 7 + 19(6)$

$= 7 + 114 = 121$

$n = 21$

$a_{21} = a + 20d$

$= 7 + 20 \times 6$

$= 7 + 120 = 127$

+6

Q. If p^{th} term of an A.P. is q and q^{th} term is p, prove that its n^{th} term is (p + q - n)

$\Rightarrow$ first term = a, Common diff. = d

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

$\rightarrow q = a + (p-1)d \quad -(1)$

$\Rightarrow a_q = a + (q-1)d$

$p = a + (q-1)d \quad -(2)$

$(2) - (1)$

$p - q = 0 + (q-1)d - (p-1)d$

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

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

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

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

$\boxed{d = -1}$

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

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

$q = a - p + 1$

$q + p - 1 = a$

$\boxed{a = p + q - 1}$

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

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

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

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

Your Roadmap to Success

Stay on track with a structured schedule that covers every essential topic you need for mid-term success. Each class is designed to reinforce core concepts and provide ample practice to ensure you're fully prepared. Follow the timetable, access class PDFs, and watch video lessons—all at your own pace. Your journey to acing the exams starts here!

13th Sept 2024

Topic	PDF	Link
Real Numbers		
Life processes		

Download the class PDF now ! link in the description.

Sum of n terms of an A.P.

$S_n - S_{n-1} = a_n$

$S_5 - S_4 = a_4$

$2, 4, 6, 8, \ldots$

$S_2 = a_1 + a_2$

$S_3 = a_2 + a_2 + a_3$

$S_n = a_1 + a_2 + a_3 + \cdots (a_n)$ → last term (l)

$= 2, 4, 6, \ldots \ldots a_n$

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

① $S_n = \frac{n}{2}(a + l)$

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

② $S_n = \frac{n}{2}[2a + (n-1)d]$

$S_5 = 120$

$S_4 = 116$

$S_5 - S_4 = 4$

S_5

S_4

a_5

last term

5th term

Q. If nth term of an A. P. is (n + 2), find the sum of first n term

$a_n = (n+2)$

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

$a = a_1 = 1 + 2$

$a = 3$, $l = a_n = (n+2)$

$S_n = \frac{n}{2}(3 + n + 2)$

$S_n = \frac{n}{2}(n+5)$

Q. If S_n the sum of first n term of an A.P. is given by $S_n = 5n^2 + 3n$, then find its n^{th} term

$a_n = (\quad)$

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

$= 5 + 3 = 8 \rightarrow \boxed{a = 8}$

$S_2 = 5(2)^2 + 3(2)$

$= 5(4) + 6$

$= 20 + 6$

$\boxed{S_2 = 26}$

$S_2 - S_1 = a_2$

$+ S_2$

S_1

$a_2 = 26 - 8$

$\boxed{a_2 = 18}$

$a = 8$

$a_2 = 18$

$d = a_2 - a_1 = 18 - 8 = 10$

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

$= 8 + (n-1)10$

$= 8 + 10n - 10$

$\boxed{a_n = 10n - 2}$

Q. If the ratio of the sum of the first n terms of two A.P. is (7n + 1): (4n +27), then find the ratio of their 9^{th} terms.

a_1, , S_{n_1} d_1 first → a_2 S_{n_2} d_2

$$\frac{S_{n_1}}{S_{n_2}} = \frac{7n+1}{4n+27}$$

$$\frac{\frac{n}{2}[2a_1+(n-1)d_1]}{\frac{n}{2}[2a_2+(n-1)d_2]} = \frac{7n+1}{4n+27}$$

$$S_{n_1} = \frac{n}{2}[2a_1+(n-1)d_1]$$

$$S_{n_2} = \frac{n}{2}[2a_2+(n-1)d_2]$$

$$\frac{2a_1 + (n-1)d_1}{2a_2 + (n-1)d_2} = \frac{7n+1}{4n+27}$$

$$\frac{a_1 + \frac{(n-1)}{2}d_1}{a_2 + \frac{(n-1)}{2}d_2} = \frac{7n+1}{4n+27}$$

$n = 17$

$$\frac{n-1}{2} = 8 \iff n-1 = 16$$

$$\boxed{n = 17}$$

$$\frac{a_1 + 8d_1}{a_2 + 8d_2} = \frac{7(17)+1}{4(17)+27}$$

$$\frac{a_9}{A_9} = \frac{119+1}{68+27} = \frac{120}{95}$$

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

$$\frac{a_9}{A_9}$$

$$\boxed{a_9} = a_1 + 8d_1$$

$$\frac{a_9}{A_9} = \frac{\cancel{120}^{24}}{\cancel{95}_{19}} = \frac{24}{19}$$

$$\boxed{a_9 : A_9 = 24:19}$$

Q. A man saved Rs 16500 in ten years. In each year after the first, he saved Rs 100 more than he did in the preceding year. How much did he save in the first year?

$\Rightarrow S_n = 16500$, $n = 10$

$a = x$, $x+100$, $x+200$, $x+300$

$d = (x+100) - x$

$\boxed{d = 100}$

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

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

$$16500 = \frac{10}{2}[2a + (9)(100)]$$

$$16500 = 5[2a + 900]$$

$$16500 = 10a + 4500$$

$$16500 - 4500 = 10a$$

$$\frac{12000}{10} = a$$

$$\boxed{a = 1200}$$

$$\boxed{\text{first year} = \text{Rs } 1200}$$

Q. Find the sum of n terms of the series

$$S = \left(4 - \frac{1}{n}\right) + \left(4 - \frac{2}{n}\right) + \left(4 - \frac{3}{n}\right) + \ldots\ldots\ldots$$

$\Rightarrow (4 + 4 + 4 \ldots n \text{ times}) + \left[-\frac{1}{n} + \left(-\frac{2}{n}\right) + \left(-\frac{3}{n}\right) \ldots n \text{ term}\right]$

$\Rightarrow 4(1+1+1 \ldots n \text{ times}) - \frac{1}{n}\{\underbrace{1+2+3+4+\ldots n^{\text{terms}}}_{S_n}\}$

$\Rightarrow 4(1 \times n) - \frac{1}{n}(S_n)$

$$\boxed{S = 4n - \frac{1}{n}(S_n)}$$

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

$$= \frac{n}{2}\{2 + (n-1)(1)\}$$

$$= \frac{n}{2}\{2 + n - 1\}$$

$$\boxed{S_n = \frac{n(n+1)}{2}}$$

$$S = 4n - \frac{1}{n}(S_n)$$

$$= 4n - \frac{1}{n}\left(\frac{n(n+1)}{2}\right)$$

$$= 4n - \frac{n+1}{2}$$

$1, 2, 3, 4, \cdots$

$a = 1$

$d = 1$

$$S = 4n - \frac{n+1}{2}$$

$$= \frac{8n - n - 1}{2}$$

$$\boxed{S = \frac{7n-1}{2}}$$

H.W

Q. A piece of equipment cost a certain factory Rs 60,000. If it depreciates in value, 15% the first year, 13.5% the next year, 12% the third year, and so on. What will be its value at the end of 10 years, all percentages applying to the original cost?

$\Rightarrow a = 60,000$

$n = 10$

$S_n = \frac{10}{2}[2 \times 9000 + 9(-900)]$

$= x$

$D_1 = 15\% \text{ of } 60000 = 9000 \rightarrow a$

$D_2 = 13.5\% \text{ of } 60000$

$= \frac{135}{1000} \times 60000 = 8100$

$D_3 = 12\% \text{ of } 60000 = 7200$

-900

-900

d

Homework

1. How many terms of the A.P. 18, 16, 14, ... Be taken so that their sum is zero? $S_n = 0$
2. Find the sum of all 3 digit natural numbers which are divisible by 13

100

104)

$$S_n = \frac{n}{2}(a + l)$$

$$\begin{array}{r} 13 \\ \times\ 8 \\ \hline 104 \end{array}$$

Your Roadmap to Success

Stay on track with a structured schedule that covers every essential topic you need for mid-term success. Each class is designed to reinforce core concepts and provide ample practice to ensure you're fully prepared. Follow the timetable, access class PDFs, and watch video lessons—all at your own pace. Your journey to acing the exams starts here!

13th Sept 2024

Topic	PDF	Link
Real Numbers		
Life processes		

Download the class PDF now ! link in the description.

Deeksha Scholastic Aptitude Test

Confused About Your Career Choices After 10th?

Take dSAT today

- 60-minutes concept-based lecture and career orientation
- Aptitude Test
- One-on-one counselling
- Competency assessment for Competitive Exams including JEE/NEET/KCET

GET UPTO 90% SCHOLARSHIP

Block Your Seat Now

Name *

Email *

Phone Number *

Is the student in 10th Grade? *

BLOCK MY SEAT

By submitting my data I agree to be contacted. Terms & Conditions and Privacy Policy

For More Information Visit Website, Link in Description


SUBSCRIBE
@Deeksha Vedantu Foundation