UDAAN 2025

Mathematics

Arithmetic Progressions

Q1 In an A.P. the first term is 8, nth term is 33 and the sum to first n terms is 123 . Find n and d, the common difference.

Q2 Aman saved Rs. 32 during the first year, Rs. 36 in the second year and in this way he increases his savings by Rs. 4 every year. Find in what time his saving will be Rs. 200.

Q3 In a flower bed, there are 43 rose plants in the first row, 41 in second, 39 in the third, and so on. There are 11 rose plants in the last row. How many rows are there in the flower bed?

Q4 Is 184 a term of the AP 3, 7, 11, 15,.....?

Q5 A sum of ₹700 is to be used to give seven cash prizes to students of a school for their overall academic performance. If each prize is ₹20 less than its preceding prize, find the value of each prize.

Q6 The sum of the 4th and 8th terms of an AP is 24 and the sum of its 6th and 10th terms is 44. Find the sum of its first 10 terms.

Q7 The sum of first 9 terms of an A.P. is 162. The ratio of its 6th term to its 13th term is 1: 2. Find the first and 15th term of the A.P.

Q8 Ram kali would need Rs. 1800 for admission fee and books etc., for her daughter to start going to school from next year. She saved Rs. 50 in the first month of this year and increased her monthly saving by Rs.20. After a year, how much money will she save? Will she be able to fulfill her dream of sending her daughter to school?

Q9 The first and the last terms of an A.P. are 5 and 45 respectively. If the sum of all its terms is 400 , find its common difference.

Q10 The sum of first n terms of an A.P. is $5n^2 + 3n$. If its m th term is 168 , find the value of m. Also, find the 20th term of this A.P.

Answer Key

Q1   n=6 and d=5

Q2   In 5 years his saving will be Rs. 200

Q3 $\Rightarrow n = 17$

Q4   No 184 is not a term of given A.P

Q5   Hence, the value of each prize is ₹160, ₹140 , ₹120 , ₹100 , ₹80 , ₹60 and ₹40.

Q6   95

Q7   Therefore, first term is 6 and 15th term is 48

Q8   Yes, she will be able to fulfill her dream of sending her daughter to school.

Q9 $\frac{8}{3}$

Q10 198

Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Text Solution:

Given First term, a = 8

$a_n = 33$

And sum of n terms,

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

123 * 2 = n * 41

$n = \frac{123*2}{41} = \frac{246}{41} = 6$

We know

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

$33 = 8 + (6-1)d$

$33 - 8 = 5d$

$25 = 5d$

$d = 5$

Hence, number of terms n = 6 and common difference, d = 5

Video Solution:

Q2 Text Solution:

Given, A man saved in first year, a = 32

A man saved in second year, $a_2 = 36$

In n years his saving will be 200, $S_n = 200$

We know

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

$200 = \frac{n}{2}[2(32) + (n-1)4]$

$400 = n[64 + 4n - 4]$

$400 = n[60 + 4n]$

$400 = 4n[15 + n]$

$100 = 15n + n^2$

$n^2 + 15n - 100 = 0$

$n^2 + 20n - 5n - 100 = 0$

$n(n+20) - 5(n+20) = 0$

$(n-5)(n+20) = 0$

$Here,\ n - 5 = 0, n = 5$

$n + 20 = 0, n = -20$

The term can never be negative, so, we consider

n = 5

Hence, in 5 years his saving will be Rs. 200

Video Solution:

Q3 Text Solution:

The numbers of rose plants in consecutive rows are 43,41, 39,....11

Difference of rose plants between two consecutive rows = (14 − 31) = (39 − 4) = −2 [Constant]

So, the given progression is an AP

Here, first term = 43

Common difference = −2

Last term 11

Let n be the last term, then we have:

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

$\Rightarrow 11 = 43 + (n-1)(-2)$

$\Rightarrow 11 = 45 - 2n$

$\Rightarrow 34 = 2n$

$\Rightarrow n = 17$

Video Solution:

Q4 Text Solution:

The given AP is 3, 7, 11, 5

Here, a = 3 and d = 7 – 3 = 4

Let the nth term of the given AP be 184. Then,

$a_n = 184$

$\Rightarrow 3 + (n-1) \times 4 = 184$

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

$\Rightarrow 4n - 1 = 184$

$\Rightarrow 4n = 185$

$\Rightarrow n = \frac{185}{4} = 46\frac{1}{4}$

But, the number of terms cannot be a fraction.

Hence 184 is not a term of the given AP.

Video Solution:

Q5 Text Solution:

Let the value of the first prize be a.

Since the value of each prize is 20 less than its preceding prize, so the values of the prizes are in a, a-20, a-40……

Number of cash prizes to given to the students, n = 7

Total sum of the prizes, $S_7 = ₹700$

Using the formula, $S_n = \frac{n}{2}\left[2a + (n-1)d\right]$, we get

$S_7 = \frac{7}{2}\left[2a + (7-1) \times (-20)\right] = 700$

$\Rightarrow \frac{7}{2}(2a - 120) = 700$

$\Rightarrow 7a - 420 = 700$

$\Rightarrow 7a = 700 + 420 = 1120$

$\Rightarrow a = 160$

Thus, the value of the first prize is ₹ 160.

Hence, the value of each prize is ₹160, ₹140, ₹120, ₹100, ₹80, ₹60 and ₹40.

Video Solution:

Q6 Text Solution:

Let a be the first and d be the common difference of the AP.

$\therefore$ 4th term +8th term =24

$\Rightarrow (a + 3d) + (a + 7d) = 24$

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

$\Rightarrow 2a + 10d = 24$

$\Rightarrow a + 5d = 12$ ....(1)

Also,

$\therefore a_6 + a_{10} = 44$ (Given)

$\Rightarrow (a + 5d) + (a + 9d) = 44$

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

$\Rightarrow 2a + 14d = 44$

$\Rightarrow a + 7d = 22$ ....(2)

Subtracting (1) from (2), we get

$(a + 7d) - (a + 5d) = 22 - 12$

$\Rightarrow 2d = 10$

$\Rightarrow d = 5$

Putting d = 5 in (1), we get

$a + 5 \times 5 = 12$

$\Rightarrow a = 12 - 25 = -13$

Using the formula, $S_n = \frac{n}{2}\left[2a + (n-1)d\right]$, we get

$\frac{=10}{2}\left[2(-13) + (10 - 1)5\right]$

$= 5\left[-26 + 45\right]$

$= 5(19)$

=95

~

Video Solution:

Q7 **Text Solution:**

Let a be the first term and d be the common defference

Now, $a_6/a_{13} = \frac{1}{2}$

$\frac{a+5d}{a+12d} = \frac{1}{2}$

$2a + 10d = a + 12d$

a = 2d   (i)

Now sum of first n terms of A.P

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

$S_9 = \frac{9}{2}\left[2a + 8d\right]$

$162 = 9(a + 4d)$

$a + 4d = 18$

2d + 4d = 18 (Using (i))

6d = 18

d = 3

Now from (i), we get

a = 2 * 3 = 6

So, first term, a_1 = a = 6

15th term, a_{15} = a +14d = 6 + 14(3)

= 6 + 42 = 48

Therefore, first term is 6 and 15th term is 48

Video Solution:

Q8 **Text Solution:**

$a = 50, d = 20$

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

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

$= \frac{12}{2}\left[100+11 \text{x} (20)\right]$

=6*320= 1920

Yes, she will be able to fulfill her dream of sending her daughter to school.

Video Solution:

Q9 **Text Solution:**

First term, a = 5

Last term, l = 45

$S_n = 400$

$\frac{n}{2}\left[a + 1\right] = 400$

$n[5 + 45] = 800$

n = 16

Now, $n = \frac{l-a}{d} + 1$

$16 = \frac{45-5}{d} + 1$

$16d = 40 + d$

$15d = 40$

$d = \frac{8}{3}$

Hence, the common difference is $\frac{8}{3}$

Video Solution:

Q10 **Text Solution:**

Given that

$S_n = 5n^2 + 3n$

$Put\ n = 1$

$S_1 = T_1 = 5 + 3 = 8$

$Put\ n = 2$

$S_2 = 5(2)^2 + 3 + 2 = 26$

$T_2 = S_2 - S_1 = 26 - 8 = 18$

$S_3 = 5(3)^2 + 3 + 3 = 54$

$T_3 = S_3 - S_2 = 54 - 26 = 28$

Therefore, first term, a = 8 and common

difference = 18 – 8 = 10

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

$168 = 8 + (m-1)10$

$168 = 8 + 10m - 10$

$170 = 10m$

$m = 17$

$T_{20} = 8 + (20-1)10$

$= 8 + 19 * 10 = 198$

Video Solution: