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Where Minds Pollinate

Class 11
Mathematics

Chapter 4
Exercise 4.3
Notes

National Book Foundation

Exercise # 4.3

Find the sum of each series.

1. $4+7+10+13+16+19+22+25$

Sol:-

Here $n=8$, $a_n = 25$, $a_1 = 4$

$\therefore \quad S_n = \frac{n}{2}(a_1 + a_n)$

So, $\quad S_8 = \frac{8}{2}(4+25)$

$\therefore \quad S_8 = 116$

2. $a_1 = 2$, $a_n = 200$, $n = 100$

Sol:-

As. $\quad S_n = \frac{n}{2}(a_1 + a_n)$

$\therefore \quad S_{100} = \frac{100}{2}(2+200)$

$S_{100} = 10100$

3. $a_1 = 5$, $a_n = 100$, $n = 200$

Sol:-

As. $\quad S_n = \frac{n}{2}(a_1 + a_n)$

$$S_{200} = \frac{200}{2}(5+100)$$

$$S_{200} = 10500$$

4. $a_1 = 4,\ n = 15,\ d = 3$

Sol:-

As, $S_n = \frac{n}{2}\left[2a_1 + (n-1)d\right]$

$\therefore\ S_{15} = \frac{15}{2}\left[2(4) + (15-1)(3)\right]$

$$S_{15} = 375$$

5. $a_1 = 50,\ n = 20,\ d = -4$

Sol:-

As, $S_n = \frac{n}{2}\left[2a_1 + (n-1)d\right]$

$\therefore\ S_{20} = \frac{20}{2}\left[2(50) + (20-1)(-4)\right]$

$$S_{20} = 240$$

6. $-3 + (-7) + (-11) + \dots + a_{10}$

Sol:-

Common difference $= d = -7-(-3) = -4$

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

So, $a_{10} = -3 + (10-1)(-4)$

$a_{10} = a_n = -39$

As, $S_n = \frac{n}{2}(a_1 + a_n)$

$S_{10} = \frac{10}{2}(-3-39)$

$\therefore$ $S_{10} = -210$

7. $9+11+13+15+\dots$ for $n=12$

Sol:-

As, common difference $= d = 11-9 = 2$

Also, $S_n = \frac{n}{2}[2a_1 + (n-1)d]$

$\therefore$ $S_{12} = \frac{12}{2}[2(9)+(12-1)(2)]$

$S_{12} = 240$

8. Find the sum of even number from 2 to 100

Sol:-

Common difference between even no. $= 4-2 = 2$

As, in 100 no. there are 50 odd and 50 even

$\therefore$ $n = 50$

$\therefore \quad S_n = \frac{n}{2}\left(2a_1 + (n-1)d\right)$

$\Rightarrow \quad S_{50} = \frac{50}{2}\left[2(2) + (50-1)(2)\right]$

$S_{50} = 2550$

9. Sum of odd no. from one to 99.

Sol:-
Common difference $= d = 3 - 1 = 2$

and, $a_1 = 1$ and $n = 50$

$\therefore \quad S_n = \frac{n}{2}\left[2a_1 + (n-1)d\right]$

$S_{50} = \frac{50}{2}\left[2(1) + (50-1)(2)\right]$

$S_{50} = 2500$

10. Find sum of all multiples of 4 between 14 and 523

Sol:-
we have arithmetic series

$16 + 20 + 24 + 28 + 32 + \dots + 520$

Here, $a_n = 520$, $d = 4$, $a_1 = 16$

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

$520 = 4 + (n-1)(4)$

$520 - 4 = 4n - 4$

$516 + 4 = 4n$

$n = 130$

Also, $S_n = \frac{n}{2}(a_1 + a_n)$

$\therefore \quad S_{130} = \frac{130}{2}(4 + 520)$

$S_{130} = 34060$

Find S_n for arithmetic series.

11. $a_1 = 3$, $a_n = -38$, $n = 8$

Sol:-

As, $S_n = \frac{n}{2}(a_1 + a_n)$

$\therefore \quad S_8 = \frac{8}{2}(3 - 38)$

$S_8 = -140$

$a_1 = 85$, $n = 21$, $a_n = 25$

Sol:-

As, $S_n = \frac{n}{2}(a_1 + a_n)$

$\therefore \quad S_{21} = \frac{21}{2}(85 + 25$

$S_{21} = 1155$

13. $a_1 = 34,\ n = 9,\ a_n = 2$

Sol:-

As, $S_n = \frac{n}{2}(a_1 + a_n)$

$\therefore\ S_9 = \frac{9}{2}(34 + 2)$

$S_9 = 162$

14. $a_1 = 5,\ d = \frac{1}{2},\ n = 13$

Sol:-

As, $S_n = \frac{n}{2}[2a_1 + (n-1)d]$

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

$S_{13} = 104$

15. $a_1 = 91,\ d = -4,\ a_n = 15$

Sol:-

As, $S_n = \frac{n}{2}[2a_1 + (n-1)d]$ —(i)

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

$15 = 91 + (n-1)(-4)$

$15 - 91 = 4 - 4n$

$\frac{-76 + 4}{-4} = n$

$n = 20$

$\therefore$ eq.(i) $\Rightarrow$ $S_{20} = \frac{20}{2}[2(91) + (20-1)(-4)]$

$S_{20} = 1060$

16. $d = -4,\ n = 9,\ a_n = 27$

Sol:-

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

$27 = a_1 + (9-1)(-4)$

$27 = a_1 - 32$

$a_1 = 59$

$\therefore\ S_n = \frac{n}{2}\left[2a_1 + (n-1)d\right]$

$S_9 = \frac{9}{2}\left[2(59) + (9-1)(-4)\right]$

$S_9 = 387$

Find sum of arithmetic series

17. $6 + 12 + 18 + \dots + 96$

Sol:-

As, $a_n = 96,\ a_1 = 6,\ d = 12 - 6 = 6$

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

$96 = 6 + (n-1)(6)$

$96 - 6 = 6n - 6$

$\frac{90+6}{6} = n \Rightarrow n = 16$

also, $S_n = \frac{n}{2}\left[2a_1 + (n-1)d\right]$

$$S_{16} = \frac{16}{2}\left[2(6) + (16-1)(6)\right]$$

$$S_{16} = 816$$

18. $34 + 30 + 26 + \dots + 2$

Sol:-

Here, $a_1 = 34$, $a_n = 2$, $d = 30 - 34 = -4$

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

$$2 = 34 + (n-1)(-4)$$

$$2 - 34 = 4 - 4n$$

$$\frac{-32-4}{-4} = n$$

$$n = 9$$

$\therefore$ $S_n = \frac{n}{2}\left[2a_1 + (n-1)d\right]$

$$S_9 = \frac{9}{2}\left[2(34) + (9-1)(-4)\right]$$

$$S_9 = 162$$

19. $10 + 4 + (-2) + \dots + (-50)$

Sol:-

Here, $a_1 = 10$, $a_n = -50$. $d = 4 - 10 = -6$

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

$$-50 = 10 + (n-1)(-6)$$
$$-50 - 10 = 6 - 6n$$
$$\frac{-60 - 6}{-6} = n$$
$$n = 11$$

also, $S_n = \frac{n}{2}\left[2a_1 + (n-1)d\right]$

$$S_{11} = \frac{11}{2}\left[2(10) + (11-1)(-6)\right]$$

$$S_{11} = -220$$

Find the first three terms of arithmetic series.

20. $a_1 = 7$, $a_n = 139$, $S_n = 876$

Sol:-

As, $S_n = \frac{n}{2}(a_1 + a_n)$

$$\therefore \quad 876 = \frac{n}{2}(7 + 139)$$

$$n = 12$$

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

$$\therefore \quad 139 = 7 + (12-1)d$$
$$139 - 7 = 11d$$
$$d = 12$$

for $a_2 = a_1 + (2-1)d$
$$a_2 = 7 + 1(12)$$
$$a_2 = 19$$

$a_3 = a_1 + (3-1)d$

$a_3 = 7 + 2(12)$

$a_3 = 31$

So, $a_1 + a_2 + a_3 + \dots$

$\therefore \quad 7 + 19 + 31 + \dots$

Sequence :- $7, 19, 31, \dots$

21. $n = 14$, $a_n = 53$, $S_n = 378$

Sol:-

As, $S_n = \frac{n}{2}(a_1 + a_n)$

$378 = \frac{14}{2}(a_1 + 53)$

$\frac{378}{7} = a_1 + 53$

$a_1 = 1$

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

$53 = 1 + (14-1)d$

$53 - 1 = 13d$

$\frac{52}{13} = d$

$d = 4$

for, $a_2 = a_1 + (2-1)d$

$a_2 = 1 + 4$

$a_2 = 5$

$a_3 = a_1 + (3-1)d$

$a_3 = 1 + 2(4)$

$a_3 = 9$

$\therefore$ sequence :- $1, 5, 9, \ldots$

2. $a_1 = 6$, $a_n = 306$, $S_n = 1716$

Sol:-

As. $S_n = \frac{n}{2}(a_1 + a_n)$

$1716 = \frac{n}{2}(6 + 306)$

$2(1716)\ n(312)$

$n = \frac{3432}{312}$

$n = 11$

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

$306 = 6 + (11-1)d$

$306 - 6 = 10d$

$d = 300/10$

$d = 30$

for $a_2 = a_1 + (2-1)d$

$= 6 + 30$

$= 36$

$a_3 = a_1 + (3-1)d$

$a_3 = 6 + 2(36)$

$a_3 = 66$

Sequence :- $6, 36, 66, \ldots$

Q23. A formation of marching brand has 14 marches in the first row, 16 in second row, 18 in third row and so on. for 25 rows. How many martches in last row. How many martches altogether

Sol:-

For last row i.e 25, $a_1 = 14$, $n = 25$

and $d = 16 - 14 = 2$

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

$$a_{25} = 14 + (25-1)(2)$$

$$a_{25} = 62$$

Now, sum of all marches is,

$$S_n = \frac{n}{2}(a_1 + a_n)$$

$$\therefore \quad S_{25} = \frac{25}{2}(14 + 62)$$

$$S_{25} = 950$$

Q24. How many poles will be in a pile of telephone poles if there are 50 in first row, 49 in second and so on until there are 0 in last layer?

Sol:-

We have, $a_1 = 50$, $d = 49 - 50 = -1$,
$a_n = 0$

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

$6 = 50 + (n-1)(-1)$

$6 - 50 = 1 - n$

$-44 - 1 = -n$

$n = 45$

$\therefore S_n = \frac{n}{2}(a_1 + a_n)$

$S_{45} = \frac{45}{2}(50 + 6)$

$S_{45} = 1260$

125 A family saves money in an arithmetic sequence : Rs. 6000 in the first year, Rs. 70,000 in second year and so on, for 20 years. How much do they save in all.

Sol:-

We have, $a_1 = 6{,}000$, $n = 20$, $d = 70{,}000 - 6000$

$d = 64{,}000$

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

$a_n = 6{,}000 + (20-1)(64000)$

$a_n = 1{,}222{,}000$

also, $S_n = \frac{n}{2}(a_1 + a_n)$

$S_{20} = \frac{20}{2}(6000 + 1222000)$

$S_{20} = 12{,}280{,}000$

Total save in 20 years = Rs. 12,280,000

Q26. Mr. Saleem saves Rs. 500 on october 1, Rs. 550 on October 2 and Rs. 600 on october 3 and so on. How much he saved during october (october has 31 days)?

Sol:-

We have, $a_1 = 500$, $n = 31$, $d = 550 - 500$

$d = 50$

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

$a_n = 500 + (31-1)(50)$

$a_n = 2000$

also, $S_n = \frac{n}{2}(a_1 + a_n)$

$S_{31} = \frac{31}{2}(500 + 2000)$

$S_{31} = 38,750$

Total save in october = Rs. 38,750.