CLASS 10 – CBSE | MATHEMATICS

ARITHMETIC PROGRESSIONS

SECTION -A (Multiple choice questions)

1. Two APs have the same common difference. The first term of one of these is –1 and that of the other is – 8. Then the difference between their 4th terms is

   (a) –1 (b) – 8 (c) 7 (d) –9

2. Which term of the AP: 3,10,17,.. will be 84 more than its 13th term?

   (a) 24^{th} (b) 25^{th} (c) 35^{th} (d) 34^{th}

3. If the sum of the first 'n' terms of an AP is $3n^2-2n$, then its common difference is :

   (a) 1 (b) 3 (c) $\frac{3}{2}$ (d) 6

4. If 7 times the 7th term of an AP is equal to 11 times its 11th term, then its 18th term will be

   (a) 7 (b) 11 (c) 18 (d) 0

5. The 20th term from the end of the A.P. $7, 10, 13, \ldots, 100$ is:

   (a) 40 (b) 43 (c) 46 (d) 49

6. If in an AP, $S_p = a\,p^2 + b\,p$, Then common difference of AP is

   (a) a + b (b) a (c) 2a (d) $\frac{a}{2}$

7. The value of x for which $2x,\ x+10,\ 3x+2$ are three consecutive terms of an A.P. is:

   (a) -6 (b) 6 (c) 18 (d) -18

8. The 15th term from the end of the AP, $\sqrt{3}$, $\sqrt{12}$, $\sqrt{27}$, ,....., $\sqrt{5043}$ is

   (a) $\sqrt{1875}$ (b) $\sqrt{6561}$ (c) $\sqrt{625}$ (d) $\sqrt{2187}$

9. If $S_n = n(3n+1)$, then the 5th term of the A.P. is:

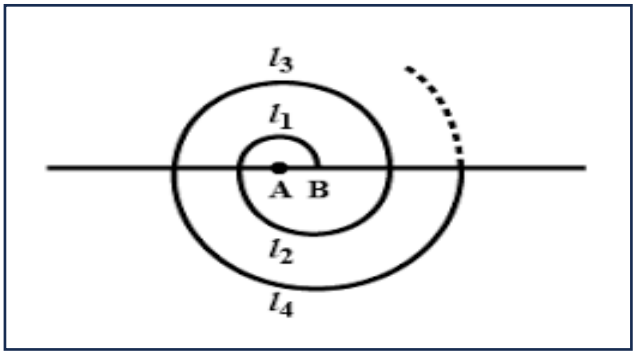
   (a) 22 (b) 24 (c) 26 (d) 28

10. If an A.P. has last term $l$and common difference d, then the rth term from the end is:

    (a) $l - rd$ (b) $l + (r-1)d$ (c) $l - (r-1)d$ (d) $l + (r+1)d$

SECTION -B (Long Answer Questions)

11. If pth term of an AP is $\frac{1}{q}$ & the qth is $\frac{1}{p}$ .Show that the sum of pq terms is $\frac{1}{2}(pq+1)$
12. How many numbers lie between 10 & 300, which when divided by 4 leave a remainder 3 ? Also find their sum.
13. In an AP , m T_m = n T_n , Prove That : $T_{m+n} = 0$
14. If the Sum of first m terms of an AP is n & the sum of first n terms is m, then show that : $S_{(m+n)} = -(m+n)$.
15. Find the sum of number of natural numbers between 101 and 999 which are divisible by both 2 and 5.
16. In an AP , $S_n = 3n^2 + 2n$ & $T_k = 281$, Find value of k.
17. Which term of AP 53,48,43..... is the first negative term?
18. 360 bricks are stacked in the following manner : 30 bricks in the bottom row , 29 in the next row, 28 in the row next to it , and so on. In how many rows are the 360 bricks placed and how many bricks are there in the top row?
19. If the 15th term of an AP is $\frac{1}{12}$ and 12th term of the same AP is $\frac{1}{15}$, then find its 180th term .
20. Determine the 10th term from the end of the A.P. 4, 9, 14, ..., 254.
21. Two APs have the same common difference. The first term of one of these is –5 and that of the other is – 17. Then find difference between their 11th terms.
22. In a school, students thought of planting trees in and around the school to reduce air pollution. It was decided that the number of trees, that each section of each class will plant, will be the same as the class, in which they are studying, e.g., a section of Class I will plant 1 tree, a section of Class II will plant 2 trees and so on till Class XII. There are three sections of each class. How many trees will be planted by the students?
23. A spiral is made up of successive semicircles, with centres alternately at A and B, starting with centre at A, of radii 0.5 cm, 1.0 cm, 1.5 cm, 2.0 cm, What is the total length of such a spiral made up of thirteen consecutive semicircles?



24. The sum of four consecutive numbers in an AP is 32 and the ratio of the product of the first and the last terms to the product of the two middle terms is 7 : 15. Find the numbers.
25. Solve the equation $-4 + (-1) + 2 + ... + x = 437$.
26. Which term of Progression $20, 19\frac{1}{4}, 18\frac{1}{2}, 17\frac{3}{4}, \ldots\ldots\ldots\ldots\ldots$ is first negative term ?
27. If the p^{th}, q^{th} & r^{th} term of an AP is x, y and z respectively, show that $x(q-r) + y(r-p) + z(p-q) = 0$.
28. If the term of m terms of an A.P. is the same as the sum of its n terms, show that the $S_{(m+n)} = 0$.
29. A sum of Rs.1890 is to be used to give seven cash prizes. If each prize is Rs.50 less than the preceding prize, find the value of each prize?
30. In an AP of 50 terms, the sum of first 10 terms is 210 and the sum of its last 15 terms is 2565. Find the AP.
31. The digits of a positive integer ,having three digits are in AP and their sum is 15 .The number obtaining by reversing the digit is 594 less than the original number .Find the number.
32. How many terms of the series 54, 51, 48, ... be taken so that their sum is 513 ? Explain the double answer.
33. The sum of the first seven terms of an AP is 182. If its 4th and the 17th terms are in the ratio 1 : 5, Find the AP.
34. Find the middle term of the sequence formed by all three-digit numbers which leave a remainder 5 when divided by 7.
35. Find the sum of number of natural numbers between 101 and 999 which are divisible by both 2 and 5.

SECTION - C (Case Study Based Questions)

36. Push-ups are a fast and effective exercise for building strength. These are helpful in almost all sports including athletics. While the push-up primarily targets the muscles of the chest, arms, and shoulders, support required from other muscles helps in toning up the whole body. Nitesh wants to participate in the push-up challenge. He can currently make 3000 push-ups in one hour. But he wants to achieve a target of 3900 push-ups in 1 hour for which he practices regularly. With each day of practice, he is able to make 5 more push-ups in one hour as compared to the previous day. If on first day of practice he makes 3000 push-ups and continues to practice regularly till his target is achieved. Keeping the above situation in mind answer the following questions:
    i) Form an A.P representing the number of push-ups per day and hence find the minimum number of days he needs to practice before the day his goal is accomplished?
    ii) Find the total number of push-ups performed by Nitesh up to the day his goal is achieved.

37. Manpreet Kaur is the national record holder for women in the shot-put discipline. Her throw of 18.86m at the Asian Grand Prix in 2017 is the maximum distance for an Indian female athlete. Keeping her as a role model, Sanjitha is determined to earn gold in Olympics one day. Initially her throw reached 7.56m only. Being an athlete in school, she regularly practiced both in the mornings and in the evenings and was able to improve the distance by 9cm every week. During the special camp for 15 days, she started with 40 throws and every day kept increasing the number of throws by 12 to achieve this remarkable progress.

i) How many throws Sanjitha practiced on 11th day of the camp?

ii) What would be Sanjitha's throw distance at the end of 6 weeks? Or
When will she be able to achieve a throw of 11.16 m?

iii) How many throws did she do during the entire camp of 15 days ?

38. The school auditorium was to be constructed to accommodate at least 1500 people. The chairs are to be placed in concentric circular arrangement in such a way that each succeeding circular row has 10 seats more than the previous one.

i) If the first circular row has 30 seats, how many seats will be there in the 10th row?

ii) For 1500 seats in the auditorium, how many rows need to be there? Or
If 1500 seats are to be arranged in the auditorium, how many seats are still left to be put after 10th row?

iii) If there were 17 rows in the auditorium, how many seats will be there in the middle row?

39. Ms. Sheela visited a store near her house and found that the glass jars are arranged one above the other in a specific pattern. On the top layer there are 3 jars. In the next layer there are 6 jars. In the 3rd layer from the top there are 9 jars and so on till the 8th layer. On the basis of the above situation answer the following questions.

i) Write an A.P whose terms represent the number of jars in different layers starting from top . Also, find the common difference.

ii) Is it possible to arrange 34 jars in a layer if this pattern is continued? Justify your answer.

iii) (A) If there are 'n' number of rows in a layer then find the expression for finding the total number of jars in terms of n. Hence find S_8. Or
(B) The shopkeeper added 3 jars in each layer. How many jars are there in the 5th layer from the top?

40. In a class, the teacher asks every student to write an example of A.P. Two boys Aryan and Roshan writes the progression as −5, −2,1,4, …… and 187, 184, 181, …. respectively. Now the teacher asks

his various students the following questions on progression. Help the students to find answers for the following:

i) Find the sum of the common difference of two progressions.

ii) Find the 34th term of progression written by Roshan.

iii) (A) Find the sum of first 10 terms of the progression written by Aryan. Or

(B) Which term of the progressions will have the same value?

CLASS 10 – CBSE | MATHEMATICS

Arithmetic Progressions- Answer Key

SECTION -A (Multiple choice questions)

1. (c)

2. (b)

3. (d)

4. (d)

5. (b)

6. (c)

7. (b)

8. (d)

9. (d)

10. (c)

SECTION -B (Long Answer Questions)

11. Proved

12. 73 numbers, Sum = 11315

13. Proved

14. Proved

15. 89 numbers, Sum = 48950

16. k = 47

17. 12th term (T12 = -2)

18. 16 rows, 15 bricks in top row

19. $T_{180} = 1$

20. 209

21. 12

22. 234 trees

23. 143 cm

24. Numbers: 2, 6, 10, 14

25. n = 19, x = 50

26. 28th term

27. Proved

28. Proved

29. Prizes: 420, 370, 320, 270, 220, 170, 120

30. AP: 3, 7, 11, 15, ...

31. Number = 852

32. n = 18 or 19 (double answer)

33. AP: 2, 10, 18, 26, ...

34. 551

35. 89 numbers, Sum = 48950

SECTION - C (Case Study Based Questions)

36. Push-ups (Nitesh)

i) 181

ii) 624450

37. Shot-put (Sanjitha)

i) 160

ii) 8.10 m OR 41 weeks

iii) 1860

38. Auditorium Seating

i) 120

ii) 15 rows OR 750

iii) 110

39. Glass Jars

i) 3

ii) Not possible

iii) 108 OR 18

40. Aryan's and Roshan's Progressions

i) 0

ii) 88

iii) 85 OR 33rd term, value 91