UNIT-1: ARITHMETIC PROGRESSION

I. The Statements regarding to the arithmetic progressions are given below. State whether the following statements are true or false.

1. The n^{th} term of an arithmetic progression is described by some explicit linear function.
2. The difference of a term and its previous term is always constant in arithmetic progression.
3. Arithmetic progression is a sequence in which the numbers are arranged in a definite order according to some rule.
4. 3, 8, 12, 17, 22, ….. is an example for an arithmetic progression.
5. The sequence of squares of natural numbers forms an arithmetic progression.
6. The sequence defined by $\{a_n\} = \frac{n-2}{3}$ is not an arithmetic progression.
7. The type of sequence in which each term except the first, progress in a definite manner is arithmetic progression.
8. In any arithmetic progression $a_{n+1} - a_n$ is 'a' independent of n.
9. The sequence defined by $a_n = 3n^2-1$ is an arithmetic progression.

II. Answer the following questions with suitable answer. Questions are related to the sequences -3, 1, 5, 9, …

1. Is the sequence -3, 1, 5, 9, … an arithmetic progression or not. Justify your answer.
2. Mention the first term of an AP -3, 1, 5, 9, …
3. Check whether the number 76 is a term of an AP -3, 1, 5, 9, … or not. Justify your answer.
4. Write the general term of an AP -3, 1, 5, 9, …
5. Calculate the common difference of an AP -3, 1, 5, 9, …
6. Calculate the value of a_n-a_{n-1} in an AP -3, 1, 5, 9, …
7. Find out the value of $a_{n+1}-a_n$ in an AP -3, 1, 5, 9, …

8. If all terms of an AP -3, 1, 5, 9,… are added with a number 2 then calculate the common difference of a new AP.
9. What is the common difference of an AP obtained when all terms of an AP -3, 1, 5, 9, … are multiplied by 7?
10. If the common difference of an AP -3, 1, 5, 9,… is 4 then What is the common difference of an AP $\frac{-3}{2}, \frac{1}{2}, \frac{5}{2}, \frac{9}{2}, ...$?
11. Calculate the $(n+1)^{th}$ term of an AP -3, 1, 5, 9, …
12. Check whether the sequence -3, 1, 5, 9, … is an AP described by the rule $a_n=4n-7$.
13. Is 193 a term of an AP -3, 1, 5, 9, …?
14. Which term of an AP -3, 1, 5, 9, … is 201?
15. How many terms are there in an AP -3,1,5,9,…..153?
16. Determine the number of terms in an AP -3,1,5,9,…..125
17. Which formula is used to calculate the n^{th} term of anAP -3,1,5,9,…..?
18. Calculate the 20^{th} term of an AP -3,1,5,9,…..
19. Calculate the sum of first 15 terms of an AP -3,1,5,9,…..
20. If the S_{25} and S_{24} of an AP -3,1,5,9,….. are 1125 and 552 respectively then calculate the 25^{th} term of a given AP.
21. Prove that the sum of first 'n'terms of an AP -3,1,5,9,….. is $2n^2-5n$.
22. Solve for "x" : -3+1+5+9+……..+x = 1125
23. How many terms of an AP -3,1,5,9,….. to be taken so that sum is 3000?
24. Solve for "x" : -3+1+5+9+……..+217 = x
25. Write the next three terms of an AP -3,1,5,9,…..
26. The 19^{th}term of an AP -3,1,5,9,….. is 69. Find the 18^{th}term and 17^{th} term of given AP.
27. Write the value of $a_{30} - a_{10}$ for an AP -3,1,5,9,…..
28. What will be the value of $a_8 - a_4$ for an AP -3,1,5,9,…..

29. Find the n^{th}term of an AP formed by the terms in even positions of an AP -3,1,5,9,…..

III. Answer the following questions regarding to an AP described by $a_n = 3n - 5$

1. Write the first term of an AP whose n^{th} term is 3n-5.
2. If the general term of an AP is 3n-5. Then calculate the value of a_n-a_{n-1}?
3. Find the common difference of an AP whose n^{th} term is 3n-5.
4. Check whether the number 25 is a term of an AP whose n^{th} term is 3n-5.
5. Calculate the 20^{th} term of an AP whose n^{th} term is 3n-5.
6. Write the arithmetic progression whose n^{th} term is 3n-5.
7. Show that the sequence which is described by a rule a_n = 3n-5 forms an arithmetic progression.
8. Is 115 a term of an arithmetic progression whose n^{th} term is 3n-5 ?
9. Which term of an AP defined by a_n=3n-5 is 295?
10. If all the terms of an AP having a general term 3n-5 is added with a number 3. Then find out the general term of a new AP.
11. If all the terms of an AP whose general term is a_n=3n-5 is multiplied by 5 then find out the general term of an new AP.
12. If an AP defined by a_n=3n-5 has 25 terms then calculate the last term of an AP.
13. Calculate the sum of first 20 terms of an AP defined by a rule a_n=3n-5.
14. Show that the common difference of an AP defined by a_n=3n-5 is equal to the numerical co-efficient of ‘n’ in 3n-5.
15. How many terms of an AP described by a_n=3n-5 to be taken so that the sum is 530?
16. Which is the formula is used to calculate the sum of first ‘n’ terms of an AP whose first term ‘a’ and general term ‘a_n’ are given?

17. Find out the $(n-1)^{th}$ and $(n+1)^{th}$ terms of an AP whose general term is 3n-5.
18. Find out the value of a_{26} of an AP whose general term is 3n-5.
19. If n^{th}term of an AP is 3n-5, then find out the value of a_{n-1}-a_{n-2}.
20. Write the first three terms of an AP whose n^{th} term is 3n-5.
21. Name the set of values of 'n'in a_n=3n-5 which is a general term of an AP.
22. What will be the value of a_8-a_4 in an AP whose general term is 3n-5?

IV. Some questions are given below regarding an arithmetic progression whose first term and common difference are 'a' and 'd' respectively. Answer the following questions with suitable answers.

1. Write the general form of an AP whose first term and common difference are 'a' and 'd' respectively.
2. Which is the formula used to calculate the n^{th} term of an AP whose first term and common difference are 'a' and 'd' respectively.
3. Find the $(n-1)^{th}$ term of an AP having first term and common difference are 'a' and 'd' respectively.
4. Write the general term of an AP whose first term and common difference are 'a' and 'd' respectively.
5. Write the tenth term of an AP whose first term and common difference are 'a' and 'd' respectively.
6. Write the formula used to calculate the sum of first 'n' terms of an AP whose first term and common difference are 'a' and 'd' respectively.
7. Define an arithmetic progression.
8. Give an example for an arithmetic progression.

9. Mention the value of $a_{54} - a_{50}$ in terms of 'd'whose first term and common difference are 'a' and 'd' respectively.

10. Name the type of sequence in which $a_n - a_{n-1}$ is always constant.

V. The four alternatives / choices are given for each incomplete statement/question. Choose the correct one.

1. Which one of the following sequence is not an arithmetic progression?

   a) -2,1,4,……. b) 7,11,15,….

   c) 4,7,10,…. d) -4,-1,4,….

2. The general form of an AP whose first term and common difference are 'a' and 'd' respectively is given by …….

   a) a, a+d, a+2d,….. b) a, a-d,a+2d,…..

   c) a, d+a, d+2a,…. d) a,ad,2ad,….

3. The first term of an AP defined by $a_n = 4n-7$ is……

   a) 4 b)-7 c) -3 d) 11

4. The formula used to calculate the n^{th} term of an AP is ……..

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

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

5. If a_n-a_{n-1} of an AP is 7 and a=3 then seventh term of an AP is ……

   a) 54 b) 45 c) 49 d) 56

6. The common difference of an AP $\frac{3}{2}, \frac{1}{2}, -\frac{1}{2}$, ... is ….

   a) 1 b) -1 c) $\frac{1}{2}$ d) $-\frac{1}{2}$

7. If in an AP defined by $a_n=3n+4$ then the value of a_3 is……

a) 7 b) 10 c) 16 d) 13

8. If x,y,z are in an AP then $\frac{y-x}{z-y}$ is equal to ……

a) $\frac{2z}{y}$ b) $\frac{2y}{x}$ c) $\frac{2x}{z}$ d) 1

9. If in an AP $S_6=35$ and $S_5=25$ then the value of a_6 is …….

a) 50 b) 40 c) 60 d) 10

10. If a,b,c and d are in AP then (c-b) is equal to ……

a) d-a b) d-b c) d-c d) None of these

11. The sum of first 'n' odd natural numbers is ……

a) $2n^2$ b) 2n+1 c) 2n-1 d) n^2

12. The n^{th}term of the arithmetic progression x,x+y,x+2y,…… is …

a) x+ny b) x-(n-1)y c) x+(n-1)y d) n+ny

13. If the common difference of an AP is 5 then the value of $a_{15}-a_{10}$ is …

a) 25 b) 5 c) 10 d) 15

14. What is the common difference of an AP in which $a_{21}-a_7 = 84$?

a) 14 b) 28 c) 12 d) 6

15. Which term of an AP 21,18,15,……. is zero ?

a) 10^{th}term b) 12^{th}term c) 8^{th}term d) 6^{th}term

16. If 11^{th}term an AP consists of 21 terms is 7 then the sum of all 21 terms of that AP is

a) 147 b) 224 c) 70 d) 77

17. If a,b,c are in AP then the value of a+c-2b is…….

a) 2 b) 1 c) -1 d) 0

18. If x,y,z are in AP then the value of $\frac{z}{2y-x}$ is…….

a) 2 b) 1 c) -1 d) 0

19. The sum of first 10 terms of an AP whose n^{th}term is given by $a_n=2n+1$ is

a) 240 b) 180 c) 150 d) 120

19.1 The sum of first 21 terms of an AP is 462 then middle term of that AP is

a) 11 b) 21 c) 22 d) 23

19.2 If 5,x,17 are in AP then the value of x is…….

a) 10 b) 11 c) 22 d) 23

19.3 The sequence -9,-5,-1,3,……..is ……..

a) an AP with d=-14 b) an AP with d=-4

c) an AP with d=4 d) an AP with d=6

19.4 For what condition of 'n', the sequence defined by $\{a_n\}$=4n-7 is an arithmetic progression?

a) $n\geq 0, n \in N$ b) $n\leq 0, n \in N$

c) $n> 0, n \in N$ d) $n< 0, n \in N$

19.5 If the first and n^{th} term of an AP are x and y respectively, then the common difference of an AP is…

a) $\frac{y-x}{n-1}$ b) $\frac{x-y}{n-1}$

c) $\frac{y-x}{1-n}$ d) $\frac{x-y}{1-n}$

19.6 The AP whose n^{th} term is given by 3+4n is……

a) 3,7,11,…… b) 4,7,10,…..

c) 7,10,13,…. d) 7,11,15,….

20. In which of the following situation the sequence formed is not an AP?

a) The number of students left in a school auditorium from the total strength of 1000 students when they leave in the batch of 25.

b) The cost of digging a well for meter is ₹150. and rise by ₹20 for each succeeding meter.

c) The amount of money in the account every year when ₹100 are deposited annually to accumulate at simple interest.

d) After striking a floor a certain ball rebounds $(\frac{3}{4})^{th}$ of the height from which it has fallen, the distance traveled by a ball,

VI. In the following Arithmetic progressions, Find the missing terms in the blanks.

a) -4, ___, 4, _____

b) __, 7, 12, ___

c) -4, ___, ___, _____, ___, 6,

d) -5, -2, ___, 4, ___,

VII. 3,7,11,15,… is an AP Match the following contents of list A with the contents of list B

LIST A	LIST B
a) First term	i) 4n+1
b) General term	ii) 4
c) Common difference	iii) 4n-1
d) 20^{th} term	iv) 79
	v) 3

VIII. Match the following a list A with List B

LIST A	LIST B
a) Sum of first 'n' natural numbers	i) n^2
b) Sum of first 'n'odd numbers	ii) n(n+1)
c) Sum of first 'n' even numbers	iii)2n(n+1)
d) Sum of first 'n' multiples of 4	iv) $\frac{n(n+1)}{2}$

IX. Answer the following questions regarding to the situation given below.

<u>Situation 1</u>: The 2000 students are attending to a function in school auditorium. After the close of the function, they leave the auditorium in the batch of 25 students.

1. Mention the number of students left in the auditorium when first batch of students leave the auditorium.
2. Find out the total number of students left in the auditorium when the 10^{th}batch of students leave the auditorium.

3. Calculate the total number of students leaves the auditorium when the 15^{th} batch of students leaves the auditorium.
4. Mention the difference of total number of students left in the auditorium when each batch of students left the auditorium.
5. Whether the total number of students left in the auditorium at each batch leaves the auditorium forms an AP or not?
6. Write the number of students left in the auditorium at different stages in the form of sequence.
7. Write the general term of an AP formed by above situation.

Situation 2 : **Shashi kumar started a work in 2004 at an annual salary of ₹7000 and received ₹500 raise each year.**

1. What is an annual salary of Shashikumar in the first year?
2. What is the difference in the annual salaries of two consecutive years of Shashikumar?
3. What is the annual salary received by Shashikumar in the year 2015?
4. Calculate the total salary received by Shashikumar from 2004 to 2015.
5. Show that the salary received by Shashikumar in each year forms an AP.
6. In which year Shashikumar receives the annual salary of ₹11500 ?
7. After how many years Shashikumar receives the annual salary of ₹17000.

Situation 3: **A sum of ₹280 is to be used to award four prizes. if each prize after the first is ₹20 less than its preceding prize in a school sports.**

1. Calculate the value of the first prize.
2. Find out the value the last prize.
3. Mention the number of prizes awarded.

4. What is sum of values of all prizes awarded?
5. Mention the difference in the values of third and fourth prizes.
6. Calculate the value of second prize.

X. **Short answer type and long answer type questions**.

1. If In an AP, the fifth term is 6 and the common difference is 4 then calculate the sixth, seventh and eighth terms of that AP.
2. Find the 5^{th} and 15^{th}terms of an AP -3,1,5…..
3. Find the common difference and Write the AP whose n^{th}term is 4-3n.
4. Show that the 16^{th} term of an AP 2,5,8,….. is 47.
5. Calculate the 20^{th} term of an AP whose first term is 12 and common difference is 3
6. If 27^{th}term of an AP is 39 and common difference is 9 then find out the first term of that AP.
7. The first and 30^{th}terms of an AP are 2 and 205 respectively.find the common difference of that AP.
8. Which term of an AP 7,10,13,…. is 277?
9. In an AP 12,19,26,….. find a_n and hence find a_{15}.
10. Find the number of terms of an AP 7,13,19,……..,151.
11. The 8^{th} term of an AP is 17 and 19^{th}term is 39. Find out the 25^{th} term of an AP
12. Determine an AP whose 4^{th}term is 17 and 10^{th} term exceeds the 7^{th}term by 12.
13. In an AP 10 times the 10^{th}term is equal to 20 times the 20^{th}term then calculate the 30^{th} term of that AP.
14. In an AP 11 times the 11^{th}term is equal to 15 times the 15^{th}term then find which term of that AP is zero?.

15. In an AP ‘m’ times the m^{th}term is equal to ‘n’times the n^{th}term then show that the $(m+n)^{th}$ term of that AP.is zero.

16. The 10^{th} and 18^{th} terms of an AP are 41 and 73 respectively. Find the 26^{th} term of an AP

17. The sum of fourth and eighth terms of an AP is 24 and the sum of sixth and tenth terms an AP is 34. Then find an AP.

18. If in an AP,the ratio of fourth term to seventh term of an AP is 2:3 and the ninth term is 33. Find that AP.

19. The ratio of 7^{th} term to 8^{th}term of an AP is 10:7 then show that the arithmetic progression does not contains zero.

20. The ratio of 7^{th}term to 8^{th}term of an AP is 12:5. then find the ratio of 13^{th} term to the 4^{th} term of an AP.

21. If the 8^{th}term of an AP is double the 13^{th}term then show that the second term is double the tenth term.

22. If a,b,c,d,e are in AP then prove that a+e = b+d = 2c

23. The sum of 4^{th} and 8^{th} terms of an AP is 24. The sum $6^{th}$and 10^{th}terms of an AP is 44. Find the first three terms of an AP.

24. Find the four numbers in an AP such that the sum of 2^{nd} and 3^{rd}terms is 22 the product of 1^{st} and 4^{th}terms is 88.

25. The 4^{th}term of an AP is three times the first and 7^{th}term exceeds twice the third term by 1.find the terms of an AP

26. If 9^{th}term of an AP is zero then prove that its 29^{th}term is doubled the 19^{th}term.

27. How many numbers of two digits are divisible by 7?

28. How many two digit even numbers are there?

29. Find the number of two digit numbers which are the multiples of 4.

30. How many number of three digits less than 500 are divisible by 6?

31. The sum of 6^{th}term and 14^{th}terms exceeds half of the 10^{th} term by 14. Find the arithmetic progression.

32. In an AP whose first term is 2, the sum of first 5 terms is $\frac{1}{4}^{th}$ the sum of the next five terms show that 20^{th}term is -112.

33. Find the sum of first 15 terms of an AP 5,8,11,14,…..

34. In an AP of 30 terms, the first term is 6 and last term is 64. Find the sum of all the terms of an AP.

35. Find the sum from 6^{th}term to 11^{th}term of an AP 1,4,7,….

36. Calculate the sum from 10^{th}term to 20^{th}term of an AP defined by $a_n = 4n-3$.

37. If 12^{th}term of an AP is -13 and the sum of first four terms is 24. Then find the sum of first terms of that AP.

38. Calculate the sum of even numbers between 1 and 101 which are not a multiple of 4.

39. Find the sum of first 24 terms of the AP if $a_1+a_5+a_{10}+a_{15}+a_{20}+a_{24} = 225$.

40. Find the sum of all those integers between 100 to 400. Each of which are divisible by 7 which leaves the remainder 3.

41. The sum of first 7 terms of an AP is 140 and that of next 7 terms is 385. find the arithmetic progression.

42. The base of right angled triangle is 9cm. The sides of a triangle are in AP. Find the hypotenuse.

43. The angles of the triangle are in an AP. The smallest angle is 40°. Find the remaining angles of a triangle.

44. The angles of a quadrilateral are in an AP. The smallest angle is 15°. Find the remaining angles of a quadrilateral.

45. The angles of the triangle are in an AP. The greater angle is 75°. Find the remaining angles of a triangle.

46. The angles of the pentagon are in an AP. The smallest angle is 50°. Find the remaining angles of a pentagon.

47. A man saves ₹20 in the first month, ₹30 in the second month, ₹40 in the third month and so on. How much has he saved in the 20^{th}month?

48. Children are playing on a swing, when they are swinging the maximum distance reached was 50cm from the initial position. In the subsequent oscillations the distance was reduced by 2cm with every oscillation. In which oscillation the distance covered is zero.

49. Raju was standing on a ladder at a height of 12 foot from the ground to the point at the top of building. After the work was done as he climbed down the ladder, his distance the ground reduces by 1.5 foot with every rung of the ladder. How many rungs of the ladder required to reach a ground?

50. Kumar got an auto to reach his office .He observed the reading in the meter. It was ₹20. After the journey of every 100 meters, the amount is increased by ₹1 and so on. Calculate the amount to be given to auto after the journey of 1500 meters.

51. Prasanna saves ₹32 during the first year, ₹36 in the second year, and in this way he increases his savings by ₹4 every year. Find in what time his saving will be ₹200?

52. Shashi saved ₹16500 in 10 years. In each year after the first he saved 100 more than he did in the preceding year. How much he save in the save in the first year?

53. A Child wishes to build up a triangular pile of toy bricks so as to have 1 brick in the top row, 2 in the second row, 3 in the third row and so on. If has 100 bricks. How many rows can be completed and how many bricks he left?

54. A class consists of a number of boys whose ages are in an AP. The common difference being 4 months. The youngest boy of the class will be only 8 years only. The sum of ages of all boys of the class will be 168 years. Find the number of boys and the ages of oldest boy.

55. A man of 60 years old has 9 children born at equal intervals. The sum of ages of the father and nine children is known to be 222 years. Calculate the age of youngest son if 0ldest one is 30 years.

56. A man repays a loan of ₹ 3250 by ₹20 in the first month, and then increased the payment by 15 every month. How long will it take him to clear the loan?

57. A man arranges to pay off a debit of ₹3600 by 40 installments which form an arithmetic progression, when 30 installments are paid. He dies leaving $\frac{1}{3}^{rd}$ of debt unpaid. Find the value of the first installment.