CBSE

ARITHMETIC PROGRESSION WS 3

Class 10 - Mathematics

Section A

1. **Assertion (A):** $a_n - a_{n-1}$ is not independent of n then the given sequence is an AP. **[1]**

   Reason (R): Common difference $d = a_n - a_{n-1}$ is constant or independent of n.

   a) Both A and R are true and R is the correct explanation of A.

   b) Both A and R are true but R is not the correct explanation of A.

   c) A is true but R is false.

   d) A is false but R is true.

2. **Assertion (A):** Common difference of an AP in which $a_{21} - a_7 = 84$ is 14 **[1]**

   Reason (R): nth term of AP is given by $a_n = a + (n - 1)d$

   a) Both A and R are true and R is the correct explanation of A.

   b) Both A and R are true but R is not the correct explanation of A.

   c) A is true but R is false.

   d) A is false but R is true.

Section B

Question No. 3 to 4 are based on the given text. Read the text carefully and answer the questions: **[2]**

In Mathematics, relations can be expressed in various ways. The matchstick patterns are based on linear relations. Different strategies can be used to calculate the number of matchsticks used in different figures.

One such pattern is shown below. Observe the pattern and answer the following questions using Arithmetic Progression:

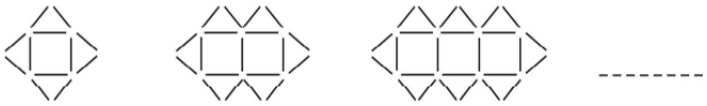


Figure 1 *Figure 2* *Figure 3*

3. Write the AP for the number of triangles used in the figures. Also, write the n^{th} term of this AP.
4. Which figure has 61 matchsticks?

Question No. 5 to 6 are based on the given text. Read the text carefully and answer the questions: **[2]**

Do you know old clothes which are thrown as waste not only fill the landfill site but also produce very harmful greenhouse gas. So, it is very important that we reuse old clothes in whatever way we can.

The picture given below on the right, shows a footmat (rug) made out of old t-shirts yarn. Observing the picture, you will notice that a number of stitches in circular rows are making a pattern: 6, 12, 18, 24, ...

5. Check whether the given pattern forms an AP. If yes, find the common difference and the next term of the AP.
6. Write the n^{th} term of the AP. Hence, find the number of stitches in the 10^{th} circular row.

Section C

7. **Fill in the blanks:** **[3]**

(a) The common difference of the AP: $\frac{1}{p}, \frac{1-p}{p}, \frac{1-2p}{p}, \ldots$ is _____. **[1]**

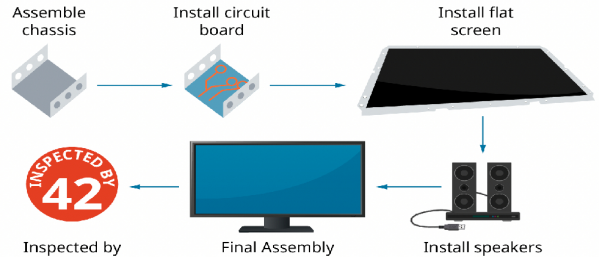
(b) If in an A.P. a = 5, d = 0, then the twenty-second term is _____. **[1]**

(c) The next term of the AP: 3, 1, -1, -3, ... is _____. **[1]**

Section D

Question No. 8 to 11 are based on the given text. Read the text carefully and answer the questions: **[4]**

Elpis Technology is a laptop manufacturer. The company works for many branded laptop companies and also provides them with spare parts. Elpis Technology produced 6000 units in 3rd year and 7000 units in the 7th year.



Assuming that production increases uniformly by a fixed number every year.

8. Find the production in the 1st year.
9. Find the production in the 5th year.
10. Find the total production in 7 years.
11. Find in which year 10000 units are produced?

Question No. 12 to 15 are based on the given text. Read the text carefully and answer the questions: **[4]**

India is competitive manufacturing location due to the low cost of manpower and strong technical and engineering capabilities contributing to higher quality production runs. The production of TV sets in a factory increases uniformly by a fixed number every year. It produced 16000 sets in 6th year and 22600 in 9th year.

12. Find the production during first year.
13. Find the production during 8th year.
14. Find the production during first 3 years.
15. In which year, the production is ₹ 29,200.

Question No. 16 to 19 are based on the given text. Read the text carefully and answer the questions: **[4]**

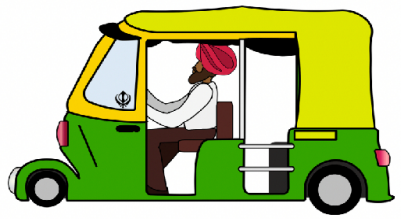
Kamla and her husband were working in a factory in Seelampur, New Delhi. During the pandemic, they were asked to leave the job. As they have very limited resources to survive in a metro city, they decided to go back to their hometown in Himachal Pradesh. After a few months of struggle, they thought to grow roses in their fields and sell them to local vendors as roses have been always in demand. Their business started growing up and they hired many workers to manage their garden and do packaging of the flowers.

In their garden bed, there are 23 rose plants in the first row, 21 are in the 2^{nd}, 19 in 3^{rd} row and so on. There are 5 plants in the last row.

16. How many rows are there of rose plants?
17. Also, find the total number of rose plants in the garden.
18. How many plants are there in 6th row.
19. If total number of plants are 80 in the garden, then find number of rows?

Question No. 20 to 23 are based on the given text. Read the text carefully and answer the questions: **[4]**

Jaspal Singh is an auto driver. His autorickshaw was too old and he had to spend a lot of money on repair and maintenance every now and then. One day he got to know about the EV scheme of the Government of India where he can not only get a good exchange bonus but also avail heavy discounts on the purchase of an electric vehicle. So, he took a loan of ₹1,18,000 from a reputed bank and purchased a new autorickshaw.



Jaspal Singh repays his total loan of 118000 rupees by paying every month starting with the first instalment of 1000 rupees.

20. If he increases the instalment by 100 rupees every month, then what amount will be paid by him in the 30th instalment?
21. If he increases the instalment by 100 rupees every month, then what amount of loan does he still have to pay after 30th instalment?
22. If he increases the instalment by 100 rupees every month, then what amount will be paid by him in the 100th instalment?
23. If he increases the instalment by 200 rupees every month, then what amount would he pay in 40th instalment?

Question No. 24 to 27 are based on the given text. Read the text carefully and answer the questions: **[4]**

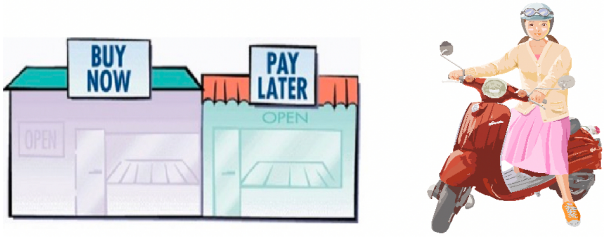
Suman is celebrating his birthday. He invited his friends. He bought a packet of toffees/candies which contains 360 candies. He arranges the candies such that in the first row there are 3 candies, in second there are 5 candies, in third there are 7 candies and so on.

24. Find the total number of rows of candies.
25. How many candies are placed in last row?
26. If Aditya decides to make 15 rows, then how many total candies will be placed by him with the same arrangement?
27. Find the number of candies in 12th row.

Question No. 28 to 31 are based on the given text. Read the text carefully and answer the questions: **[4]**

Deepa has to buy a scooty. She can buy scooty either making cashdown payment of ₹ 25,000 or by making 15 monthly instalments as below.

Ist month - ₹ 3425, Ilnd month - ₹ 3225, Illrd month - ₹ 3025, IVth month - ₹ 2825 and so on



28. Find the amount of 6th instalment.
29. Total amount paid in 15 instalments.
30. Deepa paid 10th and 11th instalment together find the amount paid that month.
31. If Deepa pays ₹2625 then find the number of instalment.

Question No. 32 to 35 are based on the given text. Read the text carefully and answer the questions: **[4]**

The students of a school decided to beautify the school on an annual day by fixing colourful flags on the straight passage of the school. They have 27 flags to be fixed at intervals of every 2 metre. The flags are stored at the position of the middlemost flag. Ruchi was given the responsibility of placing the flags. Ruchi kept her books where the flags were stored. She could carry only one flag at a time.

32. How much distance did she cover in pacing 6 flags on either side of center point?
33. Represent above information in Arithmetic progression
34. How much distance did she cover in completing this job and returning to collect her books?
35. What is the maximum distance she travelled carrying a flag?

Question No. 36 to 39 are based on the given text. Read the text carefully and answer the questions: **[4]**

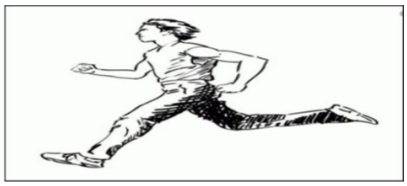
Akshat's father is planning some construction work in his terrace area. He ordered 360 bricks and instructed the supplier to keep the bricks in such as way that the bottom row has 30 bricks and next is one less than that and so on.

The supplier stacked these 360 bricks in the following manner, 30 bricks in the bottom row, 29 bricks in the next row, 28 bricks in the row next to it, and so on.

36. In how many rows, 360 bricks are placed?
37. How many bricks are there in the top row?
38. How many bricks are there in 10^{th} row?
39. If which row 26 bricks are there?

Question No. 40 to 43 are based on the given text. Read the text carefully and answer the questions: **[4]**

Your friend Varun wants to participate in a 200m race. He can currently run that distance in 51 seconds and with each day of practice it takes him 2 seconds less. He wants to do in 31 seconds.



40. Write first four terms are in AP for the given situations.
41. What is the minimum number of days he needs to practice till his goal is achieved?
42. How many second takes after 5^{th} days?
43. Out of 41, 30, 37 and 39 which term is not in the AP of the above given situation?

Question No. 44 to 47 are based on the given text. Read the text carefully and answer the questions: **[4]**

Elpis Technology is a TV manufacturer company. It produces smart TV sets not only for the Indian market but also exports them to many foreign countries. Their TV sets have been in demand every time but due to the Covid-19 pandemic, they are not getting sufficient spare parts, especially chips to accelerate the production. They have to work in a limited capacity due to the lack of raw materials.

44. They produced 600 sets in the third year and 700 sets in the seventh year. Assuming that the production increases uniformly by a fixed number every year, find an increase in the production of TV every year.
45. They produced 600 sets in the third year and 700 sets in the seventh year. Assuming that the production increases uniformly by a fixed number every year, find in which year production of TV is 1000.
46. They produced 600 sets in the third year and 700 sets in the seventh year. Assuming that the production increases uniformly by a fixed number every year, find the production in the 10th year.
47. They produced 600 sets in the third year and 700 sets in the seventh year. Assuming that the production increases uniformly by a fixed number every year, find the total production in first 7 years.

Section E

48. **State True or False:** **[5]**
    (a) The 15^{th} term of the AP: y - 7, y - 2, y + 3, ... is y - 63. **[1]**
    (b) The last term of an A.P is given by l = a + (n + 1)d. **[1]**
    (c) 10^{th} term of A.P. 10, 20, 30, 40 .....is 100. **[1]**
    (d) If k - 1, k + 3 and 3k - 1 are in AP, then the value of k is 4. **[1]**
    (e) The 25^{th} term of the AP: $-5, -\frac{5}{2}, 0, \frac{5}{2}, \ldots$ is 55. **[1]**
49. If the seventh term of an A.P. is $\frac{1}{9}$ and its ninth term is $\frac{1}{7}$, find its 63rd term. **[5]**
50. A piece of equipment cost a certain factory ₹6,00,000. If it depreciates in value, 15% the first, 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? **[5]**
51. Write the expression a_n - a_k for the AP: a, a + d, a + 2d, ... and find the common difference of the A.P for which a_{10} - a_5 = 200 **[5]**
52. A man saved ₹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. **[5]**
53. The 16^{th} term of an AP is 5 times its 3^{rd} term. If its 10^{th} term is 41, find the sum of its first 15 terms. **[5]**
54. Divide 56 in four parts in A.P. such that the ratio of the product of their extremes (1st and 4th) to the product of **[5]**

means (2nd and 3rd) is 5:6.

55. A man arranges to pay off a debt of ₹36000 by 40 monthly installments which form an arithmetic series. When 30 of the instalments are paid, he dies leaving one-third of the debt unpaid. Find the value of the first installment. **[5]**

56. 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 20^{th} term of this A.P. **[5]**

57. The sum of 5th and 9th terms of an AP is 72 and the sum of 7th and 12th terms is 97. Find the AP. **[5]**

58. The 17^{th} term of an A.P. is 5 more than twice its 8^{th} term. If the 11^{th} term of the A.P. is 43, find the n^{th} term. **[5]**

59. Find the value of x, when in the A.P. given below 2 + 6 + 10 + ... + x = 1800. **[5]**

60. The first term of an A.P. is 22, the last term is -6 and the sum of all the terms is 64. Find the number of terms of the A.P. Also, find the common difference. **[5]**

61. The sum of 5^{th} and 9^{th} terms of an A.P. is 30. If its 25^{th} term is three times its 8^{th} term, find the AP. **[5]**

62. How many multiples of 4 lie between 10 and 250? **[5]**

63. If 8th term of an A.P. is half of its second term and 11th term exceeds one third of its fourth term by 1. Find the 15th term. **[5]**

64. 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. **[5]**

65. A man arranges to pay off a debt of Rs.3600 by 40 annual installments which form an arithmetic series. When 30 of the installments are paid, he dies leaving one-third of the debt unpaid, find the value of the first installment. **[5]**

66. In an A.P., the n^{th} term is $\frac{1}{m}$ and the m^{th} term is $\frac{1}{n}$. Find (i) $(mn)^{th}$ term, (ii) sum of first (mn) terms. **[5]**

67. The ratio of the sums of first m and first n terms of an AP is $m^2:n^2$. Show that the ratio of its mth and nth terms is (2m -1):(2n -1). **[5]**

68. The sum of four consecutive numbers in A.P. is 32 and the ratio of the product of the first and last terms to the product of two middle terms is 7 : 15. Find the number. **[5]**

69. A man is employed to count ₹10710. He counts at the rate of ₹180 per minute for half an hour. After this he counts at the rate of ₹3 less every minute than the preceding minute. Find the time taken by him to count the entire amount. **[5]**