5. Arithmetic Progressions - Board Exam Questions

The detailed solution for all the questions can be found at
pschool.in/math/ncert/g10/chap-5

1 Mark Questions (MCQ)

1) The common difference of the AP: $\sqrt{2}, 2\sqrt{2}, 3\sqrt{2}, 4\sqrt{2}, \ldots$ is:
2) Which of the following sequence is not an A.P.?
   (a) $2, \frac{5}{2}, 3, \frac{7}{2}, \ldots$ (b) −1.2, −3.2, −5.2, −7.2, ...
   (c) $\sqrt{2}, \sqrt{8}, \sqrt{18}, \ldots$ (d) $1^2, 3^2, 5^2, 7^2, \ldots$
3) The number of multiples of 4 lying between 12 and 250 is:
4) The nth term of the A.P. $\frac{-1}{3}, \frac{2}{3}, \frac{5}{3}, \frac{8}{3}, \ldots$ is:
5) The nth term of an A.P. is $\sqrt{2}n + 1$. Its common difference is
6) If a_n represents nth term of the A.P. $-\frac{15}{4}, -\frac{10}{4}, -\frac{5}{4}, \ldots$ then value of $a_{16} - a_{12}$ is
7) The middle term of the A.P.: 10, 7, 4, ..., −62 is:
8) If the sum of first m terms of an AP is $2m^2 + 3m$, then its second term is:
9) The 10th term of the AP $5, \frac{19}{4}, \frac{9}{2}, \frac{17}{4}, \ldots$ is:
10) In an A.P., if the first term a = 7, nth term $a_n = 84$ and the sum of first n terms $s_n = \frac{2093}{2}$, then n is equal to:
11) The common difference of an A.P. in which $a_{15} - a_{11} = 48$, is
12) Which term of the A.P. −29, −26, −23, ..., 61 is 16?
13) The common difference of the A.P. $\frac{1}{2x}, \frac{1-4x}{2x}, \frac{1-8x}{2x}, \ldots$ is:
14) Three numbers in A.P. have the sum 30. What is its middle term?
15) The next (4th) term of the A.P. $\sqrt{18}, \sqrt{50}, \sqrt{98}, \ldots$ is:
16) The number of terms in the A.P. 3, 6, 9, 12, ..., 111 is:
17) If nth term of an A.P. is $7n - 4$ then the common difference of the A.P. is

18) If $p-1$, $p+1$ and $2p+3$ are in A.P., then the value of p is

19) The next term of the A.P.: $\sqrt{6}, \sqrt{24}, \sqrt{54}$ is:

20) The common difference of the A.P. whose nth term is given by $a_n = 3n + 7$, is:

21) The 11th term from the end of the A.P.: 10, 7, 4, ..., −62 is:

22) If the sum of the first n terms of an A.P be $3n^2 + n$ and its common difference is 6, then its first term is

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

Assertion and Reason

1) ASSERTION (A): The mean of first 'n' natural numbers is $\frac{n-1}{2}$.
REASON (R): The sum of first 'n' natural numbers is $\frac{n(n+1)}{2}$.

2) ASSERTION (A): Common difference of the AP: 5, 1, −3, −7, ... is 4.
REASON (R): Common difference of the AP: $a_1, a_2, a_3, \ldots, a_n$ is obtained by $d = a_n - a_{n-1}$.

3) ASSERTION (A): For an A.P., 3, 6, 9, ..., 198, 10th term from the end is 168.
REASON (R): If 'a' and 'l' are the first term and last term of an A.P. with common difference 'd', then nth term from the end of the given A.P. is l − (n − 1)d.

4) ASSERTION (A): a, b, c are in A.P. if and only if 2b = a + c.
REASON (R): The sum of first n odd natural numbers is n^2.

5) ASSERTION (A): $-5, -\frac{5}{2}, 0, \frac{5}{2}, \ldots$ is in Arithmetic Progression.
REASON (R): The terms of an Arithmetic Progression cannot have both positive and negative rational numbers.

2 Mark Questions

1) Find the middle term of A.P. 6, 13, 20, ..., 230.

2) In an A.P., the first term is 32 and the last term is −10. If the common difference is −2, then find the number of terms and their sum.

3) Find the sum of the first 28 terms of an A.P. whose nth term is given by $a_n = 3n - 2$.

4) The A.P. 8, 10, 12, ... has 60 terms. Find the sum of last 10 terms.

3 Mark Questions

1) How many terms are there in an A.P. whose first and fifth terms are −14 and 2, respectively and the last term is 62.

2) Which term of the A.P.: 65, 61, 57, 53, ... is the first negative term?

3) If pth term of an A.P. is q and qth term is p, then prove that its nth term is $(p + q - n)$.

4) The sum of first n terms of an A.P. is $2n^2 + 13n$. Find its nth term and hence 10th term.

5) If the sum of the first 14 terms of an A.P. is 1050 and the first term is 10, then find the 20th term and the nth term.

6) The first term of an A.P. is 5, the last term is 45 and the sum of all the terms is 400. Find the number of terms and the common difference of the A.P.

7) If the sum of first 7 terms of an A.P. is 49 and that of first 17 terms is 289, find the sum of its first 20 terms.

8) The ratio of the 10th term to its 30th term of an A.P. is 1 : 3 and the sum of its first six terms is 42. Find the first term and the common difference of A.P.

9) In an A.P., 15th term exceeds the 8th term by 21. If sum of first 10 terms is 55, then form the A.P.

10) If the sum of first m terms of an A.P. is same as sum of its first n terms ($m \neq n$), then show that the sum of its first $(m + n)$ terms is zero.

11) In an A.P., the sum of three consecutive terms is 24 and the sum of their squares is 194. Find the numbers.

12) Find the sum of integers between 1 and 400 that are multiples of 4 as well as of 5.

13) A sum of ₹2,000 is invested at 7% per annum simple interest. Calculate the interests at the end of 1st, 2nd and 3rd year. Do

these interests form an AP? If so, find the interest at the end of the 27th year.

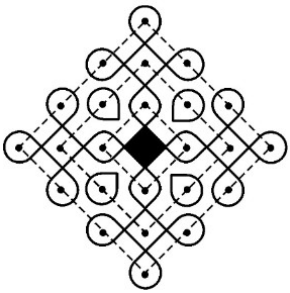
14) Ridhi drew a polygon with n sides. The smallest exterior angle is 8° and each subsequent exterior angle is 4° more than the previous exterior angle. Find the number of sides of the polygon that Ridhi had drawn.

4 Mark Questions

1) In a class, the teacher asks every student to write an example of A.P. Two boys Aryan and Roshan write the progressions 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. (1)
(ii) Find the 34th term of progression written by Roshan. (1)
(iii) Find the sum of first 10 terms of the progression written by Aryan. (2)
OR Which term of the progressions will have the same value?

2) Treasure Hunt is an exciting and adventurous game where participants follow a series of clues/numbers/maps to discover hidden treasures. Players engage in a thrilling quest, solving puzzles and riddles to unveil the location of the coveted prize. While playing a treasure hunt game, some clues (numbers) are hidden in various spots collectively forming an A.P. If the number on the nth spot is $20 + 4n$, then answer the following questions to help the players in spotting the clues:
(i) Which number is on first spot? (1)
(ii) (a) Which spot is numbered as 112? (2)
OR (b) What is the sum of all the numbers on the first 10 spots?
(iii) Which number is on the (n − 2)th spot? (1)

3) 'Kolam' is a decorative art which is made with rice flour in South Indian States. It is drawn on grid pattern of dots. One such art work is shown below.



Observe the given figure carefully. There are 4 dots in first square, 8 dots in second square, 12 dots in third square and so on.

(i) Show that number of dots given above form an A.P. Write the first term and common difference. (1)

(ii) Write nth term of the A.P. formed. (1)

(iii) (a) The pattern is expanded on a large ground. If total 220 dots are used, then find the number of squares formed. (2)

OR (b) Is it possible to complete n number of squares using 100 dots? If yes, then find the value of n.

4) 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.

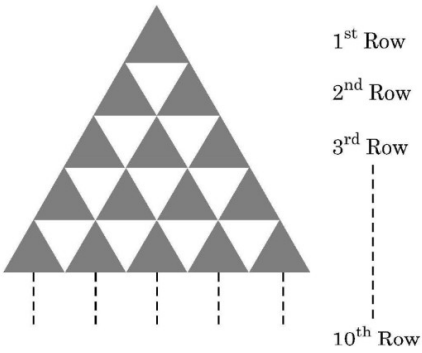
(i) Write an A.P whose terms represent the number of jars in different layers starting from top. Also, find the common difference. (1)

(ii) Is it possible to arrange 34 jars in a layer if this pattern is continued? Justify your answer. (1)

(iii) 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. (2)

OR The shopkeeper added 3 jars in each layer. How many jars are there in the 5th layer from the top?

5) In an equilateral triangle of side 10 cm, equilateral triangles of side 1 cm are formed as shown in the figure below, such that there is one triangle in the first row, three triangles in the second row, five triangles in the third row and so on.



Based on given information, answer the following questions using Arithmetic Progression.

(i) How many triangles will be there in bottom most row? (1)

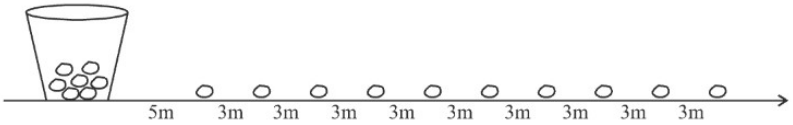
(ii) How many triangles will be there in fourth row from the bottom? (1)

(iii) (a) Find the total number of triangles of side 1 cm each till 8th row. (2)

OR (b) How many more number of triangles are there from 5th row to 10th row than in first 4 rows? Show working.

6) In a potato race, a bucket is placed at the starting point, which is 5 m from the first potato. The other potatoes are arranged 3 m apart in a straight line, with a total of 10 potatoes, as shown in the figure:

A competitor starts from the bucket, picks up the nearest potato, runs back to the bucket to drop it in, then returns to pick up the next potato. This process continues until all the potatoes are in the bucket.



(i) What is the distance covered to pick up the first potato and drop it in bucket? (1)

(ii) What is the distance covered to pick up the second potato and drop it in bucket? (1)

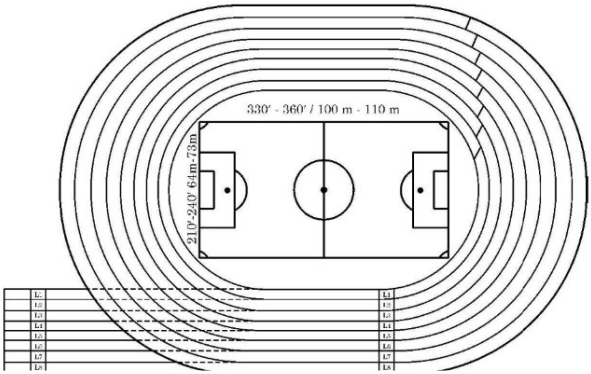
(iii) (a) What is the total distance the competitor has to run? (2)

OR (b) If average speed of competitor is 5 m/s, then find the average time taken by competitor to put all the potatoes in the

bucket.

7) A school is organizing a charity run to raise funds for a local hospital. The run is planned as a series of rounds around a track, with each round being 300 metres. To make the event more challenging and engaging, the organizers decide to increase the distance of each subsequent round by 50 metres. For example, the second round will be 350 metres, the third round will be 400 metres and so on. The total number of rounds planned is 10.
(i) Write the fourth, fifth and sixth term of the Arithmetic Progression so formed. (1)
(ii) Determine the distance of the 8th round. (1)
(iii) (a) Find the total distance run after completing all 10 rounds. (2)
OR (b) If a runner completes only the first 6 rounds, what is the total distance run by the runner?

8) In order to organise, Annual Sports Day, a school prepared an eight lane running track with an integrated football field inside the track area as shown below:



The length of innermost lane of the track is 400 m and each subsequent lane is 7.6 m longer than the preceding lane. Based on given information, answer the following questions, using concept of Arithmetic Progression.
(i) What is the length of the 6th lane? (1)
(ii) How long is the 8th lane than that of 4th lane? (1)
(iii) (a) While practicing for a race, a student took one round each in first six lanes. Find the total distance covered by the student. (2)
OR (b) A student took one round each in lane 4 to lane 8. Find

the total distance covered by the student.

9) 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? (1)
(ii) For 1500 seats in the auditorium, how many rows need to be there? (2)
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? (1)

10) Cable cars at hill stations are one of the major tourist attractions. On a hill station, the length of cable car ride from base point to top most point on the hill is 5000 m. Poles are installed at equal intervals on the way to provide support to the cables on which car moves. The distance of first pole from base point is 200 m and subsequent poles are installed at equal interval of 150 m. Further, the distance of last pole from the top is 300 m.



Based on above information, answer the following questions using Arithmetic Progression:
(i) Find the distance of 10th pole from the base. (1)
(ii) Find the distance between 15th pole and 25th pole. (1)
(iii) (a) Find the time taken by cable car to reach 15th pole from the top if it is moving at the speed of 5 m/sec and coming from top. (2)
OR (b) Find the total number of poles installed along the entire journey.

11) Manpreet Kaur is the national record holder for women in the shot-put discipline. Her throw of 18.86 m 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 7.56 m 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 9 cm 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? (1)
(ii) What would be Sanjitha's throw distance at the end of 6 weeks? (2)
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? (1)

12) Your elder brother wants to buy a car and plans to take a loan from a bank for his car. He repays his total loan of ₹1,18,000 by paying every month, starting with the first instalment of ₹1,000 and he increases the instalment by ₹100 every month.
(i) Find the amount paid by him in the 30th instalment. (1)
(ii) If the total number of instalments is 40, what is the amount paid in the last instalment? (1)
(iii) (a) What amount does he still have to pay after the 30th instalment? (2)
OR (b) Find the ratio of the tenth instalment to the last instalment.

5 Mark Questions

1) If the sum of first 6 terms of an A.P. is 36 and that of the first 16 terms is 256, find the sum of first 10 terms.

2) In an A.P. of 40 terms, the sum of first 9 terms is 153 and the sum of last 6 terms is 687. Determine the first term and common difference of A.P. Also, find the sum of all the terms of the A.P.

3) The sum of the third term and the seventh term of an AP is 6 and their product is 8. Find the sum of the first sixteen terms of the AP.

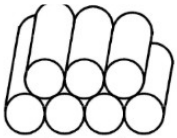
4) The sum of first and eighth terms of an A.P. is 32 and their product is 60. Find the first term and common difference of the A.P. Hence, also find the sum of its first 20 terms.

5) The ratio of the 11th term to 17th term of an A.P. is 3 : 4. Find the ratio of 5th term to 21st term of the same A.P. Also, find the ratio of the sum of first 5 terms to that of first 21 terms.

6) The ratio of the 11th term to the 18th term of an A.P. is 2 : 3. Find the ratio of the 5th term to the 21st term. Also, find the ratio of the sum of first 5 terms to the sum of first 21 terms.

7) How many terms of the arithmetic progression 45, 39, 33, ... must be taken so that their sum is 180? Explain the double answer.

8) 250 logs are stacked in the following manner: 22 logs in the bottom row, 21 in the next row, 20 in the row next to it and so on (as shown by an example). In how many rows, are the 250 logs placed and how many logs are there in the top row?


(Example)

9) The minimum age of children eligible to participate in a painting competition is 8 years. It is observed that the age of the youngest boy was 8 years and the ages of the participants, when seated in order of age, have a common difference of 4 months. If the sum of the ages of all the participants is 168 years, find the age of the eldest participant in the painting competition.