

# CLASS XI GUESS PAPER MATHEMATICS

## *Sequences and Series*

### Arithmetic Progression

- The  $p^{\text{th}}$ ,  $q^{\text{th}}$  and  $r^{\text{th}}$  terms of an AP are  $a$ ,  $b$  and  $c$  respectively, then show that
  - $a(q - r) + b(r - p) + c(p - q) = 0$
  - $(a - b)r + (b - c)p + (c - a)q = 0$
- If  $m$  times the  $m^{\text{th}}$  term of an A.P. is equal to the  $n^{\text{th}}$  term, show that the  $(m+n)^{\text{th}}$  term is zero.
- If the  $p^{\text{th}}$  term of an A.P. is  $q$  and the  $q^{\text{th}}$  term equal to  $p$ , then prove that its  $n^{\text{th}}$  term is  $(p + q - n)$ .
- If the  $m^{\text{th}}$  term of an A.P. is  $1/n$  and the  $q^{\text{th}}$  term is  $1/m$ , then show that its  $(mn)^{\text{th}}$  term is 1. Also, show that the sum of  $mn$  terms is  $(mn+1)/2$ .
- Find the  $20^{\text{th}}$  term from the last of the A.P. 3, 7, 11, ..., 407.
- If the  $(m+1)^{\text{th}}$  term of an A.P. is twice the  $(n + 1)^{\text{th}}$  term, then prove that its  $(3m + 1)^{\text{th}}$  term is twice the  $(m + n + 1)^{\text{th}}$  term.
- The first and the last terms of an A.P. are  $a$  and  $l$  respectively. Show that the sum of  $n^{\text{th}}$  term from the beginning and  $n^{\text{th}}$  term from the end is  $(a+l)$ .
- The sum of three numbers in A.P. is -3 and their product is 8. Find the numbers.
- Find four numbers in A.P. whose sum is 20 and the sum of whose squares is 120.
- Divide 32 into four parts which are in A.P. such that the product of extremes is to the product of means is 7 : 15.
- The angles of a quadrilateral are in A.P. whose common difference is  $10^\circ$ , find the angles.
- Find the sum of first 20 terms of an A.P., in which  $3^{\text{rd}}$  term is 7 and  $7^{\text{th}}$  term is two more than thrice of its third term.
- The sum of  $n$ ,  $2n$ ,  $3n$  terms of an A.P. are  $S_1$ ,  $S_2$ ,  $S_3$  respectively. Prove that  $S_3 = 3(S_2 - S_1)$ .
- The sums of  $n$  terms of three arithmetic progressions are  $S_1$ ,  $S_2$  and  $S_3$ . The first term of each is unity and the common differences are 1, 2, and 3 respectively. Prove that  $S_1 + S_2 = 2S_3$ .
- The  $p^{\text{th}}$  term of an A. p.  $a$  and  $q^{\text{th}}$  term is  $b$ . prove that the sum of its  $(p + q)$  terms is  $\frac{p+q}{2} \left[ a + b + \frac{a-b}{p-q} \right]$ .

16. If the sum of  $p$  terms of an A.P. is equal to  $q$  and the sum of  $q$  terms equal to  $p$ , then prove that the sum of  $(p + q)$  terms is  $-(p + q)$ .
17. If the sum of  $m$  terms of an A.P. is the same as the sum of its  $n$  terms, prove that the sum of its  $(m + n)$  is zero.
18. The ratio of the sum of  $n$  terms of two A.P.'s is  $(7n + 1) : (4n + 27)$ . Find the ratio of their  $m^{\text{th}}$  terms.
19. The ratio of the sums  $m$  and  $n$  terms of an A.P.'s is  $m^2 : n^2$ . Show that the ratio of  $m^{\text{th}}$  and  $n^{\text{th}}$  terms is  $(2m - 1) : (2n - 1)$ .
20. The interior angles of a polygon are in A.P. The smallest angle is  $95^\circ$  and the common difference is  $10^\circ$ . Find the number of sides of the polygon.
21. If there are  $(2n + 1)$  terms in an A.P., then prove that the ratio of the sum of odd terms and the sum of even terms is  $(n + 1) : n$ .
22. If  $S_n = n^2p$  and  $S_m = m^2p$ ,  $m$  is not equal to  $n$ , are in an A.P. prove that  $S_p = p^3$ .
23. If  $S_1$  be the sum of  $(2n + 1)$  terms of an A.P. and  $S_2$  be the sum of its odd terms, then prove that  $S_1 : S_2 = (2n + 1) : (n + 1)$ .
24. For what value of  $n$ ,  $\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$  is the arithmetic mean of  $a$  and  $b$ ?
25. If  $n$  arithmetic means are inserted between 20 and 80 such that the ratio of the first mean to the last mean is  $1 : 3$ , then find the value of  $n$ .
26. Prove that the sum of  $n$  arithmetic means between two numbers is  $n$  times the single A.M. between them.
27. The sum of two numbers is  $13/6$ . An even number of arithmetic means are being inserted between them and their sum exceeds their numbers by 1. Find the number of means inserted.
28. If the AM between the  $p^{\text{th}}$  and  $q^{\text{th}}$  terms of an AP be equal to the AM between  $r^{\text{th}}$  and  $s^{\text{th}}$  terms of the AP, then show that  $p + q = r + s$ .
29. There are  $n$  A.M.s between 3 and 17. The ratio of the first to the last mean is  $3 : 1$ . Find the value of  $n$ .
30. Insert  $n$  A.M.s between 7 and 71 such that the fifth term is 27. find the number of A.M.s.
31. The sum of  $n$  terms of an arithmetic progression is in the ratio  $5n + 4 : 9n + 16$ . Find the ratio of their  $28^{\text{th}}$  terms.
32. If  $a, b,$  and  $c$  are in A.P., prove that the following are also in AP –
  - a.  $b + c, c + a, a + b$
  - b.  $\frac{1}{\sqrt{b} + \sqrt{c}}, \frac{1}{\sqrt{c} + \sqrt{a}}, \frac{1}{\sqrt{a} + \sqrt{b}}$
  - c.  $a^2(b+c), b^2(c+a), c^2(a+b)$
  - d.  $a\left(\frac{1}{b} + \frac{1}{c}\right), b\left(\frac{1}{c} + \frac{1}{a}\right), c\left(\frac{1}{a} + \frac{1}{b}\right)$
33. If  $\frac{b+c}{a}, \frac{c+a}{b}, \frac{a+b}{c}$  are in AP, prove that –
  - i.  $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$  are in AP
  - ii.  $bc, ca, ab$  are in AP

34. If  $a\left(\frac{1}{b} + \frac{1}{c}\right)$ ,  $b\left(\frac{1}{c} + \frac{1}{a}\right)$ ,  $c\left(\frac{1}{a} + \frac{1}{b}\right)$  are in AP, prove that a, b, c are in AP.
35. For what value of n,  $\frac{a^n + b^n}{a^{n-1} + b^{n-1}}$  is the arithmetic mean of a and b?
36. Two cars start together in the same direction from the same place. The first car goes with the uniform speed of 10 km/h. the second car goes at a speed of 8 km/h in the first hour and increases the speed by  $\frac{1}{2}$  km each succeeding hour. How long will the second car take to overtake the first car?
37. The digits of a positive three digit integer are in AP and their sum is 15. If the digits are reversed the number obtained is 594 less than the original number. Find the number.
38. Along a road lie an odd number of stone placed at intervals of 10 m. these stones have to be assembled around the middle stone. A person can carry only one stone at a time. A man carried the job with one of the end stones by carrying them in succession. In carrying all the stones, he covered a distance of 3 km. find the number of stones.
39. A man is employed to count rupees 10710. He counts at the rate of Rs. 180 per minute for half an hour. After this he counts at the rate of rupees 3 less every minute than the preceding minute. Find the time taken by him to count the entire amount.
40. A piece of equipment costs a certain factory is Rs. 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 %ages applying to the original cost.
41. A farmer buys a used tractor for Rs. 12,000. He pays Rs. 6,000 cash and agrees to pay the balance in annual instalments of Rs. 500 plus 12% interest on the unpaid amount. How much the tractor costs him?
42. Abdul buys a scooter for Rs. 22,000. He pays rupees four thousand cash and agrees to pay the balance in annual instalments of Rs. 1,000 plus 10% interest on the unpaid amount. How much the scooter will cost him?
43. A man saves Rs. 32 during first week, Rs. 36 in next week, Rs. 40 in third week. If he continues his savings in this sequence, in how many weeks will he save Rs. 2,000?
44. A manufacturer of radio sets produced 600 units in the third year and seven hundred units in the seventh year. Assuming that the production uniformly increases by a fixed number every year, find (i). production in first year, (ii). total production in seven years and (iii). production in 10<sup>th</sup> year.
45. A man pays rupees 975 in monthly instalments, each instalment being less than the former by rupees 5. The amount of the first instalment is Rs. 100. In what time will the entire amount be paid?

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