

ARITHMETIC PROGRESSION - I

1. Show that the sequence  $\log a, \log(ab), \log(ab^2), \log(ab^3), \dots$  is an A.P. Find its  $n$ th term.
2. Which term of the sequence 4, 9, 14, 19, ..... is 124 ?
3. Which term of the sequence  $20, 19\frac{1}{4}, 18\frac{1}{2}, 17\frac{3}{4}, \dots$  is the first negative term ?
4. If  $m$  times the  $m^{\text{th}}$  term of an A.P. is equal to  $n$  times its  $n^{\text{th}}$  term, show that the  $(m + n)^{\text{th}}$  term of the A.P. is zero.
5. If the  $p^{\text{th}}$  term of an A.P. is  $q$  and the  $q^{\text{th}}$  term is  $p$ , prove that its  $n^{\text{th}}$  term is  $(p + q - n)$ .
6. If  $a_1, a_2, a_3, \dots, a_n$  be an A.P. of non-zero terms, prove that  $\frac{1}{a_1 a_2} + \frac{1}{a_2 a_3} + \dots + \frac{1}{a_{n-1} a_n} = \frac{n-1}{a_1 a_n}$ .
7. The sum of three numbers in A.P. is  $-3$ , and their product is 8. Find the numbers.
8. 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.
9. Find the sum of the series :  $5 + 13 + 21 + \dots + 181$ .
10. Find the sum of all three digit natural numbers, which are divisible by 7.
11. Find the sum of first 20 terms of an A.P., in which 3<sup>rd</sup> term is 7 and 7<sup>th</sup> term is two more than thrice of its 3<sup>rd</sup> term.
12. If  $S_n$  denotes the sum of first  $n$  terms of A.P. and  $\frac{S_{3n} - S_{n-1}}{S_{2n} - S_{2n-1}} = 31$ , then  $n$  is equal to
13. Find the number of terms in the series  $20, 19\frac{1}{3}, 18\frac{2}{3}, \dots$  of which the sum is 300, explain the double answer.
14. The sum of the first  $p, q, r$  terms of an A.P. are  $a, b, c$  respectively. Show that  $\frac{a}{p}(q-r) + \frac{b}{q}(r-p) + \frac{c}{r}(p-q) = 0$ .
15. 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.
16. If  $a, b, c$  are in A.P., prove that the following are also in A.P.  
 (i)  $b + c, c + a, a + b$  (ii)  $a\left(\frac{1}{b} + \frac{1}{c}\right), b\left(\frac{1}{c} + \frac{1}{a}\right), c\left(\frac{1}{a} + \frac{1}{b}\right)$
17. If  $a^2, b^2, c^2$  are in A.P., then prove that  $\frac{1}{b+c}, \frac{1}{c+a}, \frac{1}{a+b}$  is also in A.P.
18. If  $\log_{10} 2, \log_{10}(2^x - 1)$  and  $\log_{10}(2^x + 3)$  are in A.P., then find the value of  $x$ .
19. If  $S_n$  denotes the sum of  $n$  terms of A.P., then find  $S_{n+3} - 3S_{n+2} + 3S_{n+1} - S_n$  is equal to
20. The digits of a positive integer, having three digits, are in A.P. and their sum is 15. The number obtained by reversing the digits is 594 less than the original number. Find the number.
21. The least value of ' $a$ ' for which  $5^{1+x} + 5^{1-x}, a/2, 25^x + 25^{-x}$  are three consecutive terms of an AP is  
 (A) 1 (B) 5 (C) 12 (D) None of these
22. If  $p, q, r$  in A.P. and are positive, the roots of the quadratic equation  $px^2 + qx + r = 0$  are all real for  
 (A)  $\left|\frac{r}{p} - 7\right| \geq 4\sqrt{3}$  (B)  $\left|\frac{p}{r} - 7\right| < 4\sqrt{3}$  (C) all  $p$  and  $r$  (D) No.  $p$  and  $r$

23. Sum of first hundred numbers common to the two A.P.'s 12, 15, 18,... and 17, 21, 25 ..., is  
 (A) 56100 (B) 65100 (C) 61500 (D) none of these

### ARITHMETIC PROGRESSION - II

1. If  $S_r$  denotes the sum of  $r$  terms of an AP and  $\frac{S_a}{a^2} = \frac{S_b}{b^2} = c$  then  $S_c$  is  
 (A)  $c^3$  (B)  $c/ab$  (C)  $abc$  (D)  $a + b + c$
2. If  $a_r > 0$ ,  $r \in \mathbb{N}$  and  $a_1, a_2, a_3, \dots, a_{2n}$  are in AP then  $\frac{a_1 + a_{2n}}{\sqrt{a_1} + \sqrt{a_{2n}}} + \frac{a_2 + a_{2n-1}}{\sqrt{a_2} + \sqrt{a_{2n-1}}} + \frac{a_3 + a_{2n-2}}{\sqrt{a_3} + \sqrt{a_{2n-2}}} + \dots + \frac{a_n + a_{n+1}}{\sqrt{a_n} + \sqrt{a_{n+1}}}$  is equal to  
 (A)  $n - 1$  (B)  $\frac{n(a_1 + a_{2n})}{\sqrt{a_1} + \sqrt{a_{n+1}}}$  (C)  $\frac{n-1}{\sqrt{a_1} + \sqrt{a_{n+1}}}$  (D) none of these
3. If  $a_1, a_2, a_3, \dots, a_{2n+1}$  are in AP then  $\frac{a_{2n+1} - a_1}{a_{2n+1} + a_1} + \frac{a_{2n} - a_2}{a_{2n} + a_2} + \dots + \frac{a_{n+2} - a_n}{a_{n+2} + a_n}$  is equal to  
 (A)  $\frac{n(n+1)}{2} \cdot \frac{a_2 - a_1}{a_{n+1}}$  (B)  $\frac{n(n+1)}{2} \cdot \frac{a_2 - a_1}{a_n}$  (C)  $(n+1)(a_2 - a_1)$  (D) none of these
4. Let  $a_1, a_2, a_3, \dots$  be terms of an A.P. If  $\frac{a_1 + a_2 + \dots + a_p}{a_1 + a_2 + \dots + a_q} = \frac{p^2}{q^2}$ ,  $p \neq q$ , then  $\frac{a_6}{a_{21}}$  equals  
 (A)  $41/11$  (B)  $7/2$  (C)  $2/7$  (D)  $11/41$
5. Let  $\{a_n\}$  ( $n \geq 1$ ) be a sequence such that  $a_1 = 1$ , and  $3a_{n+1} - 3a_n = 1$  for all  $n \geq 1$ . Then  $a_{2002}$  is equal to  
 (A) 666 (B) 667 (C) 668 (D) 669
6. If 4<sup>th</sup> term of an AP is 64 and its 54<sup>th</sup> term is  $-61$ , then its common difference is  
 (A)  $5/2$  (B)  $-5/2$  (C)  $3/50$  (D)  $-3/50$
7. The 19<sup>th</sup> term from the end of the series  $2 + 6 + 10 + \dots + 86$  is  
 (A) 6 (B) 18 (C) 14 (D) 10
8. If  $n^{\text{th}}$  term of an AP is  $1/3 (2n + 1)$ , then the sum of its 19 terms is  
 (A) 131 (B) 132 (C) 133 (D) 134
9. If the ratio of the sum of  $n$  terms of two AP's is  $2n : (n + 1)$ , then ratio of their 8<sup>th</sup> terms is  
 (A)  $15 : 8$  (B)  $8 : 13$  (C)  $n : (n - 1)$  (D)  $5 : 17$
10. The sum of  $n$  terms of an AP is  $3n^2 + 5n$ . Then number of term when  $n^{\text{th}}$  term equals 164 is  
 (A) 13 (B) 21 (C) 27 (D) 29
11. If the  $m^{\text{th}}$  term of an A.P. is  $\frac{1}{n}$  and the  $n^{\text{th}}$  term is  $\frac{1}{m}$  then sum to  $mn$  terms is  
 (A)  $\frac{mn+1}{2}$  (B)  $\frac{mn-1}{2}$  (C)  $\frac{mn+1}{3}$  (D)  $\frac{mn-1}{3}$

12. If  $a, b, c$  be the 1<sup>st</sup>, 3<sup>rd</sup> and  $n^{\text{th}}$  terms respectively of an A.P., then sum to  $n$  terms is
- (A)  $\frac{c+a}{2} + \frac{c^2-a^2}{b-a}$  (B)  $\frac{c+a}{2} - \frac{c^2-a^2}{b-a}$  (C)  $\frac{c+a}{2} + \frac{c^2+a^2}{b-a}$  (D)  $\frac{c+a}{2} + \frac{c^2+a^2}{b+a}$
13. If  $a_1, a_2, a_3, \dots$  are in A.P. and  $a_1 + a_4 + a_7 + \dots + a_{16} = 147$  then  $a_1 + a_6 + a_{11} + a_{16}$  is equal to  
(A) 96 (B) 98 (C) 100 (D) None of these
14. If  $a_1, a_2, a_3, \dots$  is an A.P. such that  $a_1 + a_5 + a_{10} + a_{15} + a_{20} + a_{24} = 225$  then  $a_1 + a_2 + a_3 + \dots + a_{23} + a_{24}$  is equal to  
(A) 909 (B) 75 (C) 750 (D) 900
15. The sum of all even positive integers less than 200 which are not divisible by 6 is  
(A) 6534 (B) 6354 (C) 6543 (D) 6454
16. If  $x, y, z$  are in AP,  $a$  is AM between  $x$  and  $y$  and  $b$  is AM between  $y$  and  $z$ ; then AM between  $a$  and  $b$  will be  
(A)  $\frac{1}{3}(x + y + z)$  (B)  $z$  (C)  $x$  (D)  $y$
17. If  $n$  AM's are inserted between 1 and 31 and ratio of 7<sup>th</sup> and  $(n-1)^{\text{th}}$  A.M. is 5 : 9, then  $n$  equals  
(A) 12 (B) 13 (C) 14 (D) None of these
18. Three numbers are in A.P., If their sum is 33 and their product is 792, then the smallest of these numbers is  
(A) 14 (B) 11 (C) 8 (D) 4
19. If the angles of a quadrilateral are in A.P. whose common difference is  $10^\circ$ , then the angles of the quadrilateral are  
(A)  $65^\circ, 85^\circ, 95^\circ, 105^\circ$  (B)  $75^\circ, 85^\circ, 95^\circ, 105^\circ$  (C)  $65^\circ, 75^\circ, 85^\circ, 95^\circ$  (D)  $65^\circ, 95^\circ, 105^\circ, 115^\circ$
20. 20 is divided into four parts which are in A.P., such that the product of the first and fourth is to the product of the second and third is 2 : 3, then the four parts are  
(A) 2, 4, 6, 8 (B) 3, 5, 7, 9 (C) 4, 6, 8, 10 (D) 6, 10, 17, 12
21. Insert three arithmetic means between 3 and 19.

## Answers

### ARITHMETIC PROGRESSION - I

1.  $\log(ab^{n-1})$  2.  $25^{\text{th}}$  3.  $28^{\text{th}}$  7.  $-4, -1, 2; 2, -1, -4$  8. 2, 6, 10, 14  
 9. 2139 10. 70336 11. 740 12. 15 13. 25 or 36 15.  $(14m - 6) : (8m + 23)$   
 18.  $x = \log_2 5$  19. 0 20. 852 21. (C) 22. (A) 23. (C)

### ARITHMETIC PROGRESSION - II

1. (A) 2. (B) 3. (A) 4. (D) 5. (C) 6. (B) 7. (C) 8. (C) 9. (A) 10. (C)  
 11. (A) 12. (A) 13. (B) 14. (D) 15. (A) 16. (D) 17. (C) 18. (D) 19. (B) 20. (A)  
 21. 7, 11, 15