NUMBERS AND SEQUNECES
10th Standard 2019 EM

Maths

1) In the given factor tree, find the numbers m and n.
2) Can the number 6^n, n being a natural number end with the digit 5? Give reason for your answer.
3) Is 7 x 5 x 3 x 2 + 3 a composite number? Justify your answer
4) ' a ' and ' b ' are two positive integers such that ab x ba = 800. Find ' a ' and ' b'
5) Find the next three terms of the sequences.
   $\frac{1}{2}, \frac{1}{6}, \frac{1}{14}$, ... ,
6) Find the general term for the following sequences.
   3,6,9,...,
7) The general term of a sequence is defined as
   $a_n = \begin{cases} n\,(n + 3)\,; n\epsilon N & \text{is} \quad \text{odd} \\ n^2 + 1; n\epsilon N & \text{is} \quad \text{even} \end{cases}$
   Find the eleventh and eighteenth terms.
8) Find the first five terms of the following sequence,
   $a_1 = 1,\ a_2 = 1,\ a_n = \frac{a_{n-1}}{a_{n-2}+3}; n \geq 3, n\epsilon N$
9) Find the sum of first 15 terms of the A.P.$8, 7\frac{1}{4}, 6\frac{1}{2}, 5\frac{3}{4}$,....

10) Find the sum of 0.40 + 0.43 + 0.46 + ...+1
11) How many terms of the series 1 + 5 +9 + ...must be taken so that their sum is 190?
12) The 13th term of an A.P is 3 and the sum of the first 13 terms is 234.Find the common difference and the sum of first 21 terms.
13) In an A.P. the sum of first n terms is $\frac{5n^2}{2} + \frac{3n}{2}$. Find the 17th term
14) Find the sum of all natural numbers between 300 and 600 which are divisible by 7.
15) A mosaic is designed in the shape of an equilateral triangle, 12 ft on each side. Each tile in the mosaic is in the shape of an equilateral triangle of 12 inch side. The tiles are alternate in colour as shown in the figure. Find the number of tiles of each colour and total number of tiles in the mosaic.
16) The houses of a street are numbered from 1 to 49. Senthil's house is numbered such that the sum of numbers of the houses prior to Senthil's house is equal to the sum of numbers of the houses following Senthil's house. Find Senthil's house number?
17) The sum of first n, 2n and 3n terms of an A.P are S_1, S_2 and S_3 respectively prove that $S_3 = 3 (S_2 - S_1)$
18) Find the sum of 8 terms of the G.P. 1,-3,9,-27....
19) Find the first term of a G.P. in which S_6 = 4095 and r = 4

20) How many terms of the series $1 + 4 + 16 + \ldots$ make the sum 1365?

21) Find the sum $3 + 1 + \frac{1}{3} + \ldots \infty$

22) Find the rational form of the number 0.6666....

23) Find the sum to n terms of the series $5 + 55 + 555 + \ldots$

24) Find the least positive integer n such that $1 + 6 + 6^2 + \ldots + 6^n > 5000$

25) A person saved money every year, half as much as he could in the previous year. If he had totally saved Rs.7875 in 6 years then how much did he save in the first year?

26) Find the next three terms of the sequences.
   5,2,-1,-4,...,

27) Find the next three terms of the sequences.
   1,0.1,0.01,...

28) Find the general term for the following sequences.
   $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}$

29) Find the general term for the following sequences.
   5,-25,125,...

30) Which of the following list of numbers form an AP? If they form an AP, write the next two terms:
   4,10,16,22, ...

31) Which of the following list of numbers form an AP? If they form an AP, write the next two terms:
   1,-1,-3, -5, ...

32) Which of the following list of numbers form an AP? If they form an AP, write the next two terms:
   -2, 2, -2, 2, -2

33) Which of the following list of numbers form an AP? If they form an AP, write the next two terms:
   1,1,1,2,2,2,3,3,3

34) Determine the AP whose 3rd term is 5 and the 7th term is 9.

35) In a flower bed, there are 23 rose plants in the first row, 21 in the second, 19 is the third, and so on. There are 5 rose plants in the last row. How many rows are there in the flower bed?

36) If the sum of the first 14 terms of an AP is 1050 and its first term is 10, find the 20th term.

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Maths

ANSWER ALL THE QUESTIONS

1) Find all positive integers, when divided by 3 leaves remainder 2.
2) A man has 532 flower pots. He wants to arrange them in rows such that each row contains 21 flower pots. Find the number of completed rows and how many flower pots are left over.
3) Prove that the product of two consecutive positive integers is divisible by 2.
4) When the positive integers a, b and c are divided by 13, the respective remainders are 9,7 and 10. Show that a+b+c is divisible by 13.
5) Prove that square of any integer leaves the remainder either 0 or 1 when divided by 4.
6) Use Euclid's Division Algorithm to find the Highest Common Factor (HCF) of 340 and 412
7) Find the largest number which divides 1230 and 1926 leaving remainder 12 in each case.
8) If d is the Highest Common Factor of 32 and 60, find x and y satisfying $d = 32x + 60y$
9) A positive integer when divided by 88 gives the remainder 61. What will be the remainder when the same number is divided by 11?
10) Prove that two consecutive positive integers are always coprime.
11) For what values of natural number n, 4^n can end with the digit 6?
12) if m,n are natural numbers, for what values of m, does $2^n \times 5^m$ ends in 5?
13) Find the HCF of 252525 and 363636
14) If $13824 = 2^a \times 3^b$ then find a and b.
15) If $p_1^{x_1} \times p_2^{x_2} \times p_3^{x_3} \times p_4^{x_4} = 113400$ where p_1, p_2, p_3, p_4 are primes in ascending order and x_1, x_2, x_3, x_4 are integers, find the value of p_1, p_2, p_3, p_4 and x_1, x_2, x_3, x_4
16) Find the LCM and HCF of 408 and 170 by applying the fundamental theorem of arithmetic
17) Find the greatest number consisting of 6 digits which is exactly divisible by 24,15,36?
18) What is the smallest number that when divided by three numbers such as 35, 56 and 91 leaves remainder 7 in each case?
19) Find the least number that is divisible by the first ten natural numbers.
20) Find the least positive value of x such that $71 \equiv x \pmod 8$
21) if x is congruent to 13 modulo 17 then 7x -3 is congruent to which number modulo 17?
22) Solve $5x \equiv 4 \pmod 6$
23) Solve $3x - 2 \equiv 0 \pmod{11}$
24) What is the time 100 hours after 7 a.m.?
25) What is the time 15 hours before 11 p.m.?
26) Today is Tuesday. My uncle will come after 45 days. In which day my uncle will be coming?
27) Prove that $2^n + 6 \times 9^n$ is always divisible by 7 for any postive integer n,
28) Find the remainder when 2^{81} is divided by 17.
29) The duration of flight travel from Chennai to London through British Airlines is approximately 11 hours. The airplane begins its journey on Sunday at 23:30 hours. If the time at Chennai is

four and half hours ahead to that of London's time, then find the time at London, when will the flight lands at London Airport

30) Find the next three terms of the following sequence.

8, 24, 72, …

31) Find the first four terms of the sequences whose nth terms are given by

$a_n = n^3 - 2$

32) Find the nth term of the following sequences,

2,5,10,17,….,

33) Find the indicated terms of the sequences whose n^{th} terms are given by

$a_n = \frac{5n}{n+2}$; a_6 and a_{13} ,

34)

Find a_8 and a_{15} whose n^{th} term is $a_n = \begin{cases} \frac{n^2-1}{n+3}; n \text{ is even, } n \epsilon N \\ \frac{n^2}{2n+1}, n \text{ is odd, } n \epsilon N \end{cases}$

35) if $a_1 = 1$, $a_2 = 1$ and $a_n = 2a_{n-1} + a_{n-2}$ $n \geq 3$, $n \epsilon N$, then find the first six terms of the sequence

36) Check whether the following sequences are in A.P.

a - 3, a -5, a - 7,….

37) First term a and common difference d are given below. Find the corresponding A.P a = 5, d = 6

38) Find the first term and common difference of the Arithmetic Progressions whose nth terms are given below

$t_n = -3 + 2n$

39) Find the 19th term of an A.P. -11, -15, -19,….

40) Which term of an A.P. 16,11,6,1,... is -54?

41) Find the middle term(s) of an A.P 9,15,21,27,……,183.

42) If nine times ninth term is equal to the fifteen times fifteenth term, show that six times twenty fourth term is zero.

43) If 3 + k, 18 - k, 5k + 1 are in A.P. then find k.

44) Find x, y and z, given that the numbers x, 10, y, 24, z are A.P.

45) In a theatre, there are 20 seats in the front row and 30 rows were allotted. Each successive row contains two additional seats than its front row. How many seats are there in the last row?

46) The sum of three consecutive terms that are in A.P. is 27 and their product is 288. Find the three terms.

47) The ratio of 6th and 8th term of an A.P is 7:9 Find the ratio of 9th term to 13th term

48) In a winter season let us take the temperature of Ooty from Monday to Friday to be in A.P. The sum of temperatures from Monday to Wednesday is 0^0 C and the sum of the temperatures from Wednesday to Friday is 18^0 C. Find the temperature on each of the five days

49) Priya earned Rs.15,000 in the first month. Thereafter her salary increased by Rs1500 per year. Her expenses are Rs.13,000 during the first year and the expenses increases by Rs.900 per year. How long will it take for her to save Rs.20,000 per month

50) Find the sum of the following

3,7,11….up to 40 terms

51) How many consecutive odd integers beginning with 5 will sum to 480?

52) Find the sum of first 28 terms of an A.P. whose n^{th} term is 4n-3.

53) The sum of first n terms of a certain series is given as $2n^2 - 3n$.Show that the series is an A.P

54) The 104th term and 4th term of an A.P. are 125 and 0. Find the sum of first 35 terms.

55) Find the sum of all odd positive integers less than 450.

56) Find the sum of all natural numbers between 602 and 902 which are not divisible by 4.

57) Raghu wish to buy a laptop. He can buy it by paying Rs.40,000 cash or by giving it in 10 installments as Rs.4800 in the first month, Rs.4750 in the second month, Rs.4700 in the third month and so on. If he pays the money in this fashion, find
total amount paid in 10 installments.

58) A man repays a loan of Rs.65,000 by paying Rs.400 in the first month and then increasing the payment by Rs.300 every month. How long will it take for him to clear the loan?

59) A brick staircase has a total of 30 steps. The bottom step requires 100 bricks. Each successive step requires two bricks less than the previous step.
(i) How many bricks are required for the top most step?
(ii) How many bricks are required to build the stair case?

60) If $S_1,S_2,S_3,...S_m$ are the sums of n terms of m A.P.s Whose first terms are 1,2,3,....m and whose common differences are 1,3,5 ,...., (2m-1) respectively , then show that $S_1+S_2+S_3+..+S_m= \frac{1}{2}mn(mn+1)$.

61) Find the sum $\left[\frac{a-b}{a+b} + \frac{3a-2b}{a+b} + \frac{5a-3b}{a+b} +...\text{to} \quad 12 \quad \text{terms} \right]$

62) Which of the following sequences are in G.P.?
3,9,27,81,…,

63) Write the first three terms of the G.P. whose first term and the common ratio are given below a = 6, r = 3

64) In a G.P. 729, 243, 81…..find t_7

65) Find x so that x+6, x+12 and x+15 consecutive terms of a Geometric Progression.

66) Find the number of terms in the following G.P.
4,8,16,…,8192

67) In a G.P. the 9th term is 32805 and 6th term is 1215. Find the 12th term

68) Find the 10th term of a G.P. whose 8th term is 768 and the common ratio is 2

69) If a, b, c are in A.P. then show that $3^a,3^b,3^c$ are in G.P

70) In a G.P. the product of three consecutive terms is 27 and the sum of the product of two terms taken at a time is $\frac{57}{2}$.Find the three terms.

71) A man joined a company as Assistant Manager. The company gave him a starting salary of Rs.60,000 and agreed to increase his salary 5% annually. What will be his salary after 5 years?

72) Sivamani is attending an interview for a job and the company gave two offers to him.
Offer A: Rs.20,000 to start with followed by a guaranteed annual increase of 6% for the first 5 years.
Offer B: Rs.22,000 to start with followed by a guaranteed annual increase of 3% for the first 5 years.
What is his salary in the 4th year with respect to the offers A and B?

73) If a, b, c are three consecutive terms of an A.P. and x, y, z are three consecutive terms of G.P then prove that $x^{b-c} \times y^{c-a} \times z^{a-b} = 1$

74) Find the sum of first n terms of the G.P
5,-3, $\frac{9}{5}$, $-\frac{27}{25}$,...,

75) Find the sum of first six terms of the G.P 5,15,45,....

76) Find the first term of the G.P. whose common ratio 5 and whose sum to first 6 terms is 46872

77) Find the sum to infinity of
9 + 3 + 1 + ...

78) If the first term of an infinite G.P. is 8 and its sum to infinity is $\frac{32}{3}$ then find the common ratio

79) Find the sum to n terms of the series
    0.4 +0.44+0.444+..to n terms
80) Find the sum of the Geometric series 3 + 6 +12 + ...+1536
81) Kumar writes a letter to four of his friends. He asks each one of them to copy the letter and mail to four different persons with the instruction that they continue the process similarly. Assuming that the process is unaltered and it costs Rs. 2 to mail one letter, find the amount spent on postage when 8th set of letters is mailed
82) Find the rational form of the number $0.\overline{123}$
83) If Sn = (x + y) + (x^2+xy+y^2) + (x^3+x^{2}y+xy^2+y^3) + ...n terms then prove that (x - y)S$_n$ = $\left[\frac{x^2(x^n-1)}{x-1} \right] - \frac{y^2(y^n-1)}{y-1}$
84) Find the sum of the following series
    1+2+3+...+60
85) If 1+2+3+...+k = 325, then find 1^3+2^3+3^3+...K^3.
86) If 1^3+2^3+3^3+...k^3=44100 then find 1+2+3+...+k
87) How many terms of the series 1^3+2^3+3^3+....Should be taken to get the sum 14400?
88) The sum of the squares of the first n natural numbers is 285, while the sum of their cubes is 2025. Find the value of n.
89) Rekha has 15 square colour papers of sizes 10 cm, 11 cm, 12 cm,…, 24 cm. How much area can be decorated with these colour papers?
90) Find the sum of the series (2^3-1)+(4^3-3^3)+(6^3-15^3)+....to
    (i) n terms,
    (ii) 8 terms
91) Prove that n^2-n divisible by 2 for every positive integer n.
92) A milk man has 175 litres of cow's milk and 105 litres of buffalow's milk. He wishes to sell the milk by filling the two types of milk in cans of equal capacity. Calculate the following (i) Capacity of a can (ii) Number of cans of cow's milk (iii) Number of cans of buffalow's milk.
93) When the positive integers a, b and c are divided by 13 the respective remainders are 9, 7 and 10. Find the remainder When a + 2b + 3c is divided by 13.
94) Show that 107 is of the form 4q +3 for any integer q.
95) If (m +1)th term of an A.P. is twice the (n+1)th term, then prove that (3m+1)th term is the twice the (m+n+1)th term.
96) Find the 12th term from the last term of the A.P -2,-4,-6,....-100
97) Two A.P.'s have the same common difference. The first term of one A.P. is 2 and that of the other is 7. Show that the difference between their 10th terms is the same as the difference between their 21st terms, which is the same as the difference between any two corresponding terms.
98) A man saved Rs.16500 in ten years. In each year after the first he saved Rs.100 more thanhe did in the preceding year. How much did he save in the first year?
99) Find the G.P. in which the 2nd term is $\sqrt{6}$ and the 6th term is $9\sqrt{6}$
100) The value of a motor cycle depreciates at the rate of 15% per year.What will be the value of the motor cycle 3 year hence, which is now purchased for Rs.45,000?
101) Use Euclid's Division Algorithm to find the Highest Common Factor (HCF) of
    867 and 255
102) Use Euclid's Division Algorithm to find the Highest Common Factor (HCF) of
    10224 and 9648
103) Use Euclid's Division Algorithm to find the Highest Common Factor (HCF) of

84,90 and 120

104) Find the least positive value of x such that
$78 + x \equiv 3 \pmod{5}$

105) Find the least positive value of x such that
$89 \equiv (x + 3) \pmod{4}$

106) Find the least positive value of x such that
$96 \equiv \frac{x}{7} \pmod{5}$

107) Find the least positive value of x such that
$5x \equiv 4 \pmod{6}$

108) Find the next three terms of the following sequence.
5, 1,-3,…

109) Find the next three terms of the following sequence.
$\frac{1}{4}, \frac{2}{9}, \frac{3}{16}$ ......

110) Find the first four terms of the sequences whose nth terms are given by
$a_n - (-1)^{n+1} n (n+1)$

111) Find the first four terms of the sequences whose nth terms are given by
$a_n = 2n^2 - 6$

112) Find the nth term of the following sequences,
$0, \frac{1}{2}, \frac{2}{3}, ...$

113) Find the nth term of the following sequences,
3,8,13,18...

114) Find the indicated terms of the sequences whose n^{th} terms are given by
$a_n = -(n^2-4); a_4$ and a_{11}

115) Check whether the following sequences are in A.P.
$\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}$

116) Check whether the following sequences are in A.P.
9, 13, 17, 21, 25,... ,

117) Check whether the following sequences are in A.P.
$\frac{-1}{3}, 0, \frac{1}{3}, \frac{2}{3}, ...$

118) Check whether the following sequences are in A.P.
1,-1,1-1,1,-1,...

119) First term a and common difference d are given below. Find the corresponding A.P
a = 7, d = -5

120) First term a and common difference d are given below. Find the corresponding A
$a = \frac{3}{4}, d = \frac{1}{2}$

121) Find the first term and common difference of the Arithmetic Progressions whose nth terms are given below
$t_n = 4 - 7n$

122) Find the sum of the following
102,97,92,...up to 27 terms.,

123) Find the sum of the following
6 + 13+ 20+ ...+97

124) Which of the following sequences are in G.P.?
4,44,444,4444,...,

125) Which of the following sequences are in G.P.?

0.5,0.05,0.005,…,

126) Which of the following sequences are in G.P.?
$\frac{1}{3}, \frac{1}{6}, \frac{1}{12}$

127) Which of the following sequences are in G.P.?
1,-5,25,-125,….,

128) Which of the following sequences are in G.P.?
16,4,1,$\frac{1}{4}$

129) Write the first three terms of the G.P. whose first term and the common ratio are given below
a = $\sqrt{2}$, r =$\sqrt{2}$,

130) Write the first three terms of the G.P. whose first term and the common ratio are given below
a = 1000, r = $\frac{2}{5}$

131) Find the number of terms in the following G.P.
$\frac{1}{3}, \frac{1}{9}, \frac{1}{27}, … \frac{1}{2187}$

132) Which of the following sequences are in G.P.?
120,60,30,18

133) Find the sum of first n terms of the G.P
256,64,16,……..

134) Find the sum to infinity of
21+14+ $\frac{28}{3}$ +...

135) Find the sum to n terms of the series
3 +33 + 333 + ...to n terms

136) Find the sum of the following series
3+6+9...+96

137) Find the sum of the following series

138) Find the sum of the following series
1+4+9+16+..+225

139) Find the sum of the following series
$6^2+7^2+8^2+...+21^2$

140) Find the sum of the following series
$10^3+11^3+12^3+....+20^3$

141) Find the sum of the following series
1+3+5+...+71

142) Raghu wish to buy a laptop. He can buy it by paying Rs.40,000 cash or by giving it in 10 installments as Rs.4800 in the first month, Rs.4750 in the second month, Rs.4700 in the third month and so on. If he pays the money in this fashion, find
how much extra amount that he has to pay than the cost?

143) How many terms of the AP: 24, 21, 18, ... must be taken so that their sum is 78?

144) Find the sum of first 24 terms of the list of numbers whose nth term is given by a_n = 3 + 2n.

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