4. $M^4 + N^4 - 2$ is divisible by 16 if M & N are
(a) 234, 528 (b) 541, 684
(c) 384, 4495 (d) 297, 981

5. Which of the following number is divisible by 5?
(a) 424242242423_4
(b) 4444333221_5
(c) 11111122222333344455_6
(d) None of these

6. Find the remainder when $(135678)_{16}$ is divided by 5.
(a) 0 (b) 1 (c) 2 (d) 4

7. A 60 digit number is formed by writing natural numbers from 1 as given below 12345....
Find the remainder when this number is divided by 32.
(a) 9 (b) 0 (c) 5 (d) 31

8. The number of positive integers not greater than 1000, which are not divisible by 3, 5 and 7 is
(a) 457 (b) 675
(c) 543 (d) None of these

9. The number of positive integers 'n' from 35 to 150 such that (n – 1)! is not divisible by n is
(a) 67 (b) 33 (c) 23 (d) 25

10. When 10^x is divided by 13, remainder is 1. If x is a natural number less than 153 then how many values can 'x' take?
(a) 12 (b) 10 (c) 30 (d) 25

11. On base 8, first 100 natural numbers are written. How many of these numbers are divisible by 7?
(a) 70 (b) 21 (c) 14 (d) 28

12. Let $N = n^6 + 3n^5 - 5n^4 - 15n^3 + 4n^2 + 12n$ for any $n \in N$.
The greatest divisor of N among the number given below is
(a) 2 (b) 6 (c) 10 (d) 30

13. Find the largest 'n' such that n + 10 divides $n^3 + 100$.
(a) 890 (b) 99
(c) $n = 1000$ (d) None of these

14. Let $x_n = 6^n + 8^n$. Find the remainder when X_{49} is divided by 49.
(a) 48 (b) 1 (c) 47 (d) 0

15. Let $N = n^{12} - n^8 - n^4 + 1$ where n is any odd number. Which one of the following can divide N?
(a) 27 (b) 512
(c) 1029 (d) None of these

16. Which of the following can divide $3^{123456789} + 1$?
(a) 2 (b) 8 (c) 4 (d) 16

17. Find the number of positive divisors of 10^{9999} but not 10^{9998}.
(a) 1999 (b) 10000^2 (c) 19999 (d) 9999^2

18. $N = 2\times4\times6\times...(100\text{ numbers}) - 1\times3\times5\times...(100\text{ numbers})$
Which one of the following can divide N?
(a) 1986 (b) 2300 (c) 1000 (d) 2001

19. For any positive integer n, $2^n + 9^n - 4^n - 7^n$ is divisible by
(a) 3 (b) 10 (c) 7 (d) 3

20. Find the number of positive integer 'n' for which $n \le 2000$ and 6 is a factor of $n^2 + 3n + 2$.
(a) 1334 (b) 666 (c) 444 (d) 556

SESSION – 8

NUMBER PROPERTIES HCF & LCM

1. Find the least number which when divided by 16, 18, 20 and 25 leaves 4 as remainder in each case, but when divided by 7 leaves no remainder.
(a) 8004 (b) 13004 (c) 18004 (d) 18014

2. What is the greatest number which divides 852, 1065 and 1491 exactly?
(a) 193 (b) 183 (c) 223 (d) 213

3. Find the greatest number which will divide 25, 73 and 97 so as to leave the same remainder in each case.
(a) 12 (b) 18 (c) 24 (d) 32

4. Find the side of the largest square slabs which can be paved on the floor of a room 5 m 44 cm long and 3 m 74 cm broad.
(a) 56 cm (b) 42 cm (c) 38 cm (d) 34 cm

5. Find the greatest number of 4 digits which when divided by 10, 15, 21 and 28 leaves 4, 9, 15 and 22 as remainders respectively.
(a) 9654 (b) 9666 (c) 9664 (d) 9864

6. Five bells begin to toll together and toll at intervals of 36, 45, 72, 81 and 108 seconds. After what interval of time will they keep on tolling together?
(a) 3240 secs (b) 3080 secs
(c) 3140 secs (d) 3200 secs

7. The least perfect square number which is divisible by 3, 4, 5, 6 and 8 is
(a) 900 (b) 1200 (c) 2500 (d) 3600

8. The HCF of two numbers is 11 and their LCM is 693. If one of the numbers is 77, find the other.
(a) 909 (b) 119 (c) 66 (d) 99

9. The sum of the HCF and LCM of two numbers is 680 and the LCM is 84 times the HCF. If one of the numbers is 56, find the other number.
(a) 84 (b) 12 (c) 8 (d) 96

10. The ratio of two numbers is 3:4. Their HCF is 4. Find the LCM.
(a) 12 (b) 16 (c) 24 (d) 48

11. Philip, Tom and Brad start jogging around a circular field and complete a single round in 18 secs, 22 secs and 30 secs respectively. In how much time will they meet again at the starting point?
(a) 3 min 15 secs (b) 21 min
(c) 16 min 30 secs (d) 12 min

12. The HCF of two numbers is 8. Which one of the following can never be their LCM?
(a) 24 (b) 48 (c) 56 (d) 60

13. Three numbers which are co-primes to each other are such that the product of the first two is 551 and that of the last two is 1073. Find the sum of the three numbers.
(a) 75 (b) 81 (c) 85 (d) 89

14. The sum of two numbers is 216 and their HCF is 27. Find the numbers.
(a) 27, 189 (b) 81, 189
(c) 108, 108 (d) 154, 162

15. HCF of 3240, 3600 and a third number is 36 and their LCM is $2^4 \times 3^5 \times 5^2 \times 7^2$. Find the third number.
(a) $2^2 \times 3^5 \times 7^2$ (b) $2^2 \times 5^3 \times 7^2$
(c) $2^5 \times 5^2 \times 7^2$ (d) $2^3 \times 3^3 \times 7^2$

16. The HCF and LCM of two numbers are 33 and 264. When the first number is divided by 2, the quotient is 33. Find the other number.
(a) 66 (b) 132 (c) 198 (d) 99

17. What is the greatest possible rate at which a man can walk 51 km and 85 km in an exact number of minutes?
(a) 11 km/min (b) 13 km/min
(c) 17 km/min (d) None of these

18. Find the greatest number of 5 digits that will give us a remainder of 5 when divided by 8 and 9 respectively.
(a) 99931 (b) 99941
(c) 99725 (d) None of these

19. Two equilateral triangles have the sides of length 34 and 85 respectively. Find the greatest length of the rope that can measure both of them exactly. How many such equal parts can be measured?
(a) 17, 21 (b) 19, 18
(c) 21, 14 (d) None of these

20. The sum of two numbers is 528 and their HCF is 33. The number of pairs of such numbers satisfying the above condition is
(a) 6 (b) 12 (c) 8 (d) 4

SESSION – 9

NUMBER PROPERTIES FRACTIONS & DECIMALS

1. Which of the following has fractions in ascending order?
(a) $\frac{2}{5}, \frac{3}{5}, \frac{1}{3}, \frac{4}{7}, \frac{5}{6}$ (b) $\frac{1}{3}, \frac{2}{5}, \frac{3}{5}, \frac{5}{6}, \frac{4}{7}$
(c) $\frac{1}{3}, \frac{2}{5}, \frac{5}{6}, \frac{4}{7}, \frac{3}{5}$ (d) $\frac{1}{3}, \frac{2}{5}, \frac{4}{7}, \frac{3}{5}, \frac{5}{6}$

2. Which of the following has fractions in descending order?
(a) $\frac{5}{6}, \frac{4}{7}, \frac{2}{5}, \frac{3}{5}, \frac{1}{3}$ (b) $\frac{5}{6}, \frac{3}{5}, \frac{4}{7}, \frac{2}{5}, \frac{1}{3}$
(c) $\frac{4}{7}, \frac{1}{3}, \frac{2}{5}, \frac{5}{6}, \frac{3}{5}$ (d) $\frac{1}{3}, \frac{2}{5}, \frac{4}{7}, \frac{3}{5}, \frac{5}{6}$

3. Convert 0.737373... into vulgar fraction?
(a) $\frac{73}{99}$ (b) $\frac{73}{100}$ (c) $\frac{73}{90}$ (d) $\frac{73}{900}$

4. Convert $0.6\overline{7}$ into vulgar fraction.
(a) $\frac{67}{99}$ (b) $\frac{67}{90}$ (c) $\frac{61}{90}$ (d) $\frac{61}{100}$

5. Find the correct expression for $5.\overline{46}$ in the fractional form.
(a) $\frac{541}{100}$ (b) $\frac{541}{99}$ (c) $\frac{546}{99}$ (d) $\frac{541}{900}$

6. $0.2\overline{343} + 0.1\overline{88} = ?$
(a) $0.42\overline{32}$ (b) $0.41\overline{32}$
(c) $0.4\overline{233}$ (d) 0.4231

7. $3.\overline{23} - 2.\overline{03} + 1.\overline{55}$
(a) $2.\overline{75}$ (b) 2.75 (c) 2.70 (d) $2.\overline{71}$

8. Find the product of $0.\overline{09} \times 7.\overline{3}$
(a) $0.\overline{67}$ (b) 0.657
(c) $0.\overline{6}$ (d) None of these

9. If $\frac{347.624}{0.0089} = a$, then find the value of $\frac{347624}{0.0089} = ?$

(a) $\frac{a}{10}$ (b) 10 a (c) $\frac{a}{1000}$ (d) 1000 a

10. Find the value of

$$\frac{(0.555 \times 0.555 - 0.555 \times 0.020 + 0.020 \times 0.020)}{(0.555 \times 0.555 \times 0.555) + (0.020 \times 0.020 \times 0.020)}$$

(a) 1.55 (b) 1.74 (c) 2.36 (d) 5.02

11. Evaluate: $\frac{(2.39)^2 - (1.61)^2}{2.39 - 1.61}$

(a) 2 (b) 4 (c) 6 (d) 8

12. What decimal of an hour is a second?

(a) 0.0025 (b) 0.0256
(c) 0.00027 (d) 0.000126

13. The value of $\frac{(0.96)^3 - (0.1)^3}{(0.96)^2 + 0.096 + (0.1)^2}$ is:

(a) 0.86 (b) 0.95 (c) 0.97 (d) 1.06

14. The value of $\frac{0.1 \times 0.1 \times 0.1 + 0.02 \times 0.02 \times 0.02}{0.2 \times 0.2 \times 0.2 + 0.04 \times 0.04 \times 0.04}$ is:

(a) 0.0125 (b) 0.125
(c) 0.25 (d) 0.5

15. If $2994 \div 14.5 = 172$, then $29.94 \div 1.45 = ?$

(a) 0.172 (b) 1.72 (c) 17.2 (d) 172

16. $\frac{0.009}{?} = 0.01$

(a) 0.0009 (b) 0.09 (c) 0.9 (d) 9

17. $\frac{(0.1667)(0.8333)(0.3333)}{(0.2222)(0.6667)(0.1250)}$ is approximately equal to:

(a) 2 (b) 2.40 (c) 2.43 (d) 2.50

18. 0.04×0.0162 is equal to:

(a) 6.48×10^{-3} (b) 6.48×10^{-4}
(c) 6.48×10^{-5} (d) 6.48×10^{-6}

19. $\frac{4.2 \times 4.2 - 1.9 \times 1.9}{2.3 \times 6.1}$ is equal to:

(a) 0.5 (b) 1.0 (c) 20 (d) 22

20. If $\frac{144}{0.144} = \frac{14.4}{x}$, then the value of x is:

(a) 0.0144 (b) 1.44 (c) 14.4 (d) 144

SESSION - 10

ALGEBRA - I

Introduction

1. The equation of the form $ax + b = 0$ is a linear equation in one variable x.

2. The equations of the form $ax + by + c = 0$ where $a, b \neq 0$ is called the linear equation in two variables x and y.

3. Simultaneous equations are a pair of equations of the form $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$. The solution of these equations is (x, y) an ordered pair.

4. The set of three equations of the form $a_1x + b_1y + c_1z = d_1$, $a_2x + b_2y + c_2z = d_2$, $a_3x + b_3y + c_3z = d_3$ is called the system of linear equations in three variables x, y, z.

5. An equation of the form $ax^2 + bx + c = 0$, $a \neq 0$ is called a quadratic equation. Here x is the variable and a, b, c $\in R$ are the constants.
a, b, c are called the coefficients of the equation.

6. The roots of the quadratic equation $ax^2 + bx + c = 0$ are given by, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

The sum of the roots $= -\frac{b}{a}$, the product of the roots $= \frac{c}{a}$

7. The roots of the quadratic equation depends on $b^2 - 4ac$ which is called the discriminant of the equation.
   (i) The equation has real and distinct roots when $b^2 - 4ac > 0$
   (ii) The equation has real and equal roots when $b^2 - 4ac = 0$
   (iii) The equation has complex roots when $b^2 - 4ac < 0$
   (iv) If $b^2 - 4ac$ is a perfect square the equation has two rational roots.

8. If α, β are the roots of the quadratic equation $ax^2 + bx + c = 0$, then $\alpha + \beta = \frac{-b}{a}, \alpha\beta = \frac{c}{a}$. The quadratic equation whose roots are α and β is $(x - \alpha)(x - \beta) = 0$.