

UNIT I

1. If $a:b = 2:3$ and $b:c = 4:3$, then find $a:b:c$
A. 8:12:9
B. 2:3:8
C. 2:3:9
D. 2:3:12
2. Find the fourth proportion to 2,3,6
A. 18
B. 12
C. 9
D. 4
3. If $A:B = 2:3$, $B:C = 4:5$ and $C:D = 6:7$, then find the value of $A:B:C:D$
A. 15:24:30:35
B. 16:24:30:35
C. 17:24:30:35
D. 18:24:30:35
4. If $2 : 9 :: x : 18$, then find the value of x
A. 2
B. 3
C. 4
D. 6
5. If $x:y = 1:3$, then find the value of $(7x+3y):(2x+y)$
A. 14:5
B. 15:5
C. 16:5
D. 17:5
6. Value of $(256)^{5/4}$
A. 1012
B. 1024
C. 1048
D. 525

7. Find the value of $(10)^{150} \div (10)^{146}$

- A. 10
- B. 100
- C. 1000
- D. 10000**

8. $(1000)^7 \div (10)^{18} = ?$

- A. 10
- B. 100
- C. 1000**
- D. 10000

9. If m and n are whole numbers such that $m^n = 121$ the value of $(m-1)^{n+1}(m-1)^{n+1}$ is

- A. 1
- B. 10
- C. 100
- D. 1000**

10. $25^{7.5} \times (5)^{2.5} \div (125)^{1.5} = 5^?$

- A. 9.7
- B. 11.5
- C. 12
- D. 13**

UNIT II

11. Value of 'x' in $\sqrt[3]{(x-1)} = 4$ should be

- A. 23
- B. 17**
- C. 19
- D. 20

12. If $-5 > a$ and $a > b$ then -5 is

- A. less than a
- B. greater than b**
- C. greater than a
- D. less than b

13. If $-5 > a$ and $a > b$ then -5 is

- A. less than a
- B. greater than b
- C. greater than a

D. less than b

14. If $-5 > a$ and $a > b$ then -5 is

- A. less than a
- B. greater than b
- C. greater than a
- D. less than b**

15. By solving inequality $113(x - 3) > 12(x + 2)$, answer will be

- A. $x < -10$
- B. $x < -12$**
- C. $x < -14$
- D. $x < -15$

16. Mary scored 200 marks in three tests. If average score of 60 is required then lowest marks she must score for fourth test are

- A. $x \geq 40$**
- B. $x \geq 50$
- C. $x \geq 60$
- D. $x \geq 70$

17. By solving inequality $12(4x + 2) > 113(x + 2)$, answer will be

- A. $x > -1A5$**
- B. $x > -1B7$
- C. $x > -2C5$
- D. $x > -2D9$

18. By solving inequality $12(4x + 2) > 13(x + 2)$, answer will be

- A. $x > -1A5$
- B. $x > -1B7$
- C. $x > -2C5$**
- D. $x > -2i9$

19. By solving inequality $12(4x + 2) > 13(x + 2)$, answer will be

- A. $x > -1A5$
- B. $x > -1B7$**
- C. $x > -2C5$
- D. $x > -2D9$

20. In 2014, 200 workers received pays on hourly basis from \$15/hour to \$25/hour according to difficulty of assigned tasks. largest possible amount paid to workers for 8 working hours is

- A. \$215
- B. \$165
- C. \$200**
- D. \$170

UNIT III

21. In how many ways can we arrange the word 'FUZZONE' so that all the vowels come together?

- A. 1440
- B. 6
- C. 2160**
- D. 4320

22. In a room there are 2 green chairs, 3 yellow chairs and 4 blue chairs. In how many ways can Raj choose 3 chairs so that at least one yellow chair is included?

- A. 3
- B. 30
- C. 64**
- D. 84

23. On a railway line there are 20 stops. A ticket is needed to travel between any 2 stops. How many different tickets would the government need to prepare to cater to all possibilities?

- A. 760
- B. 190
- C. 380**
- D. 72

24. A locker in bank has 3 digit lock. Mahesh forgot his password and was trying all possible combinations. He took 6 seconds for each try. The problem was that each digit can be from 0 to 9. How much time will be needed to by Mahesh to try all the combinations?

- A. 90 MINUTES
- B. 120 MINUTES
- C. 60 MINUTES
- D. 100 MINUTES**

25. A box contains 2 white, 3 black and 5 red balls. In how many ways can three balls be drawn from the box if at least one black ball is to be included in the draw?

- A. 29
- B. 36
- C. 48
- D. 85**

26. Out of 7 consonants and 4 vowels, how many words of 3 consonants and 2 vowels can be formed?

- A. 24400
- B. 21300
- C. 210
- D. 25200**

27. From a group of 7 men and 6 women, five persons are to be selected to form a committee so that at least 3 men are there on the committee. In how many ways can it be done?

- A. 564
- B. 645
- C. 735
- D. 756**

E. None of these

28. What comes next in the sequence: 1, 2, 6, 22, _____ ?

- A. 82
- B. 84
- C. 86**
- D. 88

29. What is the sum of the sequence

$$\sum_{k=0}^4 (1 + k!)$$

- A. 36
- B. 37
- C. 38
- D. 39**

30. What is the 31st term of the sequence: 1, 4, 7, 10, ?

- A. 90
- B. 91**
- C. 92
- D. 93

UNIT IV

31. 1. A _____ is an ordered collection of objects.
- A. Relation
 - B. Function
 - C. Set**
 - D. Proposition
32. The set O of odd positive integers less than 10 can be expressed by _____
- A. {1, 2, 3}
 - B. {1, 3, 5, 7, 9}**
 - C. {1, 2, 5, 9}
 - D. {1, 5, 7, 9, 11}
33. The number of elements in the Power set $P(S)$ of the set $S = [[\Phi], 1, [2, 3]]$ is
- A. 2
 - B. 4
 - C. 8**
 - D. None of these
34. The number of elements in the Power set $P(S)$ of the set $S = [[\Phi], 1, [2, 3]]$ is
- A. 2
 - B. 4**
 - C. 8
 - D. None of these
35. The number of elements in the Power set $P(S)$ of the set $S = [[\Phi], 1, [2, 3]]$ is
- A. 2
 - B. 4
 - C. 8

D. None of these

36. The number of elements in the Power set $P(S)$ of the set $S = \{ \emptyset, 1, \{2, 3\} \}$ is

A. 2

B. 4

C. 8

D. None of these

37. The number of elements in the Power set $P(S)$ of the set $S = \{ \emptyset, 1, \{2, 3\} \}$ is

A. 2

B. 4

C. 8

D. None of these

38. Power set of empty set has exactly _____ subset.

a) One

b) Two

c) Zero

d) Three

39. What is the Cartesian product of $A = \{1, 2\}$ and $B = \{a, b\}$?

a) $\{(1, a), (1, b), (2, a), (2, b)\}$

b) $\{(1, 1), (2, 2), (a, a), (b, b)\}$

c) $\{(1, a), (2, a), (1, b), (2, b)\}$

d) $\{(1, 1), (a, a), (2, a), (1, b)\}$

40. What is the cardinality of the set of odd positive integers less than 10?

a) 10

b) 5

c) 3

d) 20

UNIT V

41. Two men on a surface want to meet each other. They have taken the point (0, 0) as meeting point. The surface is 3-D and its equation Given that they both play this game infinite number of times with their starting point as (908, 908) and (90, 180) (choosing a different path every time they play the game). Will they always meet?

a) They will not meet every time

b) They will meet every time

c) Insufficient information

d) They meet with probability $\frac{1}{2}$

42. Find $\lim_{(x,y,z) \rightarrow (0,0,0)} \frac{y^2 \cdot z^2}{x^3 + x^2 \cdot (y)^{\frac{4}{3}} + x^2 \cdot (z)^{\frac{4}{3}}}$

a) 1

b) 0

c) ∞

d) Does Not Exist

43. Find $\lim_{(x,y,z) \rightarrow (0,0,0)} \frac{\sin(x) \cdot \sin(y)}{x \cdot z}$

a) ∞

b) $\frac{1}{2}$

c) 1

d) Does Not Exist

44. Find $\lim_{(x,y,z) \rightarrow (2,2,4)} \frac{x^2 + y^2 - z^2 + 2xy}{x + y - z}$

a) ∞

b) 123

c) 9098

d) 8

45. Find $\lim_{(x,y,z,\omega) \rightarrow (0,0,0,0)} \frac{x^{-6} \cdot y^2 \cdot (z \cdot \omega)^3}{x + y^2 + z - \omega}$

a) 1990

b) ∞

c) Does Not Exist

d) 0

$$\lim_{(x,y,z,\omega) \rightarrow (3,1,1,11)} \frac{x^4 + y^2 + z^2 + 2x^2y + 2yz + 2x^2z - (\omega)^2}{x^2 + y + z - \omega}$$

46. Find

- a) 700
- b) 701
- c) 699
- d) 22**

$$\lim_{(x,y,z) \rightarrow (-2,-2,-2)} \frac{\sin((x+2)(y+5)(z+1))}{(x+2)(y+7)}$$

47. Given that limit exists find

- a) 1
- b) $\frac{1}{3}$**
- c) $\frac{1}{2}$
- d) 0

$$\lim_{(x,y,z) \rightarrow (-9,-9,-9)} \frac{\tan((x+9)(y+11)(z+7))}{(x+9)(y+10)}$$

48. Given that limit exist find

- a) 2
- b) 1
- c) 4**
- d) 3

$$\lim_{(x,y,z) \rightarrow (-1,-1,-1)} \frac{\tan((x-1)(y-2)(z-3))}{(x-1)(y-6)(z+7)}$$

49. Given that limit exists find

- a) 1
- b) $\frac{1}{2}$
- c) $\frac{1}{4}$
- d) $\frac{2}{3}$**

$$\lim_{(x,y,z) \rightarrow (2,2,2)} \left(\frac{\ln\left(1 + \frac{xy-2x-y+z}{xz-2x-6z+12} + \frac{xz-5x-2z+10}{xy-7y-2x+14}\right)}{(x-2)(y-2)(z-2)} \right)$$

50. Given that limit exists find

- a) ∞**
- b) 1
- c) 0
- d) $\ln(4)$

UNIT I

1. Variables of linear equation is implicitly raised to
 - A. first power**
 - B. second power
 - C. third power
 - D. four power
2. First step in graphing linear equation is to
 - A. identify and plot coordinates**
 - B. connect two points
 - C. extend the straight line
 - D. substitute values in intercept
3. Two equations that can be drawn as same line on graph then these equations are considered as
 - A. constant equations
 - B. solved equations
 - C. equivalent equations**
 - D. non-equivalent equations
4. Slope intercept form of linear equation is
 - A. $y = c + bx - ax$
 - B. $y = b + c - ax$
 - C. $y = c + b - ax$
 - D. $y = b + c - ax$**
5. Axes in three dimension coordinate system divide plane in three spaces called
 - A. quadrants**
 - B. space divider
 - C. dimension divider
 - D. octants
6. Set notation which states that 'S' contains (x,y) elements that satisfy linear equation $ax + by = c$ is
 - A. $\{(a,b,x,y) \mid ax+by = c\}$
 - B. $\{(x,y) \mid ax+by = c\}$**
 - C. $\{(a,b,c) \mid ax+by = c\}$
 - D. $\{(x,y,a) \mid abx+bcy = c\}$
7. Equation of straight line with slope -8 and y intercept (0,16) is written as
 - A. $8 = y + (-16)$
 - B. $y = -8x + 16$
 - C. $y = 16x + (-8)$**
 - D. $x = -8x + 16$
8. Ordered pair of x-intercept can be find by substituting the
 - A. $x = 0$

B. $a = 0$

C. $y = 0$

D. $b = 0$

9. For solution set, set builder notation is $S =$

A. $\{(a,b,c) \mid ax+by = c\}$

B. $\{(x,y,a) \mid abx+bcy = c\}$

C. $\{(a,b,x,y) \mid ax+bc = yc\}$

D. $\{(x,y) \mid ax+by = c\}$

10. Two variables x and y if involved in linear equation then equation is

A. $ax+by = c$

B. $ab+xy = c$

C. $ac+bx = y$

D. $ax+bc = y$

UNIT II

11. What will be ratio of simple to compound interest on two same sums invested in SBI at rate of interest of 8% kept for 3 years?

A. **1875/2029**

B. $1/2.5$

C. $1903/2156$

D. $4/9$

12. Raju invested Rs. 77500 in ICICI bank. In two years how much compound interest will he get, if the first year rate of interest was 10% and second year had 2% more than first year?

A. RS. 17850

B. **RS. 17980**

C. RS. 18963

D. RS. 16880

13. A has two grandsons P and Q. 13 year old P gets some money from A's wealth and 14 year old Q gets rest of the money. But P and Q will get money only when they turn 25 years old. Till then the money is in a bank getting interest at rate 4% compounded annually. When both turn 25, they receive the same amount. How much had A given Q initially, if total money with A was Rs.25500?

A. RS. 12500

B. **RS. 13000**

C. RS. 15000

D. RS. 11500

14. Ramesh gets double the amount in 9 years when invested at compound interest. In how many years will the amount become four times itself?

- A. 13.5 YEARS
- B. 27 YEARS
- C. 9 YEARS
- D. 18 YEARS**

15. At the end of 2 years difference between simple and compound interest is Rs. 2166. If the principal is Rs. 60000, then what is the rate of interest?

- A. 38%
- B. 18%
- C. 19%**
- D. 17%

16. Find the compound interest on Rs. 7500 at 4% per annum for 2 years, compounded annually.

- A. Rs. 610
- B. Rs. 612**
- C. Rs. 614
- D. Rs. 616

17. The present worth of Rs.169 due in 2 years at 4% per annum compound interest is

- A. Rs 155.25
- B. Rs 156.25**
- C. Rs 157.25
- D. Rs 158.25

18. At what rate of compound interest per annum will a sum of Rs. 1200 become Rs. 1348.32 in 2 years

- A. 3%
- B. 4%
- C. 5%
- D. 6%**

19. What will be the difference between simple and compound interest @ 10% per annum on the sum of Rs 1000 after 4 years

- A. Rs 62.10
- B. Rs 63.10
- C. Rs 64.10**
- D. Rs 65.10

20. Effective annual rate of interest corresponding to nominal rate of 6% per annum compounded half yearly will be

- A. 6.09%**
- B. 6.10%

- C. 6.12%
- D. 6.14%

UNIT III

21. What is the 11th term of the sequence: $m - 2n, m - n, m, \dots$?

- A. $m+n$
- B. $m-n$
- C. $m+6n$
- D. $m+8n$**

22. If the sum of the first $2n$ terms of the A. P. 2, 5, 8, , is equal to the sum of the first n terms of the A. P. 57, 59, 61, , then n equals

- A. 10
- B. 12
- C. 11**
- D. 13

23. Common difference of sequence 5, 8, 11, 14, ... is

- A. 3**
- B. -3
- C. 0
- D. 1

24. $2^1 + 2^2 + 2^3 + \dots + 2^n =$

- A. $2(2^n - 1)$**
- B. $2(2^{n-1} - 1)$
- C. $2(2^{n+1} - 1)$
- D. None of Above

25. If A, G, H are arithmetic, geometric and harmonic means between a and b respectively, then A, G, H are

- A. in G.P**
- B. in A.P
- C. in H.P
- D. Real numbers

26. 5th term of G.P 3, 6, 12, ... is

- A. 15
- B. 48**

- C. 2
- D. 3

27. Series obtained by adding term of arithmetic sequences is called

- A. harmonic series
- B. geometric series
- C. arithmetic series**
- D. infinite series

28. If n is total number of geometric mean between a and b then n th geometric mean between a and b is

- A. $a(b/a)^{n/n+1}$
- B. $a(b/a)^{n/n+1}$**
- C. $b(a/b)^{n/n+1}$
- D. ab

29. Sum of an infinite geometric series exist only if condition on common ratio r is

- A. $-1 < r < 1$**
- B. $-1 \leq r \leq 1$
- C. $r < -1, r > 1$
- D. $r \leq -1, r \geq 1$

30. If $a^{n+2} + b^{n+2}/a^{n+1} + b^{n+1}$ is geometric mean between a and b , then $n =$

- A. -1
- B. 1
- C. -2
- D. -0.5**

UNIT IV

31. Which of the following two sets are equal?

- a) $A = \{1, 2\}$ and $B = \{1\}$
- b) $A = \{1, 2\}$ and $B = \{1, 2, 3\}$
- c) $A = \{1, 2, 3\}$ and $B = \{2, 1, 3\}$**
- d) $A = \{1, 2, 4\}$ and $B = \{1, 2, 3\}$

32. The set of positive integers is _____

a) Infinite

b) Finite

c) Subset

d) Empty

33. What is the Cardinality of the Power set of the set $\{0, 1, 2\}$.

a) 8

b) 6

c) 7

d) 9

34. The members of the set $S = \{x \mid x \text{ is the square of an integer and } x < 100\}$ is

a) $\{0, 2, 4, 5, 9, 58, 49, 56, 99, 12\}$

b) $\{0, 1, 4, 9, 16, 25, 36, 49, 64, 81\}$

c) $\{1, 4, 9, 16, 25, 36, 64, 81, 85, 99\}$

d) $\{0, 1, 4, 9, 16, 25, 36, 49, 64, 121\}$

35. Set of rational numbers Q is a subset of

A. the set of Natural numbers

B. The set of integers

C. The set of Complex numbers

D. The set of Even integers

36. For any subset A and B of U , $(A \cap B)^c$

A. $A \cap B$

B. $A \cup B$

C. π

D. $A^c \cap B^c$

37. For a set A and universal set U , $A \cap A^c$

A. A

B. A^c

C. π

D. U

38. A subset of $B \times A$ is called a

- A. relation from A to B
- B. Relation from B to A**
- C. Relation in A
- D. relation in B

39. Number of subsets of a set of 4 elements

- A. 16**
- B. 8
- C. 4
- D. 6

40. $(A \cup B) \cup C =$

- A. $A \cap (B \cup C)$
- B. $A \cup (B \cap C)$
- C. π
- D. $A \cup (B \cup C)$**

UNIT V

$$\lim_{(x,y,z) \rightarrow (0,0,0)} \left(\frac{\cos\left(\frac{\pi}{2} - x\right) \cdot \tan(y) \cdot \cot\left(\frac{\pi}{2} - z\right)}{\sin(x) \cdot \sin(y) \cdot \sin(z)} \right)$$

41. Given that limit exists

- a) 99
- b) 0
- c) 1**
- d) 100

42. Two men on a 3-D surface want to meet each other. The surface is given by

$f(x, y) = \frac{x^{-6} \cdot y^7}{x + y}$. They make their move horizontally or vertically with the X-Y plane as their reference. It was observed that one man was initially at (200, 400) and the other at (100, 100). Their meet point is decided as (0, 0). Given that they travel in straight lines, will they meet?

- a) They will meet
- b) They Will not meet**
- c) They meet with probability $\frac{1}{2}$
- d) Insufficient information

43. The two types of errors that are related to differentials are:

- a) Human, Absolute.
- b) Absolute, Relative.**
- c) Relative, Controllable.
- d) Controllable, Natural.

44. Mathematically, what is a differential?

- a) A gear box on the back end of your car.
- b) A word used a lot on a popular medical television series.
- c) A method of directly relating how changes in an independent variable affect changes in a dependent variable.**
- d) A method of directly relating how changes in a dependent variable affect changes in an independent variable.

45. It has been determined that $g(p)$ has a maximum at $p = -47.6$. What can be said of the function's concavity at that point?

- a) $g''(p) = 0$
- b) $g''(p) > 0$
- c) $g''(p) < 0$**
- d) There's no way to tell without first knowing what the specific function is

46. Does $f(c) = (c + 2)^3 - 2$ have an inflection point? If so, where is it located?

- a) Yes, at $(-2, -2)$.**
- b) Yes, at $(2, -2)$.
- c) Yes, at $(8, -2)$.
- d) No.

47. If $f(x) = 3x^2$, then $F(x) =$

- a) $6x$
- b) x^3
- c) $x^3 + C$**
- d) $6x + C$

48. The 2nd derivative of a function at point P is 0, and concavity is positive for values to the right of P. What must the concavity be to the left of P for P to be an inflection point?

- a) The concavity must also be positive.
- b) The concavity must be negative.**
- c) The concavity must be neutral (0).
- d) The concavity must be imaginary.

49. At what value of q is the concavity of $w(q) = -2$, if $w(q) = q^4 - 16$?

- a) At $q =$ fourth root of 14.
- b) At $q = 0$.
- c) Never; $w(q)$ is always concave down.
- d) Never; $w(q)$ is always concave up.**

50. $G(d)$ was determined to be $3d + C$; here, C is called:

- a) the constant of differentiation.
- b) the constant of anti-differentiation.
- c) the constant of integration.**
- d) the constant of death and taxes.

UNIT I

1. Solve the following linear equations (i) $2x+5y-9=0$ & $3x-y-5=0$ (ii) $x^2-5x+6=0$
2. List out the rules of indices with examples.
3. Mr. Singh deposits a sum of Rs.9500 in two different banks which give 5% and $7\frac{1}{2}\%$ simple interest. If the amount repayable by the 2 banks at the end of 7 years are equal. Find the individual amount of deposits in each bank.
4. A man left for his 3 sons aged 10 years, 12 years and 14 years, an amount of Rs.10,000, Rs.8,000 and Rs.6,000 respectively. Money is invested at 3%, 6% and 10% compound interest respectively. They will receive the amount when each one of them completes the age of 20 years. Find out how much each will receive.
5. Evaluate each of 5P_3 , ${}^{10}P_2$, ${}^{11}P_5$
6. The sum of 3 numbers in AP is 24 and the product is 440. Find the numbers.
7. Evaluate $\lim_{x \rightarrow \infty} \frac{1}{x}$
8. Given that $A = \{0,1,3,5\}$, $B = \{1,2,4,7\}$ and $C = \{1,2,3,5,8\}$, prove that
$$\begin{array}{l} A \cup B \cap C = A \cap C \cup B \cap C \\ A \cap B \cup C = A \cup C \cap B \cup C \end{array}$$
9. If $xy = ae^{bx}$, prove that $x \frac{d}{dx} y = 2 \frac{dy}{dx} - xy = 0$
10. $\int \frac{1}{x^2} dx$

UNIT II

11. Ram deposited Rs. 10,000 on 1.1.07. At the end of 6 months he withdrew Rs. 4,000. Find the interest due to him on 31.12.07. Rate of interest is 11% p.a.
12. Find the total interest on Rs. 325 for 65 days, Rs. 475 for 100 days and Rs. 550 for 82 days @ 6% p.a.
13. A sum amounts to Rs. 20,800 in 5 years and Rs. 22,720 in 7 years. Find principal and rate of interest.
14. Mr. X borrows Rs. 20,000 at 4% CI and agrees to pay both the principal and the interest in 10 equal installments at the end of each year. Find the amount of installment under annuity method.
15. The sum of 3 numbers in AP is 24 and the product is 440. Find the numbers.
16. A man repays a loan of Rs. 3,250 by paying Rs. 20 in 1st month and increases the payment of Rs. 50 p.m. How long it will take to repay the loan?
17. Solve $3x^2 + 2y^2 = 36$, $5x^2 + 4y^2 = 64$

18. Solve (i) $3x - 8x - 4 = 0$

(ii) $5x - 4x - 2 = 0$

19. Find the (i) Compound ratio of 2:3, 9:4, 5:6 and 8:10.

(ii) Sub-triplicate ratio of 8:27

(iii) 3rd proportion to 2.4 and 9.6

20. Find in what ratio will the total wages of the workers of a factory be increased or decreased if there be a reduction in the number of workers in the ratio 15:11 and an increment in their wages in the ratio 22:15.

UNIT III

21. If thrice of A's age 6 years ago be subtracted from twice his present age, the result would be equal to his present age. Find A's present age.

22. The total cost curve of the number of copies of a particular photograph is linear. The total cost of 5 and 8 copies of a photograph are Rs.80 and Rs.116, respectively. Find the total cost for 10 copies of the photograph.

23. Prove that the lines $3x-4y+5=0$, $7x-8y+5=0$ and $4x+5y=45$ are concurrent

24. In a class of 60 students, 40 students like Maths, 36 likes Science, and 24 like both the subjects. Find the number of students who like

- i) Maths only ii) Science only iii) either Maths or Science iv) Neither Maths nor Science

25. I) If $f(x) = x+3$, $g(x) = x^2$, then $f \circ g(x)$ is

II) If $f(x) = x+3$, $g(x) = x^2$ then $f(x) \cdot g(x)$ is

26. Let $A = \{1, 2, 3\}$, $B = \{3, 5, 7, 8\}$ and f from A to B is defined by

$$f : x \rightarrow 2x + 1 \text{ i.e. } f(x) = 2x + 1.$$

- Find $f(1)$, $f(2)$, $f(3)$
- Show that f is a function from A to B
- Identify domain, co-domain, images of each element in A and range of f
- Verify that whether the range is equal to co-domain

27. (If $A = \{1, 2, 3, 4\}$, $B = \{2, 4, 6, 8\}$, and $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$, verify De Morgan's law.

28. Evaluate $\lim_{h \rightarrow 0} \frac{\sqrt{h} - \sqrt{h}}{h}$

29. Evaluate $\lim_{t \rightarrow 1} \frac{1}{1}$

30. Find the derivative of $\frac{1}{\sqrt{x}} = 3e^{-2} - 2\log x$

UNIT IV

31. $2x^2 - 3xy + y^2 = 0$, find $\frac{dy}{dx}$, when $x = 0$
32. Find the elasticity of demand for the function $y = 100 - x - x^2$, when $y = 70$.
33. Evaluate $30\sqrt{x} - \frac{10}{\sqrt{x}} dx$
34. Cost of selling 'x' units is $T = 500 - 4x + 7x^2$. find the selling cost of 101st unit.
35. An investor intends purchasing a three year Rs.1000 par value bond having nominal interest rate of 10%. At what price the bond may be purchased now if it matures at par and the investor requires a rate of return of 14%?
36. If the roots of the equation $p(q-r)x^2 + q(r-p)x + r(p-q) = 0$ are equal show that $2/q = 1/p + 1/r$.
37. Explain the various types of function under limits.
38. If $A = \{1,5\}$; $B = \{6,7,8,9\}$ and $C = \{6,7,10\}$ prove that
(i) $A \times (B \cup C) = (A \times B) \cup (A \times C)$
(ii) $A \times (B \cap C) = (A \times B) \cap (A \times C)$
39. A person has 2 daughters A and B aged 13 and 16 years. He has Rs. 40,000 with him now but wants that both of them should get an equal amount when they are 20 years old. How he should divide the money if it were to be deposited in a bank giving 9% CI p.a.?
40. If $g(x) = -6x + 5$ and $h(x) = -9x - 11$, find $(g \circ h)(x)$

UNIT V

41. Find the range of the function given its domain in each of the following cases:
- (i) $f(x) = 3x + 10$, $x \in \{1,5,7, -1, -2\}$
- (ii) $f(x) = 2x + x + 1$, $x \in \{1,2,3,4,5\}$
42. Out of a group of 60 students, 25 play Cricket, 30 play Football, 24 play Hockey, 10 play Cricket and Football, 9 play Cricket and Hockey, 12 play Hockey and Football and 5 play all the three. Use Venn-diagram to show how many play only one game.
43. Evaluate $\lim_{x \rightarrow 0} \frac{\sqrt{x+1} - \sqrt{x-1}}{\sqrt{x+1} + \sqrt{x-1}}$
44. A sum of money amounts to Rs. 20,800 in 5 years and Rs. 22,720 in 7 years. Find the principle and rate of interest.
45. The annual membership fee of an association is Rs. 3,000. Dr. Pandian is eager to become a life member by paying a lump sum. Assuming the expectation of life of a man of his age is 20 yrs and rate of CI is 15%, how much should the association charge now?
46. Find the 3 numbers in AP such that the sum is 27 and their product is 504.

47. Which term of the series 3,6,12,... is 768?

48. Examine the following function for maximum or minimum, $y = 3x^3 - 16x^2 + 18x - 20$

49. Solve $5x^2 - x - 650 = 0$

50. Find the compound interest on Rs. 10,000 in 2 years at 4% per annum, the interest being compounded half-yearly.

UNIT I

1. Draw a graph of the straight lines $3x+4y = 10$ and $2x-y = 0$. Find the point of intersection of these lines.
2. Solve for x, y and z:

$$\begin{array}{l} \text{i. } 2x - \quad \quad \quad 3, \\ \text{ii. } x \quad 3 - 2 \quad \quad 11, \\ \text{iii. } 3x - 2 \quad 4 \quad \quad 1 \end{array}$$

3. Graph the inequalities $5x - 4x \geq 9$,
 - a. $x - x \geq 3$,
 - b. $x \geq 0$ &
 - c. $x \geq 0$
4. A person buys national savings certificate of value exceeding the last years purchase by Rs.200. After 10 years, he finds that the total value of the certificates purchased by him is Rs.10,500. Find the value of the certificates purchased by him in the first year & in the seventh year.
5. The sum of 3 numbers in GP is 35 and their product is 1000. Find the numbers.

UNIT II

6. Find the Elasticity of demand for the function $100 - x - x$, when 70
7. Evaluate $\int \text{—————}$
8. Mr. X has 2 daughters A and B aged 10 – and 16 years respectively. He has Rs. 1,80,000 with him now, but wants that both of them should get an equal amount when they are 18 years old. How he should divide the money if it were to be deposited with his friend who gives only 5% SI p.a.
9. Solve :

$$\begin{array}{l} \text{i. } 4x - 3 \quad \quad - 10, \\ \text{ii. } 2x \quad \quad 3 \quad \quad 0, \\ \text{iii. } -x \quad 2 - 5 \quad \quad 17 \end{array}$$

10. Find the 3 numbers in GP whose sum is 39 and product is 729.

UNIT III

11. The 4th and 7th term of an AP is 3 and 36. Find the AP and 15th term.
12. Find the sum of all integers between 200 and 500 which are divisible by 7.
13. The monthly income of two persons is in the ratio 4:5 and their monthly expenditures are in the ratio 7:9. If each saves Rs.50 per month, find their monthly incomes.

14. P, Q and R are three cities. The ratio of average temperature between P and Q is 11:12 and that between P and R is 9:8. Find the ratio between the average temperature of Q and R.

15. Simplify using $(a-b)^3 = a^3 - b^3 - 3ab(a-b)$ prove that $x^3 + 3x = p - 1/p$ when $x = p^{1/3} - p^{-1/3}$.

UNIT IV

16. If the numerator of a fraction is increased by 2 and the denominator by 1 it becomes 1. Again if the numerator is decreased by 4 and the denominator by 2 it becomes $\frac{1}{2}$. Find the fraction.

17. Examine the nature of the root of the following equation $5x^2 - 4x + 2 = 0$

18. Solve $4^x - 3 \cdot 2^x + 32 = 0$

19. Prove that (3, 1), (5, -5) and (-1, 13) are collinear and find the equation of the line through these three points.

20. If $3x^4 - 4x^2$, prove that $\frac{d}{dx} \frac{y}{x} = 2 \frac{dy}{dx} - 6$

UNIT V

21. In a school of 500 students, 65 do not play any game, 200 play cricket, 180 play football, 260 play volleyball, 50 play both cricket and football, 85 play both football and volleyball and 100 play both volleyball and cricket.

i) How many play all the three?

ii) How many play cricket only?

iii) How many play only one game?

22. $x^3 - 3x^2 - 6x + 6$, find $\frac{d}{dx} \frac{y}{x}$, when $x = 0$

23. Find the maximum and minimum values of the function $5 - 3x - x^2$

24. $\int \frac{1}{x^2} dx$

25. (a) $\lim_{x \rightarrow 0} \frac{1}{x}$

a. (b) Evaluate $\lim_{x \rightarrow 0} \frac{1}{x}$