CBSE & State Boards

UNSOLVED PAPERS

MATHEMATICS

CHAPTER WISE

& SUB- TOPICWISE

Question Bank

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CONTENT

Syllabus

I. Relations and Functions **15 Periods**

Types of relations: reflexive, symmetric, transitive and equivalence relations. One to one and onto functions.

II. Inverse Trigonometric Functions **15 Periods**

Definition, range, domain, principal value branch. Graphs of inverse trigonometric functions.

III. Matrices **25 Periods**

Concept, notation, order, equality, types of matrices, zero and identity matrix, transpose of a matrix, symmetric and skew symmetric matrices. Operations on matrices: Addition and multiplication and multiplication with a scalar. Simple properties of addition, multiplication and scalar multiplication. Non- commutativity of multiplication of matrices and existence of non-zero matrices whose product is the zero matrix (restrict to square matrices of order 2). Invertible matrices and proof of the uniqueness of inverse, if it exists; (Here all matrices will have real entries).

IV. Determinants **25 Periods**

Determinant of a square matrix (up to 3 x 3 matrices), minors, co-factors and applications of determinants in finding the area of a triangle. Adjoint and inverse of a square matrix. Consistency, inconsistency and number of solutions of system of linear equations by examples, solving system of linear equations in two or three variables (having unique solution) using inverse of a matrix.

V. Continuity and Differentiability **20 Periods**

Continuity and differentiability, chain rule, derivative of inverse trigonometric functions, $\sin^{-1}$, $\cos^{-1}$ and $\tan^{-1}$, derivative of implicit functions. Concept of exponential and logarithmic functions.

Derivatives of logarithmic and exponential functions. Logarithmic differentiation, derivative of functions expressed in parametric forms. Second order derivatives.

VI. Applications of Derivatives **10 Periods**

Applications of derivatives: rate of change of quantities, increasing/decreasing functions, maxima and minima (first derivative test motivated geometrically and second derivative test given as a provable tool). Simple problems (that illustrate basic principles and understanding of the subject as well as real-life situations).

VII. Integrals 20 Periods

Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, Evaluation of simple integrals of the following types and problems based on them.

$$\int \frac{dx}{x^2 \pm a^2}, \int \frac{dx}{\sqrt{x^2 \pm a^2}}, \int \frac{dx}{\sqrt{a^2 - x^2}}, \int \frac{dx}{ax^2 + bx + c}, \int \frac{dx}{\sqrt{ax^2 + bx + c}}$$

$$\int \frac{px + q}{ax^2 + bx + c} dx, \int \frac{px + q}{\sqrt{ax^2 + bx + c}} dx, \int \sqrt{a^2 \pm x^2} dx, \int \sqrt{x^2 - a^2}\, dx$$

$$\int \sqrt{ax^2 + dx + c}\, dx$$

Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals.

VIII. Applications of the Integrals **15 Periods**

Applications in finding the area under simple curves, especially lines, circles/ parabolas/ellipses (in standard form only)

IX. Differential Equations **15 Periods**

Definition, order and degree, general and particular solutions of a differential equation. Solution of differential equations by method of separation of variables, solutions of homogeneous differential equations of first order and first degree. Solutions of linear differential equation of the type:

$\frac{dy}{dx} + py = q$, where p and q are functions of x or constants.

$\frac{dy}{dx} + px = q$, where p and q are functions of y or constants.

X. Vectors **15 Periods**

Vectors and scalars, magnitude and direction of a vector. Direction cosines and direction ratios of a vector. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Definition, Geometrical Interpretation, properties and application of scalar (dot) product of vectors, vector (cross) product of vectors.

XI. Three - dimensional Geometry **15 Periods**

Direction cosines and direction ratios of a line joining two points. Cartesian equation and vector equation of a line, skew lines, shortest distance between two lines. Angle between two lines.

XII. Linear Programming **20 Periods**

Introduction, related terminology such as constraints, objective function, optimization, graphical method of solution for problems in two variables, feasible and infeasible regions (bounded or unbounded), feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints).

XIII. Probability **30 Periods**

Conditional probability, multiplication theorem on probability, independent events, total probability, Bayes' theorem, Random variable and its probability distribution, mean of random variable.

01.

Relations And Functions

A. Relations and its types (Reflexive, symmetric, transitive and equivalence relations)

Section-A : Multiple Choice Questions

1. If set A = (x/x is a measure of an angle of scalene triangle), then the number of equivalence relations containing (measure of minimum angle, measure of maximum angle) is

(a) 8 (b) 2
(c) 3 (d) 1

Gujarat Board-July, 2018

Ans. (a)

2. Number of relations on a set with 5 elements is

(b) 5 (c) 25
(d) 2^5 (d) 2^{25}

WB Board-2024

Ans. (d)

3. The relations R in the set {1, 2, 3} given by R = {(1, 1), (2, 2), (1, 2), (2, 3), (3, 3)} is

(a) Reflexive
(b) Reflexive and symmetric
(c) Reflexive and transitive
(d) Symmetric and transitive

Karnataka Board-2024

Ans. (a)

4. A relation R = [(a, b):a = b – 2,b ≥ 6] is defined on the set N, then the correct answer will be.

(a) $(2, 4) \in R$ (b) $(3, 8) \in R$
(c) $(6, 8) \in R$ (d) $(8, 7) \in R$

UP Board-2018, 2022
Nagaland Board-2020
Gujarat Board- March, 2020, August, 2020

Ans. (c)

5. R is a relation on the set Z of integers and is given by $(x,y) \in R \Leftrightarrow |x-y| \le 1$ then R is.

(a) Reflexive and transitive
(b) Reflexive and symmetric
(c) Symmetric and transitive
(d) An equivalence relation

UP Board-2020

Ans. (b)

6. If L is a set of all straight lines in any plane and relation R = {(L_1, L_2) : L_1 is perpendicular to L_2} is defined in L. Select the correct answer from the following:

(a) R is reflexive (b) R is symmetric
(c) R is transitive (d) None of these

UP Board-2022

Ans. (b)

7. The relation R is defined in the set {1, 2, 3, 4} as follows:
R = { (1, 2), (2, 2), (1, 1), (4, 4), (1, 3), (3, 3), (3, 2)} This relation R is

(a) Reflexive and symmetric, but not transitive
(b) Reflexive and transitive, but not symmetric
(c) Symmetric and transitive but not reflexive
(d) An equivalence relation.

UP Board-2020

Ans. (b)

8. If the number of elements of two finite sets A and B are m and n respectively, then total number of relations from A to B will be

(a) 2^{m+n} (b) 2^{mn}
(c) m×n (d) m + n

UP Board-2023

Ans. (b)

9. In the set {1, 2, 3, 4, 5, 6}, the relation R defined by $R = \{(a,b) : b = a+1\}$ will be

(a) not reflexive and symmetric, but transitive
(b) not reflexive and transitive, but symmetric
(c) not reflexive not symmetric and not transitive
(d) not symmetric and transitive, but reflexive.

UP Board-2023

Ans. (c)

10. A relation R = {(a, b) : a = b – 1, b > 4} is defined on set N then correct answer will be :

(a) (2, 4) (b) (4, 5)
(c) (4, 6) (d) (3, 5)

UP Board-2023

Ans. (b)

11. Write the correct option from the following if R (a, b): a and b both are either even or odd in the set
A { 1, 2, 3, 4, 5, 6,7 } :

(a) No relation
(b) Trivial
(c) Equivalence relation
(d) Not symmetric.

UP Board-2019

Ans. (a)

12. Let A be the set of all lines in a plane. The relation R is defined on A such that aRb holds if line a and line b are perpendicular to each other when a, b ∈ A. Then R is

(a) reflexive but not symmetric
(b) reflexive but not transitive
(c) equivalence relation
(d) symmetric but not transitive

NIOS-2018

Ans. (a)

13. Relation given by R = {(1, 1), (2, 2), (1, 2), (2, 1)} is

(a) reflexive only
(b) symmetric only
(c) transitive only
(d) equivalence relation

Punjab Board-2021

Ans. (d)

14. In the set of all straight lines in a plane, the relation R to be perpendicular is .

(a) Reflexive and transitive
(b) Symmetric and transitive
(c) Symmetric
(d) None of these

Bihar Board-2019

Ans. (c)

15. How many distinct relations can be defined on the set A = {1, 2} ?

(a) 16 (b) 8
(c) 4 (d) none of these

Bihar Board-2022

Ans. (a)

16. The relation R on the set of rational number defined by R = {(x , y) : x,y ∈ Q and x < y} is

(a) Reflexive (b) Symmetric
(c) Transitive (d) None of these

Manipur Board-2017

Ans. (c)

17. If $f(x) = \sqrt{2 - x^2}$, then f o f (x) = ……

(a) x (b) x^2
(c) $2 - x^2$ (d) $\sqrt{x}$

Goa Board-2019

Ans. (a)

18. If R is a relation defined on set of integers z, such that R = {(a, b): |a – b| is a multiple of 3} then R is _____

(a) Reflexive but not symmetric
(b) Symmetric but not reflexive
(c) Symmetric and reflexive
(d) Neither reflexive nor symmetric

Goa Board-2018

Ans. (c)

19. What type of relation is R = {(a, b), (b, c), (b, a), (c, b)} on the set A = {a, b, c} ?

(a) Reflexive (b) Symmetric
(c) Transitive (d) None of these

Jharkhand Board-2023

Ans. (b)

20. If relation R defined on set A is an equivalence relation then R is:

(a) Reflexive only
(b) Symmetric only
(c) Transitive only
(d) All the three above reflexive, symmetric & transitive

Haryana Board-2016

Ans. (d)

21. Let A = {1, 2, 3}, then number of Equivalence relations containing (1, 2) is :

(a) 1 (b) 2
(c) 3 (d) 4

MP Board-2019

Ans. (b)

22. Let A = {1, 2, 3}, then number of relations containing (1,2) and (1,3) which are reflexive and symmetric but not transitive is–

(a) 1 (b) 2
(c) 3 (d) 4

MP Board-2020

Ans. (a)

23. If A = {x, y, z} and B = {1, 2, 3, 4, 5}, then write the domain of the relation
R = {(x, 2), (x, 3), (y, 1), (y, 5), (y, 4)} from A to B

(a) {x, y, z} (b) {x, y}
(c) {x, z} (d) {z}

Odisha Board-2022

Ans. (b)

24. Consider the set A = {1, 2, 3, 4}. Which one of the following relation R form a reflexive relation?

(a) R = {(1, 1), (1, 2), (2, 2), (3, 4)}
(b) R = {(1, 2), (2, 2), (2, 3), (3, 3), (3, 4)}
(c) R = {(1, 1), (2, 2), (2, 3), (3, 3), (3, 4), (4, 4)}
(d) R = {(1, 1), (2, 1), (2, 3), (3, 3), (3, 4), (4, 4)}

Nagaland Board-2017

Ans. (c)

25. If the relation is defined on R – {0} by (x, y) ∈ S ⇔ xy > 0, then S is ..... .

(a) an equivalence relation
(b) symmetric only
(c) reflexive only
(d) transitive only

Gujarat Board-March, 2018

Ans. (a)

Section-B : Very Short Answer

26. If O(A) = 3 and O(B) = 5, then the total number of onto relations that can be defined from set A to set B is____
[30, 60, 10, 45]

Odisha Board-2022

27. A = {a, b, c} and R = {(a, a), (b, b), (c, c), (a, b), (b, c)} is a relation defined on A. The relation R is ____
[reflexive, symmetric, transitive, equivalence relation]

Odisha Board-2022

28. A Relation R in a set A is said to be_____ relation if R is reflexive, symmetric, and transitive.

MP Board-2024

29. In set A {4,5,6} number of equivalence relations containing (4,5) is…….

MP Board-2022

30. Show that the relation $R = \left\{(m,n) : \frac{m}{n} \text{ is a power of } 5\right\}$ on Z – {0} is an equivalence relation.

Odisha Board-2023, 2024

31. Write the relation R = {(x, y) : x – 2y = 0} on A = { 1, 2, 3, 4, 5, 6} in tabular form R = {(x, y) : x – 2y = 0}

Odisha Board-2024

32. Show that the relation R in the set {1, 2, 3} given by {(1, 2), (2, 1) (2, 3), (3, 2)} is symmetric but neither reflexive nor transitive.

MP Board-2024

33. R is a relation on a set of natural number N defined by R = {(a, b): a, b ∈ N and $a = b^2$}.
Is (a, b) ∈ R, (b, c) ∈ R ⇒ (a, c) ∈ R true? Justify it by one example.

UP Board-2024

34. If A = {1, 2, 3}, B = {4, 5}, then find the number of relations from A to B.

UP Board-2024

35. If R_1 and R_2 be two equivalence relations in a set A, then prove that $R_1 \cap R_2$ is also an equivalence relation in A.

UP Board-2020, 2024

36. Prove that a relation R = {(a, b)} divides (a – b) on the set integers Z, is an equivalent relation.

UP Board-2022

37. If A = {a, b}, B = { 2, 3}, C = {3, 7}
then find A = (B ∪ C)

UP Board-2022

38. If A = { a, b, c} and B {1, 2}, then find number of relations from A to B.

UP Board-2023

39. Show that the relation R ={(a, b) : a > b} on N is transitive but not symmetric.

NIOS-2023

40. Show that the relation R in set of real number R defined as R = {(a, b): a≤b}, is reflexive and transitive.

Uttarakhand Board-2023

41. Show by examples that the relation R in R defined by R = {(a, b) : $a \le b^3$} is neither reflexive nor transitive.

CBSE-2019

42. Prove that the relation R in R, the set of all real numbers, defined as R = {(a, b) : $a \le b^2$} is neither reflexive nor transitive.

CBSE-2019

43. If R is an equivalence relation on A, then link the domain of R and the range of R.

Odisha Board-2023

44. Test whether the relation
$R = \{(m,n) : 2 \mid (m+n)\}$
On Z is reflexive, symmetric or transitive.

Odisha Board-2020

45. Let R be a relation on the set R of real numbers such that aRb iff a – b is an integer Test whether R is an equivalence relation If so, find the equivalence class of 1 and $\frac{1}{2}$.

Odisha Board-2019

46. If R is a relation on A such that $R = R^{-1}$ then write the type of the relation R.

Odisha Board-2019

47. Define a symmetric relation.

Manipur Board-2022

48. Prove that relation R in set of integers Z given by R = {(a, b):
(a – b) is divisible by number 2} is an equivalence relation.

CG Board-2021

49. If $R = \{(1,-1),(2,-2),(3,-1)\}$ is a relation, then find the domain and range of R.

Meghalaya Board-2021

50. Determine the relation R on the set of whole numbers ≤ 10 defined by
$R = \{(x, y) | 2x + 3y = 12\}$.

Assam Board-2020

51. A = {x : 1 < x < 10, x is an odd natural number} and B = {y : 90 < y < 100. y is a prime number}. Write the number of relations from A to B.

Assam Board-2019

52. Let A = {1, 2, 3}. For x, y ∈ A, let xRy if and only if x > y. Write down R as a subset of A × A.

Assam Board-2016

53. If A = {0, 1, 3}, what is the number of relations on A?

Assam Board-2015

54. Given that R = {(a, b) | 3divides a – b} is an equivalence relation in the set of integers Z. What is the number of partitions of Z?

Nagaland Board-2017

Assam Board-2013

55. Check whether the relation R defined in the set {1, 2, 3, 4, 5, 6} as R = {a, b} : b = a + 1} is reflexive, symmetric or transitive.

MP Board-2020

Section-C : Short Answer

56. If R_1 and R_2 be two equivalence relations in a set A, then prove that $R_1 \cap R_2$ is also an equivalence relation in A.

UP Board-2024

57. Show that the relation R in the set of real numbers R defined as R = {(a, b) : a ≤ b} is Reflexive and Transitive but not symmetric.

Karnataka Board-2024

Assam Board-2017

58. Show that the relation R in the set Z of integers given by R = {(a, b): 2 divides a – b} is an equivalence relation

J&K Board-2024

UP Board-2022, 2023

CBSE-2019

59. If R is the relation ‘‘less than" from A = {1, 2, 3, 4, 5} to B = {1, 4, 5}, find the set of ordered pairs corresponding to R. Also define this relation from B to A.

UP Board-2024

60. Prove that a relation R on N × N is defined as (a, b) R (c, d) ⇔ ad = bc is an equivalence relation.

UP Board-2024

61. Show that a relation R = {(a, b): (a – b) is a multiple of 5} on the set Z = set of integers in an equivalence relation.

UP Board-2018, 2023, 2024

62. Show that a relation

$R = \{(a,b) \in z \times z : (a-b)\}$ is divisible by 7 in the set of integers is an equivalence relation.

UP Board-2020

63. If P(x) = set of all subsets of X, where $X \neq \phi$, a relation R is defined on P(x) as ARB if and only if $A \subset B$. Prove that R is not an equivalence relation .

UP Board-2022

64. If in the set of integers Z,

R = {(a, b) ∈ Z × Z : (a – b) is divisible by 5} be a given relation, then is R an equivalence relation?

UP Board-2021, 2023

NIOS-2018

65. A relation R =

$\{(x,y) : \text{Number of pages in x and y are equal}\}$ is defined on the set A of all books in a college library. Prove that R is an equivalence relation.

UP Board-2023

66. Find whether the relation R defined by (a, b) R (c, d) ⇔ a + d = b + c on the N × N is an equivalence relation?

NIOS-2023

Manipur Board-2019

67. Find whether the relation R on the set Z of all integers defined by (x,y) ∈R ⇔ x – y is divisible by equivalence relation on Z.

NIOS-2019, 2023

Assam Board-2022

68. Show that the relation R defined in the set A of all triangles as R = {(T_1, T_2): T_1 is similar to T_2} is an equivalence relation.

Karnataka Board-2020

69. Show that the relation R in the set Z of integers given by, R = {(x, y) : 5 divides x –y} is an equivalence relation. Find the set of all elements related to 0.

Assam Board-2016

70. Let L be the set of all lines in the xy-plane and R be the relation in L defined by $R = \{(l_i, l_j) | l_i \text{ parallel to } l_j, \forall i, j\}$. Show that R is an equivalence relation. Find the set of all lines related to the line y = 7x + 5.

Assam Board-2015

71. Show that the intersection of two equivalence relations in a set is again an equivalence relation in the set.

Assam Board-2013

72. Show that relation “is Equal to” in sets is an Equivalence relation.

MP Board-2019

73. Examine that the relation R in the set {1,2,3} given by R={(1,1),(2,2),(3,3),(1,2),(2,3)} is reflexive but neither symmetric nor transitive.

MP Board-2022

UP Board-2021

74. R = {(m, n) ∈ N^2 | m +n ≥ 50} is a relation on the set of counting number N. Verify the relation or reflexive, symmetric or transitive.

Odisha Board-2022

Section-D : Long Answer

75. Let N denotes the set of all natural number. Show that the relation R on the set N × N defined by (a, b)R(c, d) ⇔ ad(b + c) = bc(a + d)∀(a, b), (c, d) ∈ N × N is an equivalence relation.

NIOS-2022

Gujarat Board-July, 2016

76. Prove that the relation R in the set A = {1, 2, 3, 4, 5, 6, 7} given by R = {(a, b) : |a – b| is even} is an equivalence relation.

CBSE-2019

77. A relation R in the set $A = \{x \in Z : 0 \le x \le 12\}$ is given by $R = \{(a, b) : |a - b| \text{ is a multiple of } 4\}$.

Prove that R is an equivalence relation. Find the set of all elements related to 1.

Assam Board-2020

78. Let L be the set of all lines in XY-plane and R be the relation in L defined as R = {(l_1, l_2) : l_1 is paraliel to l_2}.

Show that R is an equivalence relation. Find the set of all lines related to the line y = 2x + 4.

Assam Board-2018

B. Function and its type (one-one, onto into etc)

Section-A : Multiple Choice Questions

79. If f : Z → Z, where Z is the set of integers is defined as f (x) = 3x then

(a) f is both one-one and onto
(b) f is many one and onto
(c) f is one-one but not onto
(d) f is neither one-one nor onto

Karnataka Board-2024

Ans. (c)

80. The function f : N →N defined by f (n) = 2n + 3 is

(a) One-one (b) Onto
(c) Many one (d) None of these

Jharkhand Board-2024

Ans. (a)

81. Function f : R → R is defined by f(x) = 5x, ∀x∈ R. Select the correct answer:

(a) f is onto (b) f is many one
(c) f is not onto (d) f is not one-one

UP Board-2024

Ans. (a)

82. If A = {a, b, c}, B = {2, 3, 4}, then the function from A to B will be:

(a) {(a, 2), (a, 3), (b, 3), (c, 4)}
(b) {(a, 3), (a, 2), (b, 2), (c, 4)}
(c) {(a, 3), (b, 2), (c, 3)}
(d) {(a, 2), (b, 4), (b, 3), (c, 4)}

UP Board-2024

Ans. (c)

83. The modulus function f : R → R^+ is given by f(x) = |x| ; then it will be

(a) one- one (b) many- one
(c) not onto (d) none of these

UP Board-2023, 2024

Ans. (b)

84. Let the function f : N →N be defined by f(x) = x –1, x > 2 and f(1) = f(2) = 1.
The correct alternative will be

(a) f is one-one onto
(b) f is many one onto
(c) f is one-one but not onto
(d) f is many one but not onto.

UP Board-2019

Ans. (b)

85. If the function f : R → R defined by f (x) = x^3 is:

(a) One - one but not onto
(b) One - one onto
(c) Many -one but not onto
(d) Many - one onto

UP Board-2020

Ans. (a)

86. Suppose that the function f : R → R is defined by f (x) = x^2. Then f is

(a) one-one onto
(b) many-one onto
(c) one-one, but not onto
(d) neither one-one nor onto

MP Board-2024

UP Board-2020, 2022

Ans. (d)

87. Suppose that the function f : R → R is defined by f(x) = 3x. Then

(a) f is one-one onto
(b) f is many-one onto
(c) f is one-one but not onto
(d) f is neither one-one nor onto.

UP Board-2021, 2022

Haryana Board-2017

Ans. (a)

88. If A = { 1, 2, 3}, B = { 2, 3, 4} then the function from A to B will be

(a) {(1, 2), (1, 3), (2, 3) , (3, 3)}
(b) {(1, 3), (2, 4)}
(c) {(1, 3), (2, 2), (3, 3)}
(d) {(1, 2), (2, 3), (3, 2), (3, 4)}

UP Board-2023

Ans. (c)

89. If $f : X \to Y$ is an onto function, if and only if the range of f will be:

(a) X (b) $X \cap Y$

(c) Y (d) $X \cup Y$

UP Board-2023

Ans. (c)

90. The function $f : R \to R$ defined by $f(x) = x^2 + 5$ will be

(a) one-one and onto

(b) many-one and onto

(c) one-one, but not onto

(d) neither one-one nor onto

UP Board-2023

Ans. (d)

91. Function $f : R \to R$, $f(x) = 3x - 5$ is :

(a) one-one only (b) onto only

(c) one-one and onto (d) none of these

Punjab Board-2021

Ans. (c)

92. $f : A \to B$ will be an onto function, if .

(a) $f(A) \subset B$ (b) $f(A) = B$

(c) $f(A) \supset B$ (d) $f(A) \neq B$

Bihar Board-2019

Ans. (b)

93. If $f(x_1) = f(x_2) \Rightarrow x_1 = x_2 \forall x_1 . x_2 \in A$, then what type of a function is $f : A \to B$?

(a) One - One (b) Constant

(c) Onto (d) Many one

Bihar Board-2019

Ans. (a)

94. If A = (a, b, c), B = (1, 2, 3) and f = {(a, 1), (b, 2), (c, 2)} then what type of a function is f ?

(a) one - one into (b) many - one into

(c) many - one onto (d) one - one onto

Bihar Board-2021

Ans. (b)

95. If $f : X \to Y$ is an invertible function, then which of the following is true?

(a) f is one-one onto

(b) f is one-one but not onto

(c) f is onto but not one-one

(d) None of these

Haryana Board-2016

Ans. (a)

96. A = {a, b, c} B = {1, 2, 3, 4} and f = {(a, 2)}, (b, 3), (c, 4)} is a function from A to B. Which one of the following is true for the function f ?

(a) One-to-one (b) Onto

(c) One-to-one and onto (d) Many-one

Odisha Board-2022

Ans. (a)

97. The domain of the function $f(x) = \frac{x}{|x|}$ is

(a) R – {0} (b) R

(c) Z (d) W

Nagaland Board-2018

Ans. (a)

98. If A = {1, 2, 3} and B = {4, 5} then the number of function $f : A \to B$ which is not onto is ———

(a) 2 (b) 6

(c) 8 (d) 4

Gujarat Board-July, 2017

Ans. (c)

99. Function $F : N–\{1\} \to N$, f(n) = largest prime divisor of n, then f is ————

(a) one-one and onto

(b) one-one but not onto

(c) not one-one and not onto

(d) not one-one and is onto

Gujarat Board-July, 2017

Ans. (c)

100. Let $f : N \times N \to N – \{1\}$, be defined as $f(m, n) = m + n$, then function f is ..... .

(a) one-one and onto

(b) many - one and not onto

(c) one-one and not onto

(d) many - one and onto

Gujarat Board-March, 2018

Ans. (a) :

101. Let the function $f : R \to R$ be defined as $f(x) = x^4$. Choose the correct answer.

(a) f is neither one-one nor onto

(b) f is many-one and onto

(c) f is one-one but not onto

(d) f is one-one and onto

Gujarat Board-August, 2020

UP Board-2020

Ans. (a)

102. Let $f : R \to R$ be defined as $f(x) = 3 – 4x$, then f is :

(a) one –one and onto

(b) many –one and onto

(c) neither one –one nor onto

(d) one –one but not onto

Haryana Board-2017

Ans. (a)

Section-B : Very Short Answer

103. A function $f : X \to Y$ is one-one if $f(x_1) = f(x_2)$ $\Rightarrow$ $x_1 \neq x_2 \ \forall \ x_1, x_2 \in X$. (True/False)

MP Board-2024

104. Show that a one-one function f: {1, 2, 3} $\to$ {1, 2, 3} must be onto.

MP Board-2024

105. Check the injectivity and subjectivity of the function $f : R \to R$ given by $f(x) = x^2$

J&K Board-2024

106. If A = {a, b, c} and B = {α, β, γ}, then find the number of functions and number of bijective functions from B to A.

UP Board-2024

107. Prove that the function $f : IR \to (-1, 1)$ where $f(x) = \frac{x}{1+|x|}, \forall x \in IR$ is one-one and onto.

UP Board-2020

108. Prove that the function $f(x) = x^2$ defined on $f : IR \to IR$ is neither one-one nor onto.

MP Board-2022
UP Board-2019, 2020

109. Find the number of all one-one functions from the set A= $\{1,2,3\}$ itself.

UP Board-2020

110. Prove that if $f : A \to B$ and $g : B \to C$ are one to one then $gof : A \to C$ is also one-to-one

UP Board-2019, 2022

111. Prove that the function $f : N \to N$ defined by $f(x) = x - 1$, when $x > 2$ and $f(1) = f(2) = 1$ is onto but it is not one - one.

UP Board-2023

112. Prove that a one-one function $f : \{2,3,4\} \to \{2,3,4\}$ is onto.

UP Board-2023

113. Prove that the function $f : R \to R^+$ defined by $f(x) = e^x$ is one-one.

UP Board-2023

114. Is the function $f : R \to R$ onto function where $f(x) = 2x$? Given reasons.

Bihar Board-2021
UP Board-2019

115. Show that the function $f : R \to R$ defined by $f(x) = \frac{2x-1}{3}, x \in R$ is one- one and onto.

Manipur Board-2017

116. Let A and B be any two given sets. If $f : A \to B$ is a onto function, then find the range of f.

Assam Board-2022

117. Show that $f : N \to N$, given by : $f(x) = \begin{cases} x+1 & , \text{ if } x \text{ is odd} \\ x-1 & , \text{ if } x \text{ even} \end{cases}$ is one - one

Haryana Board-2018

118. Show that $f(x) = \begin{cases} 1 & , \ x > 0 \\ 0 & , \ x = 0 \\ -1 & , \ x < 0 \end{cases}$ is not one-one.

Haryana Board-2018

119. Show that $f(x) = 3x + 5$, for all $x \in Q$ is one-one.

Haryana Board-2018

120. Show that $f : [-1, 1] \to R$, given by $f(x) = \frac{x}{x+2}$ is one – one. Find the inverse of the function $f : [-1, 1] \to R$.

Haryana Board-2017

121. Consider the function $f(x) = \frac{x-3}{x+1}$ defined from R – {–1} to R – {1}. Prove that f is both one-one and onto.

Nagaland Board-2018

122. Show that the function $f : N \to N$ given by $f(1) = f(2) = 1$ and $f(x) = x - 1$ for every $x > 2$ is onto but not one-one.

Nagaland Board-2017

123. Prove that the function $f : R \to R$ defined by $f(x) = \cos x$; $\forall x \in R$ is neither one-one nor onto.

Uttarakhand Board-2017

Section-C : Short Answer

124. Let A = R – {3}, B = R – {1}. Prove that the function $f : A \to B$ defined by $f(x) = \frac{x-2}{x-3}$ is one-one and onto. (f is bijective)

WB Board-2024
NIOS-2023
Assam Board-2020

125. Prove that the function $f : R \to R$ given by $f(x) = 2x$ is one-one and onto.

CG Board-2020, 2024
Assam Board-2015

(a) The function $f : Q \to Q$ is defined by the relation $f(x) = 3x - 4, x \in Q$

Prove that f is one to one and onto mapping where Q is the set of rational numbers.

UP Board-2022

126. Consider the function f : R → R given by f(x) = x + 2. Prove that f is one-one onto. Find also the inverse function of f.

Uttarakhand Board-2018

127. If $f(x) = \frac{4x+3}{6x-4}, x \neq \frac{2}{3}$, show that '*fof*' is an identify function. What is the inverse of *f*?

NIOS-2023

128. Let f be a real function. Show that h(x) = f(x) + f(–x) is always an even function and g(x) = f(x) – f(–x) is always an odd function. Also express e^x + sin x as the sum of an even function and an odd function.

Odisha Board-2023

129. A function f : R → R is defined by $f(x) = 4x^3 + 5$, x ∈ R. Examine if f is one-one and onto.

Assam Board-2016

130. Let f : N → N be defined by

$$f(n) = \begin{cases} \frac{n+1}{2} & \text{if } n \text{ is odd} \\ \frac{n}{2} & \text{if } n \text{ is even for all } n \in N \end{cases}$$

Examine if f is bijective.

Haryana Board-2013
Assam Board-2012

131. Let $f(x) = 2x^2$ and g(x) = 3x – 4 , x ∈ R find the value of the following

(i) *fof* (x) (ii) *gog* (x) (iii) *fog* (x) . *gof* (x)

Jharkhand Board-2014

Section-D : Long Answer

132. A function *f* :R→ (–1, 1) is defined by

$f(x) = \frac{x}{1+|x|}, \forall x \in R$, then prove that *f* is one-one and onto.

UP Board-2019

133. Examine the function f : R → R where

$f(x) = \frac{1}{3}x$, x ∈ R for one-one mapping?

Bihar Board-2022

134. Prove that f : X → Y is injective if for all subsets A, B of X, f(A ∩B) = f (A) ∩ f (B).

Odisha Board-2019

135. Show that the function f in $A = R - \left\{\frac{2}{3}\right\}$ defined as $f(x) = \frac{4x+3}{6x-4}$ is one-one and onto. Hence, find f^{-1}.

CBSE-2019

C. Composition function, inverse of function and binary operations

Section-A : Multiple Choice Questions

136. If f and g are function defined from R to R by f(x) = sin x and $g(x) = x^2$, then fog is

(a) $x^2 \sin x$ (b) $(\sin x)^2$
(c) $\sin(x^2)$ (d) $(x \sin x)^2$

Manipur Board-2016

Ans. (c)

137. If $f : Q \to Q$ is given by $f(x) = x^2$ then $f^{-1}(9)$ =

(a) + 3 (b) –3
(c) ± 3 (d) None of these

Jharkhand Board-2024

Ans. (c)

138. f : R → R, $f(x) = x^3$, g : R → R, $g(x) = 3^x$ then {x/fog (x) = gof (x) = ...}

(a) R (b) {}
(c) $\{0, \sqrt{3}, -\sqrt{3}\}$ (d) $\{0, \sqrt{3}\}$

Gujarat Board-July, 2018

Ans. (c)

139. The number of binary operations on set { 3k : 1 ≤ k ≤ n; k, n∈N } is.....

(a) n^{2n} (b) n^{n^2}
(c) n^3 (d) 2^n

Gujarat Board-July, 2018

Ans. (b)

140. If R = {(x, y): x + 2y = 8} is defined on the set N then which one is the range of R

(a) {2, 4, 8}
(b) {2, 4, 6, 8}
(c) {2, 4, 6}
(d) {1, 2, 3, 4}.

UP Board-2019

Ans. (d)

141. The number of binary operations on the set A = {a,b} is

(a) 4 (b) 16
(c) 8 (d) 32

UP Board-2020

Ans. (b)

142. If $f : R \to R$ is defined by $f(x) = \frac{x-1}{2}$, then (*fof*)(x) is -

(a) $\frac{x-1}{2}$ (b) $\frac{x-3}{2}$

(c) $\frac{x-2}{4}$ (d) $\frac{x-3}{4}$

NIOS-2022

Ans. (d)

143. Let '∗' be a binary operation on the set Q defined by a∗b = a + b – ab for all values of a, b ∈ Q. Then identity element of Q is

(a) –1 (b) 1

(c) 2 (d) 0

NIOS-2019

Ans. (c)

144. f : R → R is a function defined by f (x) = 2 –3x. If g = f^{-1}, then g (x) is equal to :

(a) $\frac{1}{2-3x}$ (b) $\frac{2-x}{3}$

(c) $\frac{x-2}{3}$ (d) x + 2

NIOS-2023

Ans. (b)

145. If * is a binary operation defined on the set of real number R by a*b = ab^2, then 5*(3*1) is equal to:

(a) 15 (b) 30

(c) 45 (d) 75

NIOS-2023

Ans. (c)

146. The operation * defined by a * b = $\frac{ab}{7}$ is not a binary operation on:

(a) R (b) Q^+

(c) C (d) Z

Tamil Nadu Board-March, 2023

Ans. (d)

147. The operation * is defined as a * b = 2a + b, then (2 * 3) * 4 is –

(a) 18 (b) 17

(c) 19 (d) 21

Bihar Board-2019

Ans. (a)

148. If f : R → R such that $f(x) = 3x - 4$, then which of the following is f^{-1} (x) ?

(a) $\frac{1}{3}(x+4)$ (b) $\frac{1}{3}(x-4)$

(c) 3x – 4 (d) undefined

Bihar Board-2021

Ans. (a)

149. Which of the following is true in a binary operation 'o' defined on N by aob = $a^2 + b^2$?

(a) 'o' is both associative and commutative

(b) 'o' is commutative but not associative

(c) 'o' is associative but not commutative

(d) None of these

Bihar Board-2022

Ans. (b)

150. Subtraction is not a binary operation in:

(a) Q (b) R

(c) Z (d) N

Tamil Nadu Board-March, 2020

Ans. (d) :

151. In the set of integers under the operation* defined by a * b = a + b – 1 the identity element is:

(a) 0 (b) 1

(c) a (d) b

Tamil Nadu Board-September, 2016

Ans. (b)

152. If f : R → R be given by $f(x) = \left(3 - x^3\right)^{\frac{1}{3}}$, then f^{-1}(x) equals :

(a) x^3 (b) $x^{\frac{1}{3}}$

(c) $3 - x^3$ (d) $\left(3 - x^3\right)^{\frac{1}{3}}$

Manipur Board-2019

Ans. (d)

153. If f : R → R be given by f(x) = $(3 - x^3)^{1/3}$, then fof(x) equals

(a) $(3 - x^3)$ (b) $x^{1/3}$

(c) x^3 (d) x

Manipur Board-2018

Ans. (d)

154. If a * b = a + b – 7, where a, b ∈ R, then identity element of the binary operation '*' is

(a) 0 (b) 7

(c) 6 (d) –6

Goa Board-2018

Ans. (b)

155. If f : R → R be such that f(x) = 5x + 4, then f^{-1}(x) =

(a) $\frac{x-4}{5}$ (b) $\frac{4-x}{5}$

(c) $\frac{x-5}{4}$ (d) None of these

Jharkhand Board-2023

Ans. (a)

156. If $f(x)=\frac{x+1}{x+2}$, $x \neq -2$ and $g(x)=x^2$, then *fog* (x) is :

(a) $\left(\frac{x+1}{x+2}\right)^2$ (b) $\frac{x^2+1}{x^2+2}$

(c) $\frac{x^2-1}{x^2+2}$ (d) None of these

Haryana Board-2018

Ans. (b)

157. If f(x) = log (1 + x) and $g(x)=e^x$, then value of (fog) (x) is:

(a) log x (b) $\log\left(e^x+1\right)$

(c) log (1 + x) (d) None of these

Haryana Board-2018

Ans. (b)

158. If f(x) = log (1 + x) and $g(x)=e^x$, then value of (gof) (x) is:

(a) e^{1+x} (b) 1 + x

(c) log x (d) None of these

Haryana Board-2018

Ans. (b)

159. If $f(x)=\frac{x+1}{x+2}$, $x \neq -2$ and $g(x)=x^2$, then gof (x) is:

(a) $\left(\frac{x+1}{x+2}\right)^2$ (b) $\left(\frac{x+2}{x+1}\right)^2$

(c) $\frac{x^2+1}{x^2+2}$ (d) None of these

Haryana Board-2018

Ans. (a)

160. If the binary operation * on N defined as $a * b = a^3 + b^3$, then * is :

(a) Both associative and commutative

(b) Commutative but not associative

(c) Associative but not commutative

(d) Neither commutative nor associative

Haryana Board-2017

Ans. (b)

161. If function $f(x)=\frac{3x}{4x+3}$ is defined on $f: R-\left\{-\frac{3}{4}\right\} \to R$ then its inverse function defined g : Range $f \to R-\left\{-\frac{3}{4}\right\}$ is which of the following ?

(a) $g(y)=\frac{4y+3}{3y}$

(b) $g(y)=\frac{3y}{3-4y}, y \neq \frac{3}{4}$

(c) $g(y)=\frac{3y}{4y-3}, y \neq \frac{3}{4}$

(d) None of these

Haryana Board-2016

Ans. (b)

162. If function $f: R-\left\{\frac{3}{4}\right\} \to R$ given by $f(x)=\frac{3x}{3-4x}$, then its inverse function g : Range $f \to R-\left\{\frac{3}{4}\right\}$,

(a) $g(y)=\frac{3-4y}{3y}, y \neq 0$

(b) $g(y)=\frac{3y}{3+4y}, y \neq -\frac{3}{4}$

(c) $g(y)=\frac{3y}{3-4y}, y \neq \frac{3}{4}$

(d) None of these

Haryana Board-2016

Ans. (b)

163. If function $f: [-1, 1] \to R$ given by $f(x)=\frac{x}{x+2}$, then its inverse function g : Range $f \to R$ in which of the following ?

(a) $g(y)=\frac{2y}{1-y}, y \neq 1$ (b) $g(y)=\frac{y+2}{y}$

(c) $g(y)=\frac{2y}{1-y}, y \neq -1$ (d) None of these

Haryana Board-2016

Ans. (a)

164. If $f(x)\ 8x^3$ and $g(x)\ \frac{1}{x^3}$, then the value of *gof* is :

(a) $8x^3$ (b) $512x^3$

(c) $\frac{1}{512x^9}$ (d) 2x

MP Board-2022

Ans. (c)

165. In a set of real numbers R, an operation * is defined by $a * b = \sqrt{a^2+b^2}$. Then the value of (3 * 4) * 5 is:

(a) 5 (b) $5\sqrt{2}$
(c) 25 (d) 50

Tamil Nadu Board-June, 2015, 2016

Ans. (b)

166. If $a * b = a^3 + b^3$ on Z then $(2 * 3)^2$ = ————

(a) 925 (b) 1625
(c) 35 (d) 1225

Gujarat Board-July, 2017

Ans. (d)

167. If $A * B = A \cap B$ on P(X), then the identity for * is ———— $(X \neq \phi)$

(a) ϕ (b) X
(c) U (d) A

Gujarat Board-July, 2017

Ans. (b)

168. If, $f : R \to R$, $f(x) = \begin{cases} 1 & x > 0 \\ 0 & x = 0 \\ -1 & x < 0 \end{cases}$ and $g : R \to R$, $g(x) = [x]$, then $fog(\pi)$ = ...

(a) π (b) 0
(c) 1 (d) –1

Gujarat Board-March, 2018

Ans. (c)

169. If $a*b = a^3 + b^3$ on z, then (1*2)*0 = ...

(a) 0 (b) 729
(c) 81 (d) 27

Gujarat Board-March, 2018

Ans. (b) :

170. The number of binary operation on {1, 2, 3, 4} is ..... .

(a) 4^2 (b) 4^8
(c) 4^3 (d) 4^{16}

Gujarat Board-March, 2018

Ans. (d) :

171. If $a * b = a + b + (ab)^2$ on R, then identity element for * is ..... .

(a) 0 (b) $-a^2$
(c) 1 (d) –1

Gujarat Board-July, 2015

Ans. (a)

172. For sets $S = \{\pi, \pi^2, \pi^3\}$ and $T = \{e, e^2, e^3\}$, if $F^{-1} : T \to S$ is defined as $F^{-1} = \{(e, \pi^3), (e^2, \pi^2), (e^3, \pi)\}$, then function F = ...

(a) $\{(\pi^3, e), (\pi^2, e^2), (\pi, e^3)\}$
(b) $\{(\pi, e^2), (\pi^3, e), (\pi^2, e^3)\}$
(c) $\{(e^2, \pi), (e^3, \pi^2), (e, \pi^3)\}$
(d) $\{(\pi, e), (\pi^2, e^2), (\pi^3, e^3)\}$

Gujarat Board-March, 2020

Ans. (a)

173. $a * b = \frac{ab}{10}$ defined on Q. Inverse of 0.001 is.....

(a) 100000 (b) 10000
(c) 1000000 (d) 1000

Gujarat Board-March, 2020

Ans. (a)

174. Number of binary operations on the set {a, b} is.....

(a) 8 (b) 16
(c) 20 (d) 4

Gujarat Board-August, 2020

Ans. (b)

175. If $a * b = \frac{ab}{5}$ on Q^+, the inverse of $a(a \neq 0)$ for * is ———— .

(a) $\frac{1}{a}$ (b) $\frac{25}{a}$
(c) $\frac{5}{a}$ (d) $\frac{10}{a}$

Gujarat Board-July, 2016

Ans. (b)

176. The number of binary operations on {1, 2, 3, 4, 5} is ———— .

(a) 5^5 (b) 5^{25}
(c) 2^5 (d) 5^{10}

Gujarat Board-July, 2016

Ans. (b)

177. $f : R \to R$, $f(x) = (5 - x^3)^{1/3}$ then fof(x) = ———— .

(a) 5 – x (b) x^3
(c) x (d) $x^{1/3}$

Gujarat Board-July, 2016

Ans. (c)

178. $f : r - \left\{-\frac{3}{2}\right\} \to R - \left\{\frac{3}{2}\right\}$; $f(x) = \frac{3x+2}{2x+3}$ then $f^{-1}(x)$ = ———— .

(a) $-\left(\frac{2x-3}{3x-2}\right)$ (b) $\frac{2x-3}{3x-2}$
(c) $\frac{3x-2}{2x-3}$ (d) $-\left(\frac{3x-2}{2x-3}\right)$

Gujarat Board-July, 2016

Ans. (d)

Section-B : Very Short Answer

179. If the function $f : R \to R$ is defined as $f(x) = x^2 + 1$, then $f^{-1}(17) =$ ____
$[\phi, \pm 4, \pm 3, \pm 2]$ (Fill in the blank)
Odisha Board-2022

180. If the function f = {(1, 5), (2, 6), (3, 4)} from the set A = {1, 2, 3} to the set B is invertible, find the set B.
Assam Board-2017

181. If $f : R \to R$ such that $f(x) = (3 - x^3)^{\frac{1}{2}}$, then prove that (fof) (x) = x .
Bihar Board-2019

182. Let $f : R \to R$ be given by $f(x) = x^2 - 5x + 4$, then find the value of fof(1).
Jharkhand Board-2019

183. If f and g are two real valued functions such that $f(x) = x^2 + 2$ and $g(x) = \sqrt{x+1}$ then find fog and gof.
Goa Board-2018

184. If $g(x) = 2x^2 + 1$ and $f(x) = 3x$, then find the value of $f\{g(x)\} - g\{f(x)\}$.
WB Board-2024

185. If $f : R \to R$ is defined by $f(x) = 3x + 4$, then find f [f(x)].
Odisha Board-2024

186. Let f be an invertible real function. Find the value of $(f^{-1}of)(1) + (f^{-1}of)(2) + (f^{-1}of)(3) + (f^{-1}of)(4)$.
Jharkhand Board-2024

187. Define binary operation * on R by $m * n = m + n - (mn)^2$. The find possible inverses of 1 $(m, n \in R)$
Gujarat Board-July, 2018

188. For the function $f : R - \left\{-\frac{2}{3}\right\} \to R, f(x) = \frac{4x+3}{6x+4}$ if $fof(a) = 1$ then find a.
Gujarat Board-July, 2018

189. If $f(x) = x^2$, $g(x) = \sin x$, then find (g o f) and (fo g).
UP Board-2019

190. Find fog and gof if $f(x) = e^x$, $g(x) = \log e^x$.
UP Board-2020

191. If $f : A \to B$ and $g : B \to C$ are one - one then prove that go $f : A \to C$ is also one - one.
UP Board-2022

192. If $f : R \to R$ where $f(x) = \cos x$ and $g : R \to R$ where $g(x) = x^2$, then prove that $fog \neq gof$.
UP Board-2022

193. Function $f : R \to R$ is such that $f(x) = x^2 + 2$, then find $f^{-1}(18)$.
UP Board-2020

194. If $f(x) = 8x^3$ and $g(x) = x^{1/3}$, find gof and fog.
UP Board-2020

195. Prove that if $f : X \to Y$ and $g : Y \to Z$ are one - one, then $gof : X \to Z$ is also one - one.
UP Board-2020

196. If $f : R \to R$ where $f(x) = \sin x$ and $g : R \to R$ where $g(x) = x^2$, then find ($f$og)x and (gof) x and show that $fog \neq gof$.
UP Board-2020
Rajasthan Board-2019

197. If $f : R \to R$, where $f(x) = \sin x$ and $g : R \to R$, where $g(x) = x^2$, then find the range of f(x) and g (x)
UP Board-2023

198. Let $f : R \to R$ and $g : R \to R$ are defined by $f(x) = x^2 - 1$ and $g(x) = 3x$. Find fog (2) and gof (2).
NIOS-2018

199. If f: {4, 6, 7} $\to$ {1, 2, 4} and g: {1, 2, 4} $\to$ {1, 5, 6} be defied as f = {(4, 2), (6, 4), (7, 1)} and g = {(2, 1),(1, 6), (4, 5)}, then define go$f$.
NIOS-2023

200. If f and g are one-one onto function such that composite function (gof) and $(gof)^{-1}$ are defined, then show that $(gof)^{-1} = f^{-1}og^{-1}$.
Rajasthan Board-2020

201. If $f : R \to R$, $f(x) = x^2 + 5x + 9$, then find the value of $f^{-1}(8)$ and $f^{-1}(9)$.
Rajasthan Board-2020

202. If $f(x) = \frac{x-3}{x+1}$, then find $f\left[f\{f(x)\}\right]$.
Rajasthan Board-2019

203. If $f : R \to R$ and $g : R \to R$, are defined such that $f(x) = x^2 + 3$; $g(x) = 1 - \frac{1}{(1-x)}$ then find go$f$ (x) and $f$og (x).
Rajasthan Board-2018

204. If $f : R \to R$, $f(x) = x^2 - 5x + 7$, then find the value of $f^{-1}(1)$.
Rajasthan Board-2018

205. If $f : R \to R$ and $g : R \to R$ are given by $f(x) = \cos x$ and $g(x) = 3x^2$, then find gof.
Uttarakhand Board-2018

206. In a set of rational number Q, a binary operation '*' is defined as follows: $a * b = a + ab$; $a, b \in Q$ Show that '*' is neither commutative nor associative.
Uttarakhand Board-2023

207. Let* be the binary operation of N given by a*b = L.C.M of a and b. Find 5*7

Karnataka Board-2020

208. Let * be a binary operation on R – {–1} defined by $a * b = \frac{a}{b+1}$, for all $a, b \in R - \{-1\}$.

Show that * is neither commutative nor associative in R – {–1}.

CBSE-2019

209. If * is defined on the set $\mathbb{R}$ of all real numbers by * : $a * b = \sqrt{a^2 + b^2}$, find the identity element, if it exists in $\mathbb{R}$ with respect to *.

CBSE-2019

210. If f(x) = sinx, $g(x) = x^5$, then find gof and fog.

Odisha Board-2023

211. Construct the multiplication table X_7 on the set (1, 2, 3, 4, 5, 6). Also find the inverse element of 4 if it exists.

Odisha Board-2019

212. Show that the function $f : R \to R$ defined by $f(x) = 4x + 3$, $\forall x \in R$ is invertible and find the inverse of f.

Manipur Board-2018

213. Let the mapping f(x) = ax + b, a > 0, maps [–1, 1] onto [0, 2] ; show that cot ($\cot^{-1} 7 + \cot^{-1} 8 + \cot^{-1} 18$) = f(2).

Assam Board-2019

214. Show that the binary operation '*' on Q defined by a*b = ab + 1 is commutative but not associative.

Meghalaya Board-2017

215. Let $f(x) = [x]$, where [x] is a greatest integer function and g(x) = x. Find the value of $(fog)(-1/3)$.

Assam Board-2022

216. If $f : R \to R$ is defined by $f(x) = x^2 - 3x + 2$, find $f(f(x))$.

Assam Board-2018

217. Is multiplication a binary operation on the set {0}.

Assam Board-2014

218. Prove that the binary operation * : $R \times R \to R$ defined by a *b = a + 2b is not commutative.

UP Board-2020

219. If $f : R \to R$ and $g : R \to R$ are defined by $f(x) = \sqrt{x}$ and $g(x) = x^2$, then find fog(x).

Jharkhand Board-2023

220. Let * be the binary operation on Z^+, defined by a * b = |a – b|. Find the value of 3 * 7.

Jharkhand Board-2020

221. Let R be the set of real number. An operation * is defined on R by a * b = a + b + 2ab. Then find the value of 2 * 3.

Jharkhand Board-2019

222. Let * be the binary operation defined by a * b = 3a + b – 2. Find the value of 3 * 5.

Jharkhand Board-2018

223. Let * be the binary operation on N defined by a * b = LCM of a and b ; $\forall a, b \in N$. Prove that (20 * 16) * 8 = 20*(16 *8).

Jharkhand Board-2016

224. A binary composition * is defined in Z by a* b = $a^b - a$; $a, b \in Z$.

Jharkhand Board-2015

225. A binary composition * is defined on R × R by (a, b) * (c, d) = (ac, bc + d), where a, b, c, d ∈ R. Find (2, 3)* (1, –2)

Jharkhand Board-2014

226. If $f(x) = x^3 - x^2 + 3x + 4$, then find : f(12) and $f\left(-\frac{1}{3}\right)$

Jharkhand Board-2012

227. Let $f: R^+ \to [4, \infty)$ is given by $f(x) = x^2 + 4$. Show that f is invertible and find of f^{-1}

Haryana Board-2017

228. Let f: R→R,given by $f(x) = 4x + 3$. Show that f is invertible and find the inverse of f.

Haryana Board-2017

229. If $f : R \to R$ defined by $f(x) = x^2 - 2x + 3$ then find f(f(x)).

Haryana Board-2016

230. If binary operation * defined from $Q \times Q \to Q$ and $a * b = \frac{ab}{4}$, then show that * is an associative operation.

Haryana Board-2016

231. If $f: R \to R$ defined by $f(x) = x^2 + 3x - 5$, then find f(f(x)).

Haryana Board-2016

232. Show that the binary operation * defined from $N \times N \to N$ and by a * b = 2a+3b, is not commutative.

Haryana Board-2016

233. If $f : R \to R$ defined by $f(x) = x^2 + 3x - 5$, then find f (f(x)).

Haryana Board-2016

234. Show that the binary operation * defined from $Q \times Q \to Q$ and given by $a * b = ab^2$ is not commutative.

Haryana Board-2016

235. Show that * : R × R → R defined by a * b = a + 2b is neither commutative nor associative.

MP Board-2020

236. If $f(x) = 3x^2 + 15x + 5$. Then find the approximate value of $f(3.02)$.

MP Board-2020

237. Consider the binary operation on Q – {1} defined by a * b = a + b – ab. Find the identity element in Q – {1}.

Nagaland Board-2018

238. Let f : N → Y, f(x) = 4x + 3, be a function defined as f(x) = 4x + 3; where Y = {y ∈ N : y = 4x + 3 for some x ∈ N}. Show that f is invertible, Find the inverse.

Uttarakhand Board-2017

239. Find the identity element for the binary operation * defined in the set Q^+ of positive rational numbers, by $a * b = \frac{ab}{2} \forall a, b \in Q^+$.

Uttarakhand Board-2017

240. Find $f^{-1}(1)$ for the function f:R→R, where f(x) = 2x + 1, ∀x ∈ R.

Uttarakhand Board-2020

241. If $a*b = \frac{ab}{10}$ on Q^+, then find the identify for *.

Gujarat Board-March, 2018

Section-C : Short Answer

242. If $f(x) = \frac{3x+4}{5x-7}; x \neq \frac{7}{5}$ and $g(x) = \frac{7x+4}{5x-3}; x \neq \frac{3}{5}$ then prove that fog(x) = x

Jharkhand Board-2016

243. Show that the function f : R – {3} → R – {1} defined by $f(x) = \frac{x-2}{x-3}$ is invertible.

Goa Board-2019

244. Let f : R → R and g : R → R be defined by f(x) = x^2 – 1 and g(x) = 2x + 3. Find *fog* and *gof*.

Jharkhand Board-2018

245. If A = N × N and * is a binary operation on defined by (a, b)* (c, d) = (a + c, b + d) then show that* is commutative and associative.

Odisha Board-2024

246. If f : R → R is defined by f (x) = x^2 – 3x + 2 find f [f(x)].

CG Board-2024

247. (a) If R^+ is the set of non-negative real numbers, prove that the function f : R^+ → (4, ∞) defined by f (x) = x^2 + 4 is invertible and the inverse of f, f^{-1} : (4, ∞) → R^+, is as follows: $f^{-1}(y) = \sqrt{y-4}$.

UP Board-2020

CBSE-2019

248. If f(x) = $x + \frac{1}{x}$, prove that $[f(x)]^3 = f(x^3) + 3f\left(\frac{1}{x}\right)$,

UP Board-2023

249. Consider the function f : R → R given by f (x) = 4 x + 3 . Show that f is invertible. Find the inverse function of f.

Uttarakhand Board-2023

250. If f : R → R and g : R → R are given by f (x) = cos x and g(x) = $3x^2$. Find gof and fog.

Karnataka Board-2020

CG Board-2019

251. Find gof and fog if f : R → R and g : R→R are given by f(x) = cosx and g(x) = $3x^2$. Show that gof ≠ fog.

CG Board-2021

252. If $f(x) = \frac{4x+3}{6x-4}$, $x \neq \frac{2}{3}$, show that fof(x) = x for all $x \neq \frac{2}{3}$. Also, find the inverse of f.

CBSE-2019

Haryana Board-2017

253. Show that f : [–1, 1] → R, given by $f(x) \frac{x}{(x+2)}$ is one-one. Find the inverse of the function f : [–1, 1] → Range of f.

CBSE-2019

254. Prove that the function f : R → R defined as f (x) = 2x – 3 is invertible. Also find f^{-1}.

Manipur Board-2022

255. Find the equation of the plane through the line of intersection of the planes x + y + z = 1 and 2x + 3y + 4z = 5 which is perpendicular to the plane x – y + z = 0.

Manipur Board-2022

256. If an operation * on the set of integers Z is defined by a * b = $2a^2$ + b, then find (i) whether it is a binary or not, and (ii) if a binary, then is it commutative or not.

CBSE-2019

257. Show that the function f : R → R defined as f(x) = 2x – 3 is invertible. Also find the inverse of f.

Assam Board-2022

258. Let f : R → R is defined by f(x) = 3x – 2 and g : R → R is defined by $g(x) = \frac{x+2}{3}$. Show that f · g = g · f.

Assam Board-2019

259. Let $f : R \to R$ and $g : R \to R$ be two functions defined by $f(x) = |x|$ and $g(x) = [x]$, where [x] denotes the greatest integer less than or equal to x.

Find $(fog)(5.75)$ and $(gof)(-\sqrt{5})$.

Assam Board-2017

260. Let X be a non-empty set and P(X) be the power set of X. Consider the binary operation * on P(X) defined by $A * B = A \cap B \ \forall A, B \in P(X)$. Show that X is the identity element as well as the only invertible element in P(X) w.r.t. *.

Assam Board-2014

261. Examine if the binary operation $* : R \times R \to R$ given by $a * b = a + 4b^2$ is

(i) commutative

(ii) associative

Assam Board-2012

262. If the function $f : R \to R$ be given by $f(x) = x^2 + 2$ and $g : R \to R$ be given by $g(x) = \frac{x}{x-1}$, $x \neq 1$, find fog and gof.

Jharkhand Board-2020

CG Board-2020

263. If $f(x)$ x^2 and $g(x)$ x $3, x$ R, then find the value of $(gof)x, (fog)x, (fog)2$.

MP Board-2019

264. Suppose S = {1, 2, 3, 4}, T = {1, 4, 9, 16} and U = {11, 14, 19, 26}. $f : S \to T$ and $g : T \to U$ defined as $f(s) = s^2$ and $g(t) = t + 10$. Determine $gof(2)$ and $gof(4)$

Odisha Board-2022

265. For the binary operation *defined by $a * b = \frac{ab}{2}$ in the set Q_+ of positive rational number, find the identity element and the inverse of $a \in Q_+$.

Uttarakhand Board-2020

266. For the function $f : R \to R$, $f(x) = 3x + 2$, if f^{-1}, exists then find $f^{-1}(x)$.

Gujarat Board-July, 2017

267. f: $R \to (-1, 1)$, $f(x) = \frac{10^x - 10^{-x}}{10^x + 10^{-x}}$. Find f^{-1}, if it exists.

Gujarat Board-July, 2015

268. Consider $f : R^+ \to [-5, \infty)$ given by $f(x) = 9x^2 + 6x - 5$. Show that f is invertible with $f^{-1}(y) = \left(\frac{\left(\sqrt{y+6}\right)-1}{3}\right)$; where R^+ is the set of all non-negative real numbers.

Gujarat Board-March, 2020

Nagaland Board-2020

Section-D : Long Answer

269. Let $* : N \times N \to N$ be an operation defined as $a * b = a + ab, \ \forall \ a, b \in N$.

Check if * is a binary operation. If yes, find if it is associative too.

CBSE-2019

270. Let $f(x) = x + 7$ and $g(x) = x - 7$, $x \in R$. Find the following

(i) fof (7) (ii) fog (7)

(iii) gof(7) (iv) gog(7)

Jharkhand Board-2015

271. Let $f : R^+ \to [-5, \infty)$ be a function defined as $f(x) = 9x^2 + 6x - 5$. Show that f is invertible. Also find the inverse of f. Hence, find $f^{-1}(3)$.

NIOS-2022

272. Show that the function $f : R \to R$ given by $f(x) = 4x + 3$ is invertible. Find the inverse of f.

Karnataka Board-2020

273. Find gof and fog if $f : R \to R$ and $g : R \to R$ are given by functions $f(x) = x^2 + 2$ and $g(x) = \frac{x}{x-1}$, $x \neq 1$ respectively. Show that $gof \neq fog$.

CG Board-2022

274. Show that the operation * defined on $\{0,1,2,3,4\}$ by $a * b = a \times b \pmod 5$ is a binary operation. Test whether it is associative and commutative. Test whether the identity exists. If it exists, investigate about the inverse for each element.

Odisha Board-2020

275. If $f(x) = \frac{4x+3}{6x-4}, x \neq \frac{2}{3}$, prove that $fof(x) = x$ for $x \neq \frac{2}{3}$. What is the inverse function of f

Gujarat Board-August, 2020

CG Board-2019

276. Show that $f : [-1, 1] \to R$, given by $f(x) = \frac{x}{x+2}$ is one-one. Find the inverse of the function $f : [-1, 1] \to$ Range f.

Assam Board-2018

02.

Inverse Trigonometric Functions

A. Range, domain, principal value branches and graph of inverse trigonometric function

Section-A : Multiple Choice Questions

1. The principal value of $\sin^{-1}\left\{\sin\left(\frac{5\pi}{6}\right)\right\}$ is

(a) $\frac{\pi}{6}$ (b) $\frac{5\pi}{6}$

(c) $\frac{\pi}{2}$ (d) $\frac{\pi}{3}$

WB Board-2024

Ans. (a)

2. The principle solutions of the equation $\cos\theta = \frac{1}{2}$ are_____

(a) $\frac{\pi}{6}, \frac{5\pi}{6}$ (b) $\frac{\pi}{3}, \frac{5\pi}{3}$

(c) $\frac{\pi}{6}, \frac{7\pi}{6}$ (d) $\frac{\pi}{3}, \frac{2\pi}{3}$

Maharashtra Board-2024

Ans. (b) :

3. The principal value branch of $\sin^{-1} x$ is

(a) $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$ (b) $(0, \pi)$

(c) $[0. \pi]$ (d) $[0, 2\pi]$

Karnataka Board-2024

Ans. (a)

4. The principal value of $\text{cosec}^{-1}(-\sqrt{2})$

(a) $\frac{\pi}{4}$ (b) $-\frac{\pi}{4}$

(c) $\frac{3\pi}{4}$ (d) $-\frac{3\pi}{4}$

Jharkhand Board-2024

Ans. (b)

5. The principal value of $\sin^{-1}\left(-\frac{1}{2}\right)$ is-

(a) $\frac{\pi}{6}$ (b) $-\frac{\pi}{6}$

(c) $\frac{4\pi}{3}$ (d) $\frac{2\pi}{3}$

MP Board-2024

Tamil Nadu Board-March, 2023

Ans. (b)

6. Range of $\left[\cos^{-1} x\right]$ is.....(where $[\ ]$ = greatest integer part)

(a) $\{0, 1, 2, 3\}$ (b) $[0, 3]$

(c) $\{1, 2, 3\}$ (d) $[0, \pi]$

Gujarat Board-July, 2018

Ans. (b)

7. Value of $\tan^{-1}\sqrt{3} - \sec^{-1}(-2)$ is

(a) π (b) $-\pi/3$

(c) $\pi/3$ (d) $2\pi/3$

UP Board-2021, 2022, 2023

MP Board-2020

Nagaland Board-2020

Haryana Board-2017

Ans. (b)

8. The principal value of $\cot^{-1}\left(-\frac{1}{\sqrt{3}}\right)$ will be:

(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{6}$

(c) $\frac{2\pi}{3}$ (d) None of these

UP Board-2018, 2022

Haryana Board-2017

Ans. (c) :

9. The principal value of $\cos^{-1}\left(\cos\frac{7\pi}{6}\right)$ is.

(a) $\frac{7\pi}{6}$ (b) $\frac{5\pi}{6}$

(c) $\frac{\pi}{3}$ (d) $\frac{\pi}{6}$

UP Board-2022

Gujarat Board-August, 2020

Haryana Board-2017

Ans. (b)

10. The value of $\tan^{-1}\left(\sqrt{3}\right) - \cot^{-1}\left(-\sqrt{3}\right)$ will be :

(a) π (b) $-\pi/2$

(c) 0 (d) $2\sqrt{3}\pi$

UP Board-2023

Bihar Board-2021

Haryana Board-2017

Ans. (b)

11. The principal value of $\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$ is –

(a) $\frac{5\pi}{6}$ (b) $\frac{-\pi}{6}$

(c) $\frac{\pi}{6}$ (d) $\frac{7\pi}{6}$

NIOS-2022

Ans. (a)

12. The principal value of $\tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$ is equal to

(a) $\frac{\pi}{2}$ (b) $\frac{\pi}{6}$

(c) $\frac{\pi}{3}$ (d) 0

NIOS-2019

Ans. (b)

13. The principal value of $\sin^{-1}\frac{1}{\sqrt{5}} + \sin^{-1}\frac{2}{\sqrt{5}}$ is equal to

(a) π (b) $\pi/2$

(c) $\pi/3$ (d) $\pi/4$

NIOS-2018

Ans. (b) : j

14. $\cos^{-1}\left(-\cos\frac{2\pi}{3}\right)$ is equal to :

(a) $\frac{\pi}{5}$ (b) $\frac{2\pi}{3}$

(c) $\frac{\pi}{2}$ (d) $\frac{\pi}{3}$

Punjab Board-2021

Ans. (d)

15. The principal value of $\sec^{-1}\left(\frac{2}{\sqrt{3}}\right)$ is:

(a) $\frac{\pi}{2}$ (b) $\frac{\pi}{3}$

(c) $\frac{\pi}{4}$ (d) $\frac{\pi}{6}$

Uttarakhand Board-2018

Ans. (d) :

16. The principal value of $\cos^{-1}\left(-\frac{1}{2}\right)$ is :

(a) $-\frac{\pi}{3}$ (b) $-\frac{\pi}{6}$

(c) $\frac{2\pi}{3}$ (d) $\frac{5\pi}{6}$

NIOS-2023

Maharashtra Board-2015

Ans. (c)

17. Principal value of $\cos^{-1}\left(\frac{1}{\sqrt{2}}\right)$ is

(a) $\frac{3\pi}{4}$ (b) $\frac{\pi}{4}$

(c) $-\frac{\pi}{4}$ (d) $\frac{\pi}{3}$

Uttarakhand Board-2023

Ans. (b)

18. If $3\cos^{-1} x = \cos^{-1}(4x^3 - 3x)$.

(a) $x \in \left(\frac{1}{2}, 1\right)$ (b) $x \in \left[\frac{1}{2}, 1\right]$

(c) $x \in (-\infty, 1)$ (d) $x \in \left[\frac{1}{2}, \infty\right)$

Tamil Nadu Board-March, 2023

Ans. (b)

19. $\tan^{-1} x + \cot^{-1} x = ?$

(a) 0 (b) 1

(c) $\frac{\pi}{2}$ (d) $-\frac{\pi}{2}$

Bihar Board-2019

MP Board-2012

Jharkhand Board-2012

Ans. (c)

20. $\sin^{-1}\left(\frac{1}{\sqrt{2}}\right) = ?$

(a) $\frac{\pi}{4}$ (b) $-\frac{\pi}{4}$

(c) $\frac{\pi}{2}$ (d) $-\frac{\pi}{2}$

Bihar Board-2019

Ans. (a)

21. $\tan^{-1}1$ is equal to –

(a) π (b) $\frac{\pi}{2}$

(c) $\frac{\pi}{4}$ (d) $\frac{\pi}{6}$

Bihar Board-2021

Ans. (c)

22. $\text{cosec}^{-1}(-x) =$

(a) $\frac{\pi}{2} - \text{cosec}^{-1}x$ (b) $\pi - \text{cosec}^{-1} x$

(c) $\text{cosec}^{-1} x$ (d) $-\text{cosec}^{-1}x$

Bihar Board-2021

Ans. (d)

23. $\tan^{-1}\left(\frac{-1}{\sqrt{3}}\right) =$

(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{6}$

(c) $-\frac{\pi}{3}$ (d) $-\frac{\pi}{6}$

Bihar Board-2021

Ans. (d)

24. $\cos^{-1}\left(\cos\frac{7\pi}{4}\right) =$

(a) $\frac{7\pi}{4}$ (b) $\frac{\pi}{4}$

(c) $\frac{\pi}{2}$ (d) π

Bihar Board-2022

Ans. (b)

25. **The value of** $\sin\left[\frac{\pi}{3} - \sin^{-1}\left(-\frac{1}{2}\right)\right]$ **is :**

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

(c) $\frac{1}{\sqrt{2}}$ (d) 0

Manipur Board-2019

Ans. (a) :

26. **The principal value of is**

$\cos^{-1}\left(\cos\frac{2\pi}{3}\right) + \sin^{-1}\left(\sin\frac{2\pi}{3}\right)$ **is**

(a) π (b) 2π

(c) $\frac{2\pi}{3}$ (d) $\frac{4\pi}{3}$

Manipur Board-2018

Ans. (a)

27. **The principal value of** $\tan^{-1}\left(\tan\frac{35\pi}{3}\right)$ **is**

(a) $\frac{35\pi}{3}$ (b) $\frac{5\pi}{3}$

(c) $\frac{\pi}{3}$ (d) $-\frac{\pi}{3}$

Manipur Board-2017

Ans. (d)

28. $\cot\left(\pi - \cos^{-1}\left(\frac{-\sqrt{3}}{2}\right)\right)$ **is equal to:**

(a) $\frac{1}{\sqrt{3}}$ (b) $\frac{1}{2}$

(c) $\sqrt{3}$ (d) 2

Goa Board-2019

Ans. (c)

29. **Principal value of** $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$ **is**

(a) $\frac{2\pi}{3}$ (b) $\frac{\pi}{4}$

(c) $\frac{\pi}{3}$ (d) $\frac{\pi}{6}$

Jharkhand Board-2023

Ans. (c)

30. **The value of** $\sin\left(\cos^{-1}\frac{3}{5}\right)$ **is :**

(a) $\frac{4}{5}$ (b) $\frac{3}{5}$

(c) $\frac{2}{5}$ (d) None of these

Haryana Board-2018

Ans. (a)

31. **If** $\tan^{-1} x = y$ **then the principal value of y is:**

(a) $0 \le y \le \pi$ (b) $-\frac{\pi}{2} \le y \le \frac{\pi}{2}$

(c) $-\frac{\pi}{2} < y < \frac{\pi}{2}$ (d) $0 < y < \pi$

Haryana Board-2016

Ans. (c)

32. **The principal value of** $\cos^{-1}\left(\cos\frac{5\pi}{4}\right)$ **is**

(a) $\frac{\pi}{4}$ (b) $\frac{3\pi}{4}$

(c) $\frac{5\pi}{4}$ (d) $-\frac{\pi}{4}$

Haryana Board-2016

Ans. (b)

33. **If** $\cos^{-1} x = y$ **then the principal value of y is :**

(a) $0 \le y \le \pi$ (b) $-\frac{\pi}{2} \le y \le \frac{\pi}{2}$

(c) $0 < y < \pi$ (d) $-\frac{\pi}{2} < y < \frac{\pi}{2}$

Haryana Board-2016

Ans. (a) : j

34. **If** $\sin^{1} x$ **y, then**

(a) 0 y (b) $\frac{-\pi}{2} \le y \le \frac{\pi}{2}$

(c) 0 y (d) $\frac{-\pi}{2} < y < \frac{\pi}{2}$

MP Board-2019, 2022

Gujarat Board-August, 2020

Ans. (b)

35. The domain of $\sin^{-1} x$ is:

(a) $(-\pi, \pi)$ (b) $[-1, 1]$

(c) (0.2π) (d) $(-\infty, \infty)$

MP Board-2018

Ans. (b):

36. If $A = \sin^{-1} x = \frac{\pi}{5}$, then what is the value of $\cos^{-1} x$?

(a) $\frac{9\pi}{10}$ (b) $\frac{7\pi}{10}$

(c) $\frac{5\pi}{10}$ (d) $\frac{3\pi}{10}$

Odisha Board-2022

Ans. (d)

37. Write the value of $\sin^{-1}\frac{1}{3} + \cos^{-1}\frac{1}{3}$

(a) 0 (b) 1

(c) $\frac{\pi}{2}$ (d) π

Odisha Board-2022

Ans. (c)

38. The principal value of $\text{cosec}^{-1}\left(\sqrt{2}\right)$ is

(a) $\frac{-3\pi}{4}$ (b) $\frac{-\pi}{4}$

(c) $\frac{\pi}{4}$ (d) $\frac{3\pi}{4}$

Nagaland Board-2018

Ans. (c)

39. The value of $\cos^{-1}\left(\cos\frac{4\pi}{3}\right)$

(a) $\frac{4\pi}{3}$ (b) $\frac{2\pi}{3}$

(b) 0 (d) π

Nagaland Board-2017

Haryana Board-2016

Ans. (b)

40. If $x \in [-1,1]$, then value of $\sin^{-1}x + \cos^{-1}x$ will be-

(a) π (b) $\pi/2$

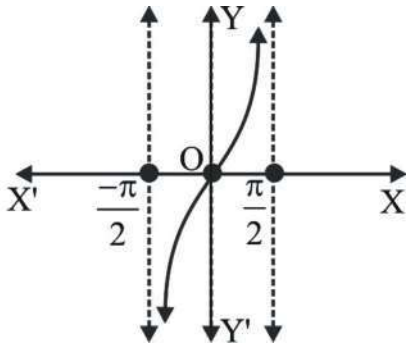
(c) 1 (d) 2π

Uttarakhand Board-2020

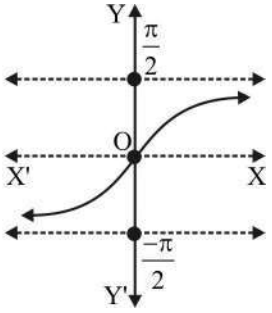
Ans. (b) :

41. Which of the following is a graph of $f(x) = \tan^{-1} x$, $(x \in R)$?

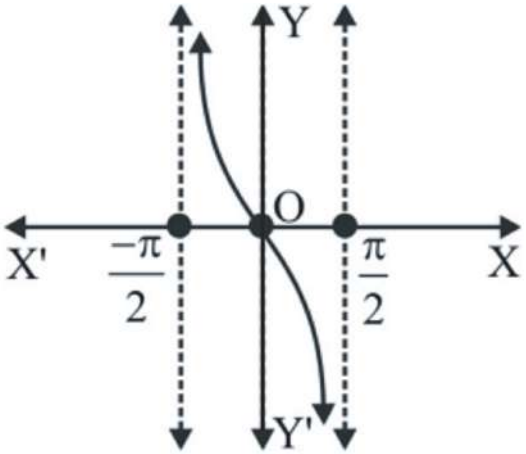
(a)



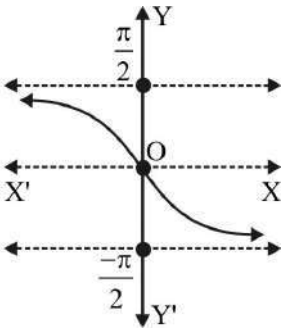
(b)



(c)



(d)



Gujarat Board-March, 2020

Ans. (b)

42. $\tan^{-1}\left(\tan\frac{5\pi}{4}\right) =$ ——— .

(a) $\frac{3\pi}{4}$ (b) $\frac{5\pi}{4}$

(c) $\frac{\pi}{4}$ (d) None of these

Gujarat Board-July, 2016

Ans. (c) :

43. **The principal solutions of cot x = $-\sqrt{3}$ are ___**

(a) $\frac{\pi}{6},\frac{5\pi}{6}$ (b) $\frac{5\pi}{6},\frac{7\pi}{6}$

(c) $\frac{5\pi}{6},\frac{11\pi}{6}$ (d) $\frac{\pi}{6},\frac{11\pi}{6}$

Maharashtra Board-2019

Ans. (c)

44. **The principal solutions of sec x = $\frac{2}{\sqrt{3}}$ are ___.**

(a) $\frac{\pi}{3},\frac{11\pi}{6}$ (b) $\frac{\pi}{6},\frac{11\pi}{6}$

(c) $\frac{\pi}{4},\frac{11\pi}{4}$ (d) $\frac{\pi}{6},\frac{11\pi}{4}$

Maharashtra Board-2018

Ans. (b)

Section-B : Very Short Answer

Fill in the blank:

45. **The value of sin (cosec^{-1}2) is_____**

Karnataka Board-2024

46. **The value of an inverse trigonometric functions which lies in its principal value branch is called ____ value of that inverse trigonometric functions.**

MP Board-2024

47. **The range of principal value branch of $\cot^{-1}$ is $(0, \pi)$. (True/False)**

MP Board-2024

48. **Evaluate : $\cos^{-1}\left(\cos\frac{13\pi}{6}\right)$.**

Jharkhand Board-2015

49. **Find the principal value of $\tan^{-1}\left(-\sqrt{3}\right)$**

J&K Board-2024

50. **Find the principal value of $\sin^{-1}\left(\sin\left(\frac{7\pi}{4}\right)\right)$.**

UP Board-2024

51. **Find the value of $\tan^{-1}\left(\sqrt{3}\right) - \cot^{-1}\left(-\sqrt{3}\right)$**

UP Board-2024

Manipur Board-2022

52. **Find the value of $\tan^{-1}\left(\sqrt{3}\right) - \sec^{-1}(-2)$.**

UP Board-2024

53. **Find principal value of**

$\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)$.

UP Board-2019

54. **Find principal value of $\text{cosec}^{-1}\left(\frac{-2}{\sqrt{3}}\right)$**

UP Board-2020

55. **Find the principal value of $\sin^{-1}\left(\sin\frac{7\pi}{4}\right)$**

UP Board-2020

56. **Find the principal value of $\cos^{-1}\left(-\frac{1}{\sqrt{2}}\right)$.**

UP Board-2018

57. **Find the principal value of $\cos^{-1}\left(-\frac{1}{2}\right)$.**

UP Board-2020

58. **Evaluate:**

$$\cos\left[\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)+\frac{\pi}{6}\right]$$

NIOS-2023

59. **For the principal values, evaluate**

$\tan^{-1}1+\cos^{-1}\left(\frac{-1}{2}\right)+\sin^{-1}\left(\frac{-1}{2}\right)$.

NIOS-2023

60. **Find the value of $\sin^{-1}\left(\frac{1}{2}\right)+2\cos^{-1}\left(\frac{1}{2}\right)$.**

Rajasthan Board-2018

61. **Write the range of the function $y = \sec^{-1} x$.**

Karnataka Board-2020

62. **Prove that,**

$\tan^{-1} 7 - \tan^{-1} 5 = \tan^{-1} \frac{1}{18}$

CG Board-2021

63. **Find the value of $\sin^{-1}\left[\sin\left(\frac{5\pi}{4}\right)\right]$.**

Tamil Nadu Board-March, 2020

64. **Write the value of $\cos^{-1}\{\cos(3\pi/2)\}$.**

Odisha Board-2019, 2023

65. **Write the domain of the function defined by $f(x) = \sin^{-1} x + \cos x$**

Odisha Board-2020

66. Find the principal value of $\sin^{-1}\left(\sin\frac{4\pi}{3}\right)$

Manipur Board-2016

67. Find the principal value of $\sec^{-1}\left(\frac{2}{\sqrt{3}}\right)$

Meghalaya Board-2021

68. Find the principal value of $\sin^{-1}\left(\frac{1}{\sqrt{2}}\right)$.

Assam Board-2022

69. Write the principal value of

$\cos^{-1}\left[\cos\left(\frac{-16\pi}{15}\right)\right]$.

Assam Board-2020

70. Write down the range of $f(x) = \cot^{-1} x$.

Assam Board-2019

71. What is the domain of the function $\text{cosec}^{-1}x$?

Assam Board-2013, 2018

72. Write down the range of $f(x) = \text{cosec}^{-1} x$.

Assam Board-2017

73. Find the principal value of $\sin^{-1}\left(\sin\frac{3\pi}{5}\right)$.

Assam Board-2015

74. Find the value of $\cos^{-1}\left(\cos\frac{9\pi}{8}\right)$

Assam Board-2012

75. Evaluate $\sin\left\{\frac{\pi}{3}-\sin^{-1}\left(-\frac{1}{2}\right)\right\}$.

Jharkhand Board-2014, 2020

CG Board-2019

76. Find the value of $\cot^{-1}(-1)$.

Jharkhand Board-2019

77. $\tan\left(\sin^{-1}\frac{4}{\sqrt{17}}\right) =$ ____

$\left[1, \sqrt{17}, 4, \sqrt{13}\right]$

Odisha Board-2022

78. Find the principal solutions of $\cot\theta = 0$

Maharashtra Board-2022

79. Find the prinicipal value of $\cot^{-1}\left(\frac{-1}{\sqrt{3}}\right)$.

Maharashtra Board-2022

Section-C : Short Answer

80. Find the value of $\sin^{-1}\left(\sin\frac{3\pi}{5}\right)$.

Karnataka Board-2020

81. Draw the graph of cosx in $[0, \pi]$ and $\cos^{-1}x$ in $[-1,1]$.

Tamil Nadu Board-March, 2020

82. Let the mapping $f(x) = ax + b$, $a > 0$, maps $[-1, 1]$ onto $[0, 2]$; show that $\cot(\cot^{-1} 7 + \cot^{-1} 8 + \cot^{-1} 18) = f(2)$.

Assam Board-2019

83. If $-1 \le x \le 1$, then prove that $\sin^{-1}x + \cos^{-1}x = \frac{x}{2}$

Maharashtra Board-2023

Manipur Board-2022

Jharkhand Board-2013

Section-D : Long Answer

84. Find the value of :

$2\tan^{-1}(1) - \cos^{-1}\left(\frac{-1}{2}\right) + 3\sin^{-1}\left(\frac{1}{\sqrt{2}}\right) + 2\sec^{-1}\left(\frac{2}{\sqrt{3}}\right)$

Punjab Board-2021

B. Elementary Property of inverse trigonometric function

Section-A : Multiple Choice Questions

85. If $0 < x < 1$ and if $\tan^{-1}(1 - x)$, $\tan^{-1} x$ and $\tan^{-1}(1 + x)$ are in arithmetic progression then $x^3 =$ .....

(a) x^2 (b) $x^2 - 1$

(c) $1 - x^2$ (d) $1 + x^2$

Gujarat Board-July, 2018

Ans. (c)

86. $\cos^{-1}\left(\frac{5}{x}\right) + \sin^{-1}\left(\frac{4}{5}\right) = \frac{\pi}{2}$; $x \ne 0$ then $x =$ .....

(a) 4 (b) 3

(c) 5 (d) 1

Gujarat Board-July, 2018

Ans. (a) :

87. If $\sin^{-1}(1-x) - 2\sin^{-1} x = \frac{\pi}{2}$, then value of x will be

(a) $0, \frac{1}{2}$ (b) $1, \frac{1}{2}$

(c) 0 (d) $\frac{1}{2}$

UP Board-2020

Ans. (c)

88. The value of $\cot(\tan^{-1}\alpha + \cot^{-1}\alpha)$ is

(a) 0 (b) 1

(c) $\frac{\pi}{4}$ (d) $\frac{\pi}{2}$

NIOS-2023

Ans. (a)

89. $\sin^{-1}\frac{1}{x} = ?$

(a) $\sec^{-1}x$ (b) $\text{cosec}^{-1}x$

(c) $\tan^{-1}x$ (d) $\sin x$

Bihar Board-2019

Ans. (b)

90. If $-1 < x < 1$. then $2\tan^{-1}x = ?$

(a) $\sin^{-1}\frac{2x}{1+x^2}$ (b) $\sin^{-1}\frac{2x}{1-x^2}$

(c) $\sin^{-1}\frac{1-x^2}{1+x^2}$ (d) $\sin^{-1}\frac{1+x^2}{1-x^2}$

Bihar Board-2019

Ans. (a)

91. $\cos^{-1}(2x) + \sin^{-1}(2x) = \ldots\ldots\ldots\ 2x \in |-1, 1|.$

(a) $\frac{\pi}{2}$ (b) $\frac{\pi}{4}$

(c) π (d) 0

Bihar Board-2021

Ans. (a)

92. $\sin^{-1}(-x) =$

(a) $\frac{\pi}{2} - \sin^{-1}x$ (b) $\sin^{-1}x$

(c) $-\sin^{-1}x$ (d) $\frac{\pi}{2} + \sin^{-1}x$

Bihar Board-2021

Ans. (c)

93. $\cot^{-1}\frac{1}{x} = \ldots\ldots(x > 0)$

(a) $-\cot^{-1}x$ (b) $\tan^{-1}\frac{1}{x}$

(c) $\tan^{-1}x$ (d) $\cot^{-1}x$

Bihar Board-2021

Ans. (c)

94. $\cos(\sec^{-1}x + \text{cosec}^{-1}x) =$

(a) 1 (b) -1

(c) 0 (d) $\frac{1}{\sqrt{2}}$

Bihar Board-2021

Ans. (c)

95. $\sin\left(\sec^{-1}x + \text{cosec}^{-1}x\right) =$

(a) $\frac{\pi}{2}$ (b) 0

(c) -1 (d) 1

Bihar Board-2021

Ans. (d)

96. $2\tan^{-1}\frac{1}{3} + \tan^{-1}\frac{1}{7} =$

(a) $\frac{\pi}{2}$ (b) π

(c) $\frac{\pi}{4}$ (d) 2π

Bihar Board-2021

Ans. (c)

97. $\cos^{-1}\frac{1-x^2}{1+x^2} = \ldots\ldots\ldots(|x| \le 1)$

(a) $2\cos^{-1}x$ (b) $2\sin^{-1}x$

(c) $2\tan^{-1}x$ (d) $\tan^{-1}2x$

Jharkhand Board-2023

Bihar Board-2021

Ans. (c)

98. $3\sin^{-1}x = \ldots\ldots\ldots |x| \le \frac{1}{2}$

(a) $\sin^{-1}\left(4x^3 - 3x\right)$ (b) $\sin^{-1}\left(3x - 4x^3\right)$

(c) $\sin^{-1}\left(3x - 4x^3\right)$ (d) $\sin^{-1}\left(3x^3 - 4x\right)$

Bihar Board-2021

Ans. (c)

99. $\sin^{-1}\frac{12}{13} + \sin^{-1}\frac{4}{5} =$

(a) $\sin^{-1}\frac{16}{18}$ (b) $\sin^{-1}\frac{48}{65}$

(c) $\sin^{-1}\frac{56}{65}$ (d) $\frac{\pi}{2}$

Bihar Board-2022

Ans. (c)

100. If $x = \frac{1}{7}$ then the value of

$\cos(2\cos^{-1}x + 2\sin^{-1}x)$ is

(a) $\frac{1}{7}$ (b) $\frac{3}{7}$

(c) -1 (d) none of these

Bihar Board-2022

Ans. (c)

101. $2\tan^{-1}\frac{1}{5}=$

(a) $\tan^{-1}\frac{5}{12}$ (b) $\tan^{-1}\frac{1}{70}$

(c) $\tan^{-1}\frac{1}{99}$ (d) $\tan^{-1}\frac{11}{12}$

Bihar Board-2022

Ans. (a)

102. $\tan^{-1}\frac{1}{5}+\tan^{-1}\frac{1}{7}=$

(a) $\tan^{-1}\frac{1}{17}$ (b) $\tan^{-1}\frac{3}{17}$

(c) $\tan^{-1}\frac{2}{35}$ (d) $\tan^{-1}\frac{6}{17}$

Bihar Board-2022

Ans. (d)

103. $\sin^{-1}\frac{2x}{1+x^2}=$

(a) $2\sin^{-1}x$ (b) $2\cos^{-1}x$

(c) $2\tan^{-1}x$ (d) $2\cot^{-1}x$

Bihar Board-2022

Ans. (c)

104. $\tan^{-1}\left(\frac{1}{4}\right)+\tan^{-1}\left(\frac{2}{9}\right)$ **is**

(a) $\tan^{-1}\left(\frac{1}{2}\right)$ (b) $\frac{1}{2}\cos^{-1}\left(\frac{3}{5}\right)$

(c) $\frac{1}{2}\sin^{-1}\left(\frac{3}{5}\right)$ (d) $\frac{1}{2}\tan^{-1}\left(\frac{3}{5}\right)$

Tamil Nadu Board-March, 2020

Ans. (a) :

105. **If** $\sin^{-1}x+\sin^{-1}y=\frac{2\pi}{3}$ **; then** $\cos^{-1}x+\cos^{-1}y$ **is equal to :**

(a) π (b) $\left(\frac{2\pi}{3}\right)$

(c) $\left(\frac{\pi}{3}\right)$ (d) $\left(\frac{\pi}{6}\right)$

Tamil Nadu Board-March, 2020

Ans. (c) :

106. **The value of** $\cos\left(\sin^{-1}\frac{8}{17}\right)$ **is:**

(a) $\frac{8}{17}$ (b) $\frac{11}{17}$

(c) $\frac{15}{17}$ (d) None of these

Haryana Board-2018

Ans. (c)

107. **The value of** $\cos\left(\sec^{-1}\frac{5}{3}\right)$ **is:**

(a) $\frac{5}{3}$ (b) $\frac{3}{5}$

(c) $\frac{4}{5}$ (d) $\frac{5}{4}$

Haryana Board-2018

Ans. (b)

108. $\cos^{-1}\left(\frac{1}{2}\right)+2\sin^{-1}\left(\frac{1}{2}\right)$ **is equal to:**

(a) $\frac{2\pi}{3}$ (b) $\frac{\pi}{2}$

(c) $\frac{3\pi}{4}$ (d) π

Haryana Board-2017

Ans. (a)

109. $\cos\left(\cos^{-1}\frac{1}{3}+\cos^{-1}\frac{1}{5}\right)+$

$\cos\left(\sin^{-1}\frac{1}{3}+\sin^{-1}\frac{1}{5}\right)=$ ———

(a) 0 (b) π

(c) $\frac{\pi}{2}$ (d) $\frac{\pi}{4}$

Gujarat Board-July, 2017

Ans. (a)

110. $\sin^{-1}\left(\cos\frac{\pi}{13}\right)+\cos^{-1}\left(\sin\frac{\pi}{13}\right)=$ ———

(a) $\frac{\pi}{13}$ (b) $\frac{11\pi}{13}$

(c) $\frac{15\pi}{13}$ (d) $\frac{9\pi}{13}$

Gujarat Board-July, 2017

Ans. (b)

111. **If** $4\cos^{-1}x+\sin^{-1}x=\frac{\pi}{2}$ **then** $x=$ ———

(a) 1 (b) 0

(c) $\frac{\sqrt{3}}{2}$ (d) $\frac{1}{2}$

Gujarat Board-July, 2017

Ans. (a)

112. $\sec^2(\tan^{-1}2)+\operatorname{cosec}^2(\cot^{-1}3)=$ ..... .

(a) 6 (b) 15

(c) 13 (d) 25

Gujarat Board-March, 2018

Ans. (b) :

113. $\sin\left(\cos^{-1}\left(-\frac{1}{7}\right)+\sin^{-1}\left(-\frac{1}{7}\right)\right)$ = ...

(a) 1 (b) $\frac{1}{7}$

(c) 0 (d) $-\frac{1}{7}$

Gujarat Board-March, 2018

Ans. (a) :

114. If $3\cos^{-1} x + \sin^{-1} x = \pi$ then x = ...

(a) $\frac{\sqrt{3}}{2}$ (b) $-\frac{1}{\sqrt{2}}$

(c) $\frac{1}{\sqrt{2}}$ (d) $\frac{1}{2}$

Gujarat Board-March, 2018

Ans. (c) :

115. $\sin[\sec^{-1}(-7) + \operatorname{cosec}^{-1}(-7)]$ = ...

(a) 0 (b) –7

(c) 1 (d) –14

Gujarat Board-July, 2015

Ans. (c)

116. $\cos^7\left(3\sin^{-1}\frac{1}{2}\right)$ = ...

(a) 1 (b) –1

(c) 0 (d) 2

Gujarat Board-July, 2015

Ans. (c) :

117. $\sec^2\left(\cot^{-1}\frac{1}{3}\right)+\operatorname{cosec}^2(\tan^{-1}3)$ = ...

(a) $\frac{100}{9}$ (b) $\frac{98}{9}$

(c) $\frac{16}{9}$ (d) 15

Gujarat Board-July, 2015

Ans. (a)

118. If $\cot^{-1}\left(\frac{11}{2}\right) + \cot^{-1}\left(\frac{24}{7}\right) = \cot^{-1}x$, then x = ...

(a) 2 (b) 3

(c) $\frac{1}{2}$ (d) 1

Gujarat Board-July, 2015

Ans. (a) :

119. $\sec^{-1} x - \operatorname{cosec}^{-1} x + \cos^{-1}\left(x^{-1}\right) + \sin^{-1}\left(x^{-1}\right)$ = ...
$\left(\text{where}\,|x| \geq 1,\ x \in R\right)$.

(a) $\frac{\pi}{2}$ (b) $\frac{3\pi}{2}$

(c) π (d) 0

Gujarat Board-March, 2020

Ans. (c) : j

120. $\cot\left\{\frac{2019\pi}{2}-\left(\operatorname{cosec}^{-1}\frac{5}{3}+\tan^{-1}\frac{2}{3}\right)\right\}$ = ...

(a) $\frac{-17}{6}$ (b) $\frac{19}{6}$

(c) $\frac{17}{6}$ (d) $\frac{-19}{6}$

Gujarat Board-March, 2020

Ans. (c) : j

121. $\sum_{i=0}^{2}\cot^{-1}\{-(i+1)\}$ = ...

(a) $\frac{\pi}{2}$ (b) $\frac{-3\pi}{2}$

(c) $\frac{-5\pi}{2}$ (d) $\frac{5\pi}{2}$

Gujarat Board-March, 2020

Ans. (d) : j

122. If $\tan^{-1} x + \tan^{-1} y = \frac{4\pi}{5}$, then $\cot^{-1} x + \cot^{-1} y$ = ...

(a) π (b) $\frac{2\pi}{5}$

(c) $\frac{3\pi}{5}$ (d) $\frac{\pi}{5}$

Gujarat Board-August, 2020

Ans. (d) : j

123. $\tan^2\left(\frac{1}{2}\cos^{-1}\frac{3}{4}\right)$ = ...

(a) 1 (b) $\frac{3}{7}$

(c) $\frac{1}{7}$ (d) $\frac{4}{7}$

Gujarat Board-August, 2020

Ans. (c) : j

124. $\sec^2(\tan^{-1}3) + \operatorname{cosec}^2(\cot^{-1}5)$ = ——— .

(a) 10 (b) 34

(c) 15 (d) 36

Gujarat Board-July, 2016

Ans. (d) :