CBSE

RELATIONS AND FUNCTIONS WS 1

Class 11 - Mathematics

1. Let R be a relation from a set A to a set B, then **[1]**

   a) R = A ∪ B

   b) R ⊆ B × A

   c) R ⊆ A × B

   d) R = A ∩ B

2. The coordinates of the foot of the perpendicular drawn from the point (2, - 3, 4) on the y-axis is: **[1]**

   a) (2, 0, 4)

   b) (2, 3, 4)

   c) (-2, -3, -4)

   d) (0, -3, 0)

3. The domain of definition of the function f(x) = log |x| is **[1]**

   a) R

   b) $(0, \infty)$

   c) $(-\infty, 0)$

   d) R - {0}

4. If A = { 1, 2, 3}, B = {x, y} Then the number of functions that can be defined from A into B is **[1]**

   a) 12

   b) 6

   c) 8

   d) 3

5. A function f from the natural numbers to the set of integers defined by f(n) = $\begin{cases} \frac{n-1}{2}, & when\ n\ is\ odd \\ -\frac{n}{2}, & when\ n\ is\ even \end{cases}$ is **[1]**

   a) neither one-one nor onto

   b) onto but not one-one

   c) both one-one and onto

   d) one-one but not onto

6. The domain of definition of the function f(x) = $\sqrt{\frac{x-2}{x+2}} + \sqrt{\frac{1-x}{1+x}}$ is **[1]**

   a) ϕ

   b) [1, -1]

   c) [-1, 1]

   d) $(-\infty, -2] \cup [2, \infty)$

7. If $e^{f(x)} = \frac{10+x}{10-x}, x \in$ (-10, 10) and f(x) = k f $\left(\frac{200x}{100+x^2}\right)$ Then k = **[1]**

   a) 0.8

   b) 0.6

   c) 0.7

   d) 0.5

8. The domain of the function f(x) = $\sqrt{5|x| - x^2 - 6}$ is **[1]**

   a) $[-3, -2) \cup [2, 3)$

   b) $[-3, -2] \cup [2, 3]$

   c) $[3, -2] \cup [2, -3]$

   d) (-3, 2) ∪ (2, 3)

9. The relation R defined on the set A = {1, 2, 3, 4, 5) by R = {(a, b) : $|a^2 - b^2| < 7$} is given by **[1]**

   a) {(1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (1, 2), (2, 3)}

   b) {(3, 3), (4, 3), (5, 4), (3, 4)}

c) {(1, 1), (2, 1), (3, 1), (4, 1), (2, 3)}

d) {(2, 2), (3, 2), (4, 2), (2, 4)}

10. Let, f : R $\rightarrow$ R be defined by f(x) = 2 x + |x| Then f (2x) + f (-x) - f (x) = **[1]**

a) -2 |x|

b) 2 |x|

c) -2 x

d) 2 x

11. If f(x) = cos (log x) then $f\left(x^2\right) f\left(y^2\right)-\frac{1}{2}\left\{f\left(\frac{x^2}{y^2}\right)+f\left(x^2 y^2\right)\right\}$ has the value **[1]**

a) -1

b) -2

c) None of these

d) 1/2

12. The range of the function f(x) $=\frac{x+2}{|x+2|}, x \neq-2$ is **[1]**

a) {1}

b) {-1, 1}

c) $(0, \infty)$

d) {-1, 0, 1 }

13. The range of f(x) = cos [x] , for $-\pi/2<x<\pi/2$ is **[1]**

a) [-1, 1]

b) {cos1, cos 2, 1}

c) {-1, 1, 0}

d) {cos 1, - cos 1,1}

14. The range of f(x) = x $+\frac{1}{x}$ is **[1]**

a) [2, ∞)

b) [-2, 2]

c) $(-\infty,-2]$

d) none of these

15. The range of the function f(x) = $\frac{x}{|x|}$ is **[1]**

a) {-1, 1}

b) R -{0}

c) R - {-1, 1}

d) {-1, 2}

16. A relation ϕ from C to R is defined by x ϕ y $\Leftrightarrow$ | x | = y. Which one is correct? **[1]**

a) (1 + i) ϕ 2

b) 3 ϕ (-3)

c) i ϕ 1

d) (2 + 3i) ϕ 13

17. If f(x) = cos $\left(\log _e x\right)$ Then $f\left(\frac{1}{x}\right) f\left(\frac{1}{y}\right)-\frac{1}{2}\left\{f(x y)+f\left(\frac{x}{y}\right)\right\}$ is equal to **[1]**

a) log (cos (x - y))

b) 0

c) 1

d) cos (x - y)

18. The function f : $R \rightarrow R$ is defined by f (x) = $\sin^4$ x - $\sin^2$ x +1 f,then R(f) = **[1]**

a) (3 / 4 ,1)

b) [3 /4 ,1]

c) [3 /4 ,1)

d) (3 / 4 ,1]

19. If set A = {1, 2} and set B = {a, b}, then cartesian product of set and A set B is given by **[1]**

a) A $\times$ B = {(a, 1), (b, 1), (2, a), (2, b)}

b) A $\times$ B = {(a, 1), (1, b), (2, a), (2, b)}

c) A $\times$ B = {(1, a), (1, b), (2, a), (2, b)}

d) A $\times$ B = {(a, 1), (b, 1), (2, a), (b, 2)}

20. Let T be the set of all triangles in the Euclidean plane, and let a relation R on T be defined as aRb if a is congruent to b a,b $\in$ T. Then R is **[1]**

a) an equivalence relation

b) neither reflexive nor symmetric

c) transitive but not symmetric

d) reflexive but not transitive

21. Let n (A) = m, and n (B) = n. Then the total number of non-empty relations that can be defined from A to B is **[1]**

a) m^n

b) $m^n - 1$

c) $n^m - 1$

d) $2^{mn} - 1$

22. Number of relations that can be defined on the set A = {a, b, c, d} is **[1]**

a) 24

b) 4^4

c) 16

d) 2^{16}

23. If f(x) = |cos x|, then $f\left(\frac{3\pi}{4}\right)$ is **[1]**

a) 1

b) -1

c) $\frac{-1}{\sqrt{2}}$

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

24. If f : R $\rightarrow$ R is given by f(x) = |x| and A = {x $\in$ R : x < 0} , then $f^{-1}(A)$ equals **[1]**

a) ϕ

b) A

c) A $\cup$ {0}

d) R

25. If f(x) = $\frac{x-1}{x+1}$ then $\left(f\frac{1}{f(x)}\right)$ equals **[1]**

a) 0

b) 1

c) x

d) $\frac{1}{x}$

26. The relation R = {1, 1), (2, 2), (3, 3)} on the set {1, 2, 3) is **[1]**

a) an equivalence relation

b) reflexive relation only

c) symmetric relation only

d) transitive relation only

27. The range of f(a) = a^x, where a > 0 is **[1]**

a) (- ∞, 0]

b) (0, ∞)

c) [0, ∞)

d) (- ∞, 0)

28. Let R = { (x,y): $x^2 + y^2 = 1$ and x, y $\in$ R } be a relation in R. The relation R is **[1]**

a) symmetric

b) anti – symmetric

c) reflexive

d) transitive

29. Let f(x) = $\cos^{-1}(3x - 1)$ find domain of f(x) **[1]**

a) $\left[\frac{2}{3}, \frac{-2}{3}\right]$

b) $\left(0, \frac{2}{3}\right)$

c) $\left[0, \frac{2}{3}\right]$

d) $\left[\frac{-2}{3}, \frac{2}{3}\right]$

30. If $A = \{(x, y) : x^2 + y^2 = 25\}$ and $B = \{(x, y) : x^2 + 9y^2 + y^2 = 144\}$, then $A \cap B$ contains **[1]**

a) three points

b) two points

c) four points

d) one point

31. R is a relation from {11, 12, 13} to {8, 10, 12} defined by y = x - 3. Then, R^{-1} is **[1]**

a) {(10,13),(12,10)}

b) {(10,13), (8,11), (12,10)}

c) {(11,8), (13,10)}

d) {(8,11), (10,13)}

32. If $x \neq 1$ and f (x) $= \frac{x+1}{x-1}$ is a real function, then f (f (f(2))) is **[1]**

a) 4

b) 3

c) 2

d) 1

33. The domain and range of the real function f defined by f (x) $= \frac{4-x}{x-4}$ is given by **[1]**

a) Clearly, Domain = R - {-4}, Range = {-1 , 1}

b) Domain = R - {1}, Range = R

c) Domain = R, Range = {-1, 1}

d) Domain = R - {4}, Range = {-1}

34. If f(x) = log $\left(\frac{1+x}{1-x}\right)$ and g(x) $= \frac{3x+x^3}{1+3x^2}$ Then f(g)(x) is equal to **[1]**

a) f (3x)

b) -f (x)

c) $[f(x)]^3$

d) 3 f(x)

35. If A = {1, 2, 3), B = {1, 4, 6, 9} and R is a relation from A to B defined by x is greater than y. The range R is **[1]**

a) {6, 9}

b) {1}

c) {4, 6, 9}

d) {1, 4, 6, 9}

36. If f (x) = $x^3 - \frac{1}{x^3}$, then f (x) + f ($\frac{1}{x}$) is equal to **[1]**

a) $2x^3$

b) $2\frac{1}{x^3}$

c) 1

d) 0

37. Let A and B be finite sets containing m and n elements respectively. The number of relations that can be defined from A to B is **[1]**

a) 2^{m+n}

b) 0

c) 2^{mn}

d) mn

38. Let A = $\{x \in R : x = 0, -4 \leq x \leq 4\}$ and f : $A \to R$ be defined by f(x) = $\frac{|x|}{x}$ for $x \in A$ Then A is **[1]**

a) $|x : -4 \leq x \leq 0|$

b) {1}

c) $|x : 0 \leq x \leq 4|$

d) {1 ,-1 }

39. If f (x) = sin $\left[x^2\right] x + \sin\left[-\pi^2\right]$ x. where x denotes the greatest integer less than or equal to x them **[1]**

a) f $(\pi/4)$ = -2

b) f $(\pi/2)$ = 1

c) f (π) = 2

d) f $(\pi/4)$ = -1

40. In a city 20 percent of the population travels by car, 50 percent travels by bus and 10 percent travels by both car and bus. Then persons travelling by a car or bus is **[1]**

a) 60 percent

b) 80 percent

c) 70 percent

d) 40 percent

41. Let A = {a, b, c}, then the range of the relation R = {(a, b), (a, c), (b, c)} defined on A is **[1]**

a) {b, c}

b) {c}

c) {a, b}

d) {a, b, c}

42. Consider the non – empty set consisting of children in a family and a relation R defined as aRb if a is brother of b. Then R is **[1]**

a) both symmetric and transitive

b) transitive but not symmetric

c) neither symmetric nor transitive

d) symmetric but not transitive

43. The domain of the function f defined by f(x) = $\sqrt{4-x}+\frac{1}{\sqrt{x^2-1}}$ is equal to **[1]**

a) $(-\infty,-1)\cup[1,4)$

b) $(-\infty,-1]\cup(1,4)$

c) $(-\infty,-1)\cup(1,4]$

d) $(-\infty,-1)\cup[1,4]$

44. If the set A contains 5 elements and the set B contains 6 elements, then the number of one – one and onto mappings from A to B is **[1]**

a) 100

b) 720

c) 120

d) 0

45. Let R be the relation over the set of all straight lines in a plane such that l_1 R $l_2 \Leftrightarrow l_1 \perp l_2$. Then, R is **[1]**

a) symmetric and transitive but not Reflexive

b) Reflexive and transitive but not symmetric

c) Symmetric and reflexive but not transitive

d) Symmetric but neither reflexive nor transitive.

46. Range of f(x) = $\frac{1}{1-2\cos x}$ is **[1]**

a) $(-\infty,-1]\cup\left[\frac{1}{3},\infty\right)$

b) $\left[-1,\frac{1}{3}\right]$

c) $\left[\frac{1}{3},1\right]$

d) $\left[-\frac{1}{3},1\right]$

47. Which one of the following is not a function? **[1]**

a) $\{(x,y):x,y\in R,y=x^3\}$

b) $\{(x, y): x, y \in R, x^2 = y\}$

c) $\{(x,y):x,y\in R,y^2=x\}$

d) $\{(x,y):x,y\in R,x=y^3\}$

48. The domain of the function f(x) = $\log_{3+x}(x^2 - 1)$ is **[1]**

a) (-3, -2) ∪ (-2, -1) ∪ (1, ∞)

b) [-3, -1) ∪ [1, ∞)

c) (-3, -1) ∪ (1, ∞)

d) [-3, -2) ∪ (-2, -1) ∪ [1, ∞)

49. Let A = {1, 2, 3} and B = {2, 4, 6, 8}. Consider the rule f : A → B, defined f(x) = 2x, $\forall x \in$ A, then range of f is given by set **[1]**

a) {6, 4, 8}

b) {1, 2, 3}

c) {2, 4, 6}

d) {2, 4, 6, 8}

50. The relation R defined on the set A ={1,2, 3, 4, 5} by R = {(a, b) :| $a^2 - b^2$ | < 16}, is given by **[1]**

a) {(2, 2), (3, 2), (4, 2), (2, 4)}

b) R = {(1, 1), (2, 1), (3, 1), (4, 1), (2, 3),(2, 2), (3, 2), (4, 2), (2, 4),(3, 3), (5, 4), (3, 4)}

c) none of these

d) {(3, 3), (4, 3), (5, 4), (3, 4)}

51. Let the relation R be defined in N by aRb, if 2a + 3b = 30. Then, R = _____. **[1]**

a) {(8, 3), (6, 6), (9, 4), (12, 2)}

b) {(3, 8) (6, 5)(9, 4), (12, 2)}

c) {(3, 8) (6, 6), (9, 4), (12, 2)}

d) {(3, 8), (6, 6), (9, 4), (2,12)}

52. Suppose f : [2, 2] $\rightarrow$R be defined by $f(x) = \begin{cases} -1 \ for & -2 \leq x \leq 0 \\ x-1 \ for & 0 \leq x \leq 2 \end{cases}$, Then { x $\in$ [-2, 2]: x $\leq$ 0 and f (| x |) = x} = **[1]**

a) {-1}

b) ϕ

c) $\left\{-\frac{1}{2}\right\}$

d) {0}

53. If R is a relation on a finite set having n elements, then the number of relations on A is **[1]**

a) $_{n}n$

b) 2^{n}

c) 2^{n^2}

d) $_{n}2$

54. Domain and range of f(x) = $\frac{|x-3|}{x-3}$ are respectively. **[1]**

a) R, [-1, 1]

b) R^{-}, R

c) R - {3}, {1, -1}

d) R^{+}, R

55. A relation R on a non – empty set A is an equivalence relation if it is **[1]**

a) reflexive, symmetric and transitive

b) reflexive

c) reflexive, antisymmetric, transitive

d) symmetric and transitive

56. If f(x) = $64x^3 + \frac{1}{x^3}$ and α, β are the roots of $4x + \frac{1}{x} = 3$ Then **[1]**

a) f $(\alpha) = f(\beta)$ = -9

b) f $(\alpha) = f(\beta)$ = 32

c) f $(\alpha) = f(\beta)$ = 63

d) f $(\alpha) \neq f(\beta)$

57. Let R be the relation in the set N given by R = {(a, b) : a = b – 2, b > 6}. **[1]**

a) (6, 8) $\in$ R

b) (8, 7) $\in$ R

c) (2, 4) $\in$ R

d) (3, 8) $\in$ R

58. If A = [a, b], B = [c, d], C = [d, e] then {(a, c), (a, d), (a,e), (b,c), (b, d), (b, e)} is equal to **[1]**

a) $A \cap (B \cup C)$

b) $A \times (B \cap C)$

c) $A \times (B \cup C)$

d) $A \cup (B \cap C)$

59. If f(x) = cos (log x) then [f(x) f(y) $-\frac{1}{2}\ f\left(\frac{x}{y}\right) + f(xy)$] has the value **[1]**

a) 1/2

b) -2

c) None of these

d) -1

60. Let R = {[a, a^3) : a is a prime number less than 5} be a relation. Find the range of R. **[1]**

a) {2, 27}

b) {2, 3}

c) {3, 8}

d) {8, 27}

61. let f(x) = $e^{\sqrt{x^2-1}}$ log (x - 1) Then, dom f(x) =? **[1]**

a) (1, ∞)

b) $(-\infty, -1] \cup (1, \infty)$

c) (-∞, 1]

d) [- 1 , ∞)

62. The domain of function f : R $\rightarrow$ R defined by $f(x) = \sqrt{x^2 - 3x + 2}$ is **[1]**

a) $[2, \infty]$

b) $(-\infty, 1] \cup [2, \infty)$

c) $(-\infty, 1]$

d) [1, 2]

63. The domain and range of real function f defined by f (x) = $\sqrt{x-1}$ is given by **[1]**

a) Domain $= [\infty, \infty)$, Range $= [0, \infty)$

b) Domain $= [1, \infty)$, Range $= (\infty, \infty)$

c) Domain $= [1, \infty)$, Range $= [0, \infty)$

d) Domain $= (1, \infty)$, Range $= (0, \infty)$

64. If R is a relation from a non – empty set A to a non – empty set B, then **[1]**

a) $R \subseteq A \times B$

b) $R = A \cap B$

c) $R = A \cup B$

d) $R = A \times B$

65. If f (x) = cos (log x), then value of f (x) $f(4) \ - \frac{1}{2}\left\{f\left(\frac{x}{4}\right) + f(4x)\right\}$ is **[1]**

a) 0

b) ± 1

c) -1

d) 1

66. Two functions f : R $\rightarrow$ R and g : R $\rightarrow$ R are defined as follows : $f(x) = \left\{\begin{array}{l} 0\,(xRational) \\ 1\,(xIrrational) \end{array}\right\}$,g(x) = $\left\{\begin{array}{l} -1(x \text{ Rational }) \\ 0(x \text{ Irrational }) \end{array}\right\}$ then (gof)(e) + (fog)(π) = **[1]**

a) 0

b) 1

c) 2

d) -1

67. Let R = {(a, a), (b, b), (c, c), (a, b)} be a relation on set A = {a, b, c}. Then, R is **[1]**

a) transitive

b) anti – symmetric

c) symmetric

d) reflexive

68. The range of the function f(x) = |x - 1| is **[1]**

a) R

b) $(-\infty, 0)$

c) $(0, \infty)$

d) $[0, \infty)$

69. The range of the function f(x) = $\frac{x^2-x}{x^2+2x}$ is **[1]**

a) R - { - 1 / 2 ,1 }

b) R - {1}

c) R

d) R - { 1 / 2 ,-1 }

70. Let R be the relation on N defined as by x + 2 y = 8. The domain of R is **[1]**

a) {2, 4, 6, 8}

b) {2, 4, 8}

c) {1, 2, 3, 4}

d) {2, 4, 6}

71. Let S be the set of all real numbers. Then the relation R = {(a, b) : 1 + ab > 0} on S is **[1]**

a) reflexive symmetric and transitive.

b) reflexive and symmetric but not transitive.

c) reflexive and transitive but not symmetric.

d) symmetric and transitive but not reflexive.

72. Let f(x) = x^3 . Then, dom (f) and range (f) are respectively **[1]**

a) R and R^+

b) R^+ and R

c) R^+ and R^+

d) R and R

73. Which of the following are functions? **[1]**

a) $\{(x, y) : x^2 - y^2 = 1, x, y \in R\}$

b) $\{(x, y) : y^2 = x, \ \ x, y \in R\}$

c) $\{(x, y) : x^2 + y^2 = 1, x, y \in R\}$

d) $\{(x, y) : y = |x|, x, y \in R\}$

74. If A = {(x, y) : x^2 + y^2 = 5} and B = {(x, y) : 2x = 5y}, then A ∩ B contains **[1]**

a) two points

b) one-point

c) infinite points

d) no point

75. Let f(x) = $\frac{\sin^{-1} x}{x}$ Then , dom (f) = ? **[1]**

a) [-1,1] - {0}

b) [1,-1]

c) [-1,1]

d) (-1,1)