UNIT TEST – 1(Relations and functions, Graphs, Practical geometry)

MATHEMATICS

CLASS: X standard **MARKS: 100**

PART-I [Marks 14]

Answer all the 14 questions **14x1=14**

1. If n($A \times B$) = 6 and A = {1, 3} then n (B) is
(a)1 (b)2 (c)3 (d)6

2. If n(A)= p and n(B) = q then n(A x B) =
(a) p+q (b) p – q (c) p x q (d) p/q

3. A = {a, b, p}, B = {2, 3}, C = {p, *q, r, s}* then n [(A UC) x B] is
(a)8 (b)20 (c)12 (d)16

4. If there are 1024 relations from a set A = {1, 2, 3, 4, 5} to a set B, then the number of elements in $B$is
(a)3 (b)2 (c)4 (d)8

5. The range of the relation $R = \{(x, x^2) \mid x$ is a prime number less than 13}is
(a){2,3,5,7} (b){2,3,5,7,11} (c){4,9,25,49,121} (d){1,4,9,25,49,121}

6. 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
(a) m^n (b)n^m (c)$2^{mn}-1$ (d)2^{mn}

7. If {(a, 8), (6, b) represents an identity function, then the value of a and b are respectively
(a)(8,6) (b)(8,8) (c)(6,8) (d)(6,6)

8. Let A = {1, 2, 3, 4} and B = *{4, 8, 9, 10}*. A function $f : A \to B$ given by f = {(1, 4),(2, 8),(3, 9),(4, 10)} is a
a) Many-one function (b) Identity function c) one-to-one function (d) Into function

9.If $f(x) = 2x^2$ and $g(x) = \frac{1}{3x}$ then f o g is

a) $3/2x^2$ b)$2/3x^2$ c)$2/9x^2$ d)$1/6x^2$

10. If f: $A \longrightarrow B$ is a bijective function and if n (B) = 7, then n (A) is equal to
(a) 7 (b) 49 (c)1 (d)14

11. The range of a function is a subset of its _____
(a) Co domain (b) Domain (c) Unique (d) Constant

12. Let f and g be two functions given by f = {(0, 1), (2, 0), (3, –4), (4, 2), (5, 7)}
g= {(0, 2), (1, 0), (2, 4), (–4, 2), (7, 0)} then the range of f o g is
(a){0,2,3,4,5} (b){–4,1,0,2,7} (c){1,2,3,4,5} (d){0,1,2}

13. If g = {(1, 1), (2, 3), (3, 5), (4, 7)} is a function given by g(x) = α x+ β then the values of α and β are

a)(−1,2) b)(2,−1) c)(−1,−2) (d)(1,2)

14.$f(x)= (x+1)^3-(x-1)^3$ represents a function which is

(a) linear (b)cubic (c)reciprocal (d)quadratic

PARTS-II [MARKS: 20]

Answer all the questions [Question number 28 is compulsory] 10x2=20

15. Let A={1,2,3}and B={x|xisaprimenumberlessthan10}.Find A x B and B x A.

16. If $B \times A$ = {(-2,3), (-2,4), (0,3), (0,4, (3,3), (3,4)} find A and B.

17. Let A= {3, 4, 7, 8} and B= {1, 7, 10}.Which of the sets are relations from A to B? R= {(3, 7), (4, 7), (7, 10), (8, 1)}

18. Let A= {1, 2, 3, 4,..., 45}and R be the relation defined as "is square of" on A. Write R as a subset of A x A. Also, find the domain and range of R.

19. A Relation R is given by the set{(x,y)/y=x+3,x€{0,1,2,3,4}}. Determine its domain and range.

20. Represent each of the given relations by (a) an arrow diagram, (b) agraph and (c) a set in roster form, wherever possible.
{(x, y) |y=x+3, x, y are natural numbers <10}

21. LetX={1,2,3, 4)andY={2,4,6,8,10}andR={(1,2),(2,4),(3,6),(4,8)}.
Show that R is a function and find its domain, co-domain and range?

22. A relation 'f' is defined by $f(x) = x^2-2$ where x€ {-2, -1, 0,3}
i) List the elementoff ii) Isf afunction?

23.Let$A$={1,2,3}B={4,5,6,7}and f={(1,4)(2,5)(3,6)}be a function from A to B. Show that f is one – one but not onto function.

24. Show that the function F: N ⟶ N defined by $f(x) = m^2+m+3$ is one-one function.

25. Let A = {-1, 1} and B = {0, 2} If the function $f: A$ B defined by $f(x) = ax + b$ an onto function? Find a and$b$.

26. If $f(x)=x^2-1$ and g(x)=x−2,find a if g o f(a)=1

27. Find fog and g o f when f(x) =2x+1 and g(x) =x^2-1

28. Find *k*, if f (k) =2k-1 and f o f (k) =5

PARTS-III [MARKS: 50]

Answer all the questions [Question number 42 is compulsory] 10x5=50

29. Let A={x€N|1<x<4}, B={x€W|0≤x<2} and C={x € N |x<3} then verify that

A x (BUC) = (A x B) U (A x C)

30. IfA={5,6},B={4,5,6},c={5,6,7}showthatAxA=(BxB)∩(CxC)

31. Given the function f: x ⟶ x^2- 5x + 6, evaluate

i)f(-1) ii)f(2a) iii)f(2) iv) f(x-1)

32. A function *f* is defined by f(x) =2x-3

i) find $\frac{f(0)+f(1)}{2}$

ii) find x such that f(x)=0

ii) find x such that f(x)=x

iii) find x such that f(x)=f(1-x)

33. Let *A* = {1, 2, 3, 4} and *B* = {2, 5, 8, 11, 14} be two sets. Let *f: A*⟶*B* be a function given by f(x) =3x-1. Represent thisfunction

(i) by arrow diagram (ii) in a table form

(iii) as a set oforderedpairs (iv) in a graphical form

34. Forensic scientists can determine the height (in cms) of a person based on the length of their thigh bone. They usually do so using the function h(b) = 2. 47b + 54. 10 where b is the length of the thigh bone.

(i) Check if the function h is one – one

(ii) Also find the height of a person if the length of his thigh bone is 50 cms.

(iii) Find the length of the thigh bone if the height of a person is 147. 96cms.

35. If the function f: R⟶ R is define by f(x) = $\begin{cases} 2x+7, & x<-2 \\ x^2-2, & -2\le x<3 \\ 3x-2, & x\ge 3 \end{cases}$

i)f(4) iif(-2) iii)f(4)+2f(1) iv)$\frac{f(1)-3f(4)}{f(-3)}$

36. Ifthe function f is defined by $f(x) = \begin{cases} x+2, & \text{if } x>1 \\ 2, & \text{if } -1\le x\le 1 \\ x-1, & \text{if } -3<x<-1 \end{cases}$

i)f(3) iif(0) iii)f(-1.5) iv)f(2)+f(-2)

37. The function't' which maps temperature in Celsius(C) into temperature in Fahrenheit it (F) is defined by t(C)=F where $F=\frac{9}{5}C+32$

Find (i) t (0) (ii) t (28) (iii) t (-10)
(iv)the value of C when $t(C)=212$

(v) the temperature when the Celsius value is equal to the Fahrenheit value.

38. Find the value of k, such that fog= g o f, f(x) =3x-2 and g(x) =2x+k

39. If f(x) =2x+3, g(x) =1-2x and h(x)=3x prove that fo(goh)=(fog)oh

40. Consider the functions f(x),g(x),h(x)as given below Show that $(fog)h=fo(goh)$ in each case. f(x) = x – 4, g(x) = x^2, h(x) = 3x-5

41. Find x if gff(x) = fgg(x), given f (x) = 3 x+1 and g (x) =x+3.

42. If the function f: {-5, 9]⟶ R is define by $f(x) = \begin{cases} 6x+1, \text{ if } -5\le x<2 \\ 5x^2-1, \text{ if } 2\le x<6 \\ 3x-4, \text{ if } 6\le x\le 9 \end{cases}$

iii) 2f(4)+f(8) iv) $\frac{2f(-2)-f(-6)}{f(4)+f(-2)}$

PARTS-IV [MARKS: 16]

Answer both questions **2x8=16**

43. a) Construct a triangle similar to a given triangle PQR with its sides equal to 7/ 3 of the corresponding sides of the triangle PQR (scale factor 7/3)

(or)

b) Construct a triangle ΔPQR such that QR = 5 cm, $P=30^o$ and the altitude from P to QR is of length 4.2 cm.

44. a)Discuss the nature of solutions of the following quadratic equations $x^2+x-12=0$

(or)

b) Draw the graph of $y=x^2+3x-4$ and hence use it to solve $x^2+3x-4=0$

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