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Test / Exam Name: Maths – Relations And Functions **Standard: 11th Science** **Subject: Mathematics**

Student Name: ..... **Section:** ..... **Roll No.:** .....

Questions: 28 **Time: 01:45 hh:mm** **Marks: 50**

Instructions

1. New section on new page
2. Rough work at the last page should be in proper manner too
3. Honesty is the best policy.

SECTION-A

Q1. A relation R is defined from the set of integers to the set of real numbers as {x, y) = R if $x^2 + y2 = 16$ then the domain of R is. **1 Mark**

A {0, 4, 4) **B** {0, -4, 4) **C** {0, -4, -4) **D** None of these

Q2. Consider the following statements: **1 Mark**

1. If n(A) = p and n(B) = q then n(A × B) = pq
2. A × f = f
3. In general, A × B^1 B × A

Which of the above statements are true?

A only (i) **B** only (ii) **C** only (iii) **D** All the above

Q3. The domain of $\tan^{-1}(2x + 1)$ is: **1 Mark**

A $\mathbb{R}$ **B** $\mathbb{R} - \frac{1}{2}$

C $\mathbb{R} - \frac{-1}{2}$ **D** None of these

Q4. The period of the function f(x) = $\sin\left(\frac{2\pi x}{3}\right) + \cos\left(\frac{\pi x}{3}\right)$. **1 Mark**

A 3 **B** 4 **C** 12 **D** None of these

Q5. Choose the correct answers: **1 Mark**

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

A Domain = R, Range = {-1, 1} **B** Domain = R - {1}, Range = R

C Domain = R - {4}, Range = {-1} **D** Domain = R - {-4}, Range = {-1, 1}

Q6. If two sets A and B are having 99 elements in common, then the number of elements common to each of the sets A × B and B × A are. **1 Mark**

A 2^{99} **B** 99^2 **C** 100 **D** 18

Q7. $f(x) = \frac{|x|}{x}$ for x≠0 and 0 for x=0}Which function is this? **1 Mark**

A Constant **B** Modulus **C** Identity **D** Signum function

Q8. Choose the correct answers: **1 Mark**

If $[x]^2 - 5[x] + 6 = 0$, where [.] denote the greatest integer function, then.

A x ⇒ [3, 4] **B** x ⇒ (2, 3] **C** x ⇒ [2, 3] **D** x ⇒ [2, 4)

Q9. The function f(x) = $\sin\left(\frac{\pi x}{2}\right) + 2\cos\left(\frac{\pi x}{3}\right) - \tan\left(\frac{\pi x}{4}\right)$ is periodic with period. **1 Mark**

A 4 **B** 6 **C** 8 **D** 12

Q10. State whether each of the following statements are true or false. If the statement is false, rewrite the given statement correctly. **1 Mark**

If A and B are non-empty sets, then A × B is a non-empty set of ordered pairs (x, y) such that x ∈ A and y ∈ B.

Q11. State whether each of the following statements are true or false. If the statement is false, rewrite the given statement correctly. **1 Mark**

If $A = \{1, 2\}, B = \{3, 4\}$, then $A \times (B \cap \phi) = \phi$.

Q12. **Directions:** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as: **1 Mark**

Assertion: The range of the function f(x) = 2 -3x, $x \in \mathbb{R}$, x > 0 is R.

Reason: The range of the function f(x) = x^2 + 2 is $(2, \infty)$.

A A is true, R is true; R is a correct explanation of A. **B** A is true, R is true; R is not a correct explanation of A.

C A is true; R is false. **D** A is false; R is true.

Q13. If f and g are two real valued function defined as f(x) = 2x + 1, $g(x) = x^2 + 1$, then find. **1 Mark**

fg

Q14. If $f(x) = \cos\left[\pi^2\right]x + \cos\left[-\pi^2\right]x$, where[x] denotes the greatest integer less than or equal to x, then write the value of $f(\pi)$ **1 Mark**

Q15. **If A = {1, 2, 3}, B = {3, 8}, then (A ∪ B)´ (A ∩B) is equal to.** **1 Mark**

Q16. If f (x) = $\frac{x \cdot 1^{17}}{x^3}$ 'then $f'(x) + f\left(\frac{1}{x}\right)$ is equal to: **1 Mark**

A $2x^3$ **B** $2.\frac{1}{x^3}$

C 0 **D** 1

SECTION-B

4. If A = {a, b} and B = {2, 3}, then the number of relations from A to B is:
1. 4
2. 8
3. 6
4. 16

5. If n (A) = 3 and B = {2, 3, 4, 6, 7, 8}, then the number of relations from A to B is:
1. 2^3
2. 2^6
3. 2^{18}
4. 2^9

Q17. Let A = {x, y, z} and B = {1, 2}. Find the number of relations from A to B. **2 Marks**

Q18. In following case, find a and b. **2 Marks**

$\left(\frac{a}{4}, a - 2b\right) = (0, 6 + b)$

Q19. Find the domain and range of the following real valued functions: **2 Marks**

$f(x) = \frac{ax-b}{cx-d}$

Q20. If A = {1, 2, 3}, B = {4, 5, 6}, the given following are relations from A to B? Give reason in support of your answer. **2 Marks**

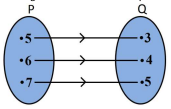
A × B.

Q21. Let f and g be real functions defined by f(x) = 2x + 1 and g(x) = 4x - 7. **2 Marks**

For what real numbers x, f(x) < g(x)?

Q22. Let A and B be two sets such that n(A) = 3 and n(B) = 2. If (x, 1), (y, 2), (z, 1) are in A × B, find A and B, where x, y and z are distinct elements. **3 Marks**

Q23. The Fig2.7 shows a relationship between the sets P and Q. Write this relation **3 Marks**



1. in set-builder form
2. roster form. What is its domain and range?

Q24. Let A = {1, 2, 3, 4, 6}. Let R be the relation on A defined by {(a, b): a, b ∈ A, b is exactly divisible by a}. **3 Marks**

1. Write R in roster form.
2. Find the domain of R.
3. Find the range of R.

Q25. If a function f : R → R be defined by: **3 Marks**

$$f(x) = \begin{cases} 3x - 2, & x < 0 \\ 1, & x = 0 \\ 4x + 1, & x > 0 \end{cases}$$

Find: f(1), f(-1), f(0) and f(2)

Q26. If $f(x) = x^3 - \frac{1}{x^3}$, show that $f(x) + f\left(\frac{1}{x}\right) = 0$ **3 Marks**

SECTION-C

Q27. Define a relation R on the set N of natural numbers by R = {(x, y) : y = x + 5, x is a natural number less than 4; x, y ∈ N}. Depict this relationship using roster form. Write down the domain and the range. **4 Marks**

Q28. Representation of a Relation A relation can be represented algebraically by roster form or by set-builder form and visually it can be represented by an arrow diagram which are given below: **5 Marks**

Roster form In this form, we represent the relation by the set of all ordered pairs belongs to R:

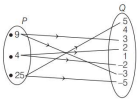
Set-builder form In this form, we represent the relation R from set A to set B as R = $\{(a, b) : a \in A, b \in B\}$ and the rule which relate the elements of A and B).

Arrow diagram To represent a relation by an arrow diagram, we draw arrows from first element to second element of all ordered pairs belonging to relation R:

Based on the above topics, answer the following questions.

1. Expression of $R = \{(a, b) : 2a + b = 5; a, b \in W\}$ as the set of ordered pairs (in roster form) is:
1. R = {(5, 0), (3, 1), (1, 2)}
2. R = {(0, 5), (1, 3), (1, 2)}
3. R = {(0, 5), (1, 3), (2, 1)}
4. None of the above

2. The relation between sets P andQ given by an arrow diagram in roster form will be:



1. R = {(9, 3), (9, -3), (4, 2), (4, -2), (25, 5), (25, -5)}
2. R = {(9, 3), (4, 2), (25, 5)}
3. R = {(9, -3), (4, -2), (25, -5)}
4. None of the above

3. The relation given in (ii) can be written in set-builder form as:
1. $R = \{(x, y) : x \in p, y \in Q \text{ and } x \text{ is the square of } y\}$
2. $R = \{(x, y) : x \in p, y \in Q \text{ and } y \text{ is the square of } y\}$
3. $R = \{(x, y) : x \in p, y \in Q \text{ and } x = \pm y\}$
4. None of the above