PRACTICE PAPER 01 (2026-27)
CHAPTER 01 : RELATIONS AND FUNCTIONS

SUBJECT: MATHEMATICS	**MAX. MARKS:** 40
CLASS: XII	**DURATION:** 1½ hrs

General Instructions:

(i) All questions are compulsory.

(ii) This question paper contains 20 questions divided into five Sections A, B, C, D and E.

(iii) Section A comprises 10 MCQs of 1 mark each (Q9 and Q10 are Assertion–Reason questions). Section B comprises 4 questions of 2 marks each. Section C comprises 3 questions of 3 marks each. Section D comprises 1 question of 5 marks with an internal choice. Section E comprises 2 case study based questions of 4 marks each, with internal choice in the last sub-part.

(iv) There is no overall choice. Internal choices have been provided where indicated.

(v) Use of calculators is not permitted.

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. If R = {(x, y) : x, y ∈ ℕ, x + 2y = 12} is a relation in the set ℕ of natural numbers, then the domain of R is

(a) {2, 4, 6, 8, 10} (b) {1, 2, 3, 4, 5} (c) {2, 4, 6, 8, 10, 12} (d) {0, 2, 4, 6, 8, 10}

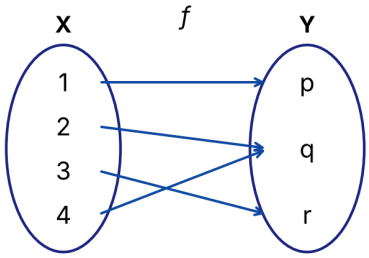
2. Let R be a relation in the set A = {x ∈ ℤ : 0 ≤ x ≤ 14} given by R = {(a, b) : |a − b| is a multiple of 5}. Then the equivalence class [2] is

(a) {2, 7, 12} (b) {2, 7} (c) {0, 5, 10} (d) {2, 7, 12, 17}

3. The number of reflexive relations that can be defined on a set A having 3 elements is

(a) 8 (b) 64 (c) 512 (d) 6

4. The arrow diagram given below represents a function f : X → Y. The function f is



(a) one-one but not onto (b) onto but not one-one

(c) bijective (d) neither one-one nor onto

5. If set A has 3 elements and set B has 5 elements, then the number of one-one functions from A to B is

(a) 125 (b) 243 (c) 60 (d) 10

6. The function f : ℝ → ℝ defined by f(x) = x|x| is

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

7. If f, g : ℝ → ℝ are defined by f(x) = 3x − 2 and g(x) = x² + 1, then (fog)(2) − (gof)(2) is equal to

(a) −4 (b) 4 (c) 30 (d) −30

8. If f : ℝ → ℝ is given by f(x) = 5x − 7, then $f^{-1}(8)$ is equal to

(a) 3 (b) 33 (c) 1/3 (d) 4

For Q9 and Q10, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

9. Assertion (A): The function $f : \mathbb{Z} \to \mathbb{Z}$ defined by $f(x) = 2x + 1$ is one-one but not onto.
Reason (R): For every $y \in \mathbb{Z}$ there exists some $x \in \mathbb{Z}$ such that $f(x) = y$.

10. Assertion (A): The function $f : \mathbb{R} \to \mathbb{R}$ defined by $f(x) = x^2$ is not invertible.
Reason (R): A function is invertible if and only if it is both one-one and onto.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Let $A = \{1, 2, 3, 4\}$ and $R = \{(a, b) : a \cdot b \text{ is even}\}$ be a relation on A. Show that R is symmetric but neither reflexive nor transitive.

12. If $f, g : \mathbb{R} \to \mathbb{R}$ are defined by $f(x) = x + 3$ and $g(x) = x^2$, find $(fog)(x)$ and $(gof)(x)$. Are fog and gof equal functions? Justify your answer.

13. Show that the function $f : \mathbb{N} \to \mathbb{N}$ defined by $f(n) = n^2 + 2$ is one-one but not onto.

14. Show that the function $f : \mathbb{R} \to \mathbb{R}$ defined by $f(x) = (3x + 4)/5$ is invertible and find its inverse.

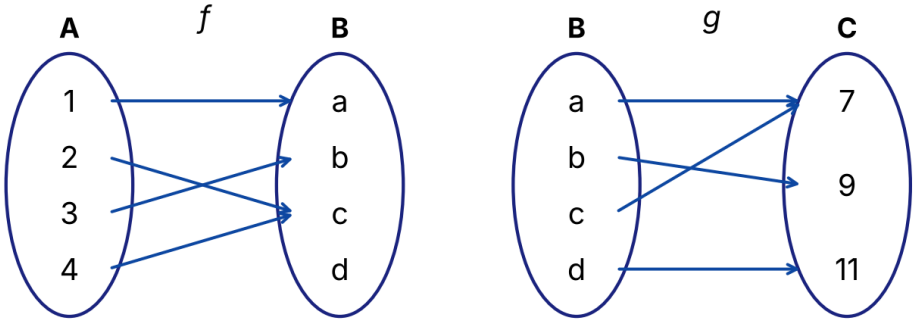
SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Let R be the relation on the set $\mathbb{Z}$ of integers defined by $R = \{(a, b) : 3a + 4b \text{ is divisible by } 7\}$. Show that R is an equivalence relation.

16. Let $f : [0, \infty) \to [2, \infty)$ be defined by $f(x) = x^2 + 2$. Show that f is invertible. Hence find f^{-1} and the value of $f^{-1}(11)$.

17. Functions $f : A \to B$ and $g : B \to C$ are shown in the arrow diagram below, where $A = \{1, 2, 3, 4\}$, $B = \{a, b, c, d\}$ and $C = \{7, 9, 11\}$. Find gof. Is gof one-one? Is gof onto? Justify your answers.



SECTION – D

Question 18 carries 5 marks.

18. Let $A = \{x \in \mathbb{Z} : 0 \le x \le 10\}$ and let $R = \{(a, b) : a^2 - b^2 \text{ is divisible by } 5\}$ be a relation on A. Show that R is an equivalence relation. Also find the equivalence class [2].

OR

Show that the function $f : \mathbb{R} - \{-2\} \to \mathbb{R} - \{3\}$ defined by $f(x) = (3x + 1)/(x + 2)$ is one-one and onto. Hence find $f^{-1}(y)$.

SECTION – E (Case Study Based Questions)

Questions 19 and 20 carry 4 marks each.

19. A school library issues books to students. Let S = $\{s_1, s_2, s_3\}$ be the set of three students and B = $\{b_1, b_2, b_3, b_4\}$ be the set of four books available, where b_1 and b_2 are Mathematics books, b_3 is a Physics book and b_4 is a Chemistry book.

Based on the above information, answer the following questions:

(i) How many relations are possible from S to B? (1)

(ii) How many functions can be defined from S to B? (1)

(iii) A function f : S → B is defined by f = $\{(s_1, b_1), (s_2, b_3), (s_3, b_4)\}$. Check whether f is one-one and whether f is onto. Justify your answer. (2)

OR

(iii) Let R be a relation on B defined by R = {(x, y) : x and y are books of the same subject}. Write R as a set of ordered pairs and show that R is an equivalence relation. (2)

20. A cab company charges a fixed amount of ₹50 plus ₹12 per kilometre. The fare for a journey of x kilometres is given by the function f : $\mathbb{N} \to \mathbb{N}$, f(x) = 12x + 50.

Based on the above information, answer the following questions:

(i) Find the fare for a journey of 6 km. (1)

(ii) A passenger paid a fare of ₹218. Find the distance travelled. (1)

(iii) (a) Show that f is one-one but not onto. (2)

OR

(iii) (b) A 10% tax is added to the fare, so the amount payable is given by g : $\mathbb{N} \to \mathbb{R}$, g(y) = 1.1y. Find (gof)(x) and hence the amount payable for a 10 km journey. (2)

— End of Question Paper —