

Relations and Functions — CBSE Pattern Test 2

Class 11 Maths · 90 minutes · 40 marks · Sections A–D with answer key · Narayan Gurukul Academy

Test 2 — CBSE Pattern (90 minutes, 40 marks)

Class 11 Maths · Relations and Functions · Narayan Gurukul Academy (ClassApna)

General Instructions: (1) This paper has four sections — Section A (1×10), Section B (2×4), Section C (3×4) and Section D (5×2) — total 40 marks. Time allowed: 90 minutes.
 (2) All questions are compulsory. No overall choice is given; internal choice, where allowed, is clearly marked.
 (3) For MCQ questions choose the single correct option; for VSA answers write a single line.
 (4) Take $g = 10 \text{ m/s}^2$. All symbols carry their usual meaning. Use of a calculator is not permitted.

Section A — MCQ & VSA ($10 \times 1 = 10$ marks)

1. The Cartesian product $A \times B$ is the set of all
 - (A) ordered pairs (a, b) with $a \in A, b \in B$
 - (B) subsets of $A \cap B$
 - (C) elements common to A and B
 - (D) ordered pairs (b, a) with $a \in A$
2. The range of a relation R is the set of
 - (A) all second elements of the ordered pairs in R
 - (B) all first elements of the ordered pairs in R
 - (C) all elements of A
 - (D) all elements of B
3. The set of all first elements of a function f is called its
 - (A) domain
 - (B) range
 - (C) codomain
 - (D) graph
4. The function $f : \mathbb{R} \rightarrow \mathbb{R}, f(x) = x^2$ is
 - (A) not injective
 - (B) injective
 - (C) bijective
 - (D) constant
5. A function that is both injective and surjective is called
 - (A) bijective
 - (B) injective only
 - (C) surjective only
 - (D) constant
6. The domain of $f(x) = \sqrt{x - 1}$ is
 - (A) $[1, \infty)$
 - (B) $\mathbb{R}$
 - (C) $(1, \infty)$
 - (D) $(-\infty, 1]$
7. If $f(x) = x + 1$ and $g(x) = x$, then $(f \circ g)(x)$ is
 - (A) $x + 1$

- (B) $x^2 + 1$
 (C) x
 (D) $2x + 1$
8. The function $f(x) = |x|$ is called the
 (A) modulus function
 (B) signum function
 (C) identity function
 (D) linear function
9. Define the domain and range of a relation.
10. Define a bijective function.

Section B — Short Answer I ($4 \times 2 = 8$ marks)

11. If $n(A) = 2$ and $n(B) = 3$, find $n(A \times B)$.
12. For $R = \{(1, 1), (2, 4), (3, 9)\}$, find the domain and range.
13. Find the domain of $f(x) = 1/x$.
14. If $f(x) = x + 1$ and $g(x) = x - 1$, find $(f + g)(x)$.

Section C — Short Answer II ($4 \times 3 = 12$ marks)

15. If $A = \{1, 2, 3\}$ and $B = \{4, 5\}$, find $A \times B$ and $B \times A$.
16. Find the domain and range of the real functions $f(x) = 1/x$ and $f(x) = \sqrt{x - 1}$.
17. Show that $f: \mathbb{R} \rightarrow \mathbb{R}$, $f(x) = 2x$ is injective. Explain surjective and bijective functions with one example each.
18. If $f(x) = x + 2$ and $g(x) = 2x - 1$, find $(f + g)(x)$, $(f - g)(x)$ and $(fg)(x)$.

Section D — Long Answers ($2 \times 5 = 10$ marks)

19. Define a function and explain its domain, codomain and range with an example, distinguishing a function from a general relation. Prove that if $A \neq \emptyset$ then $A \times C \neq \emptyset \times C$.
20. Explain the greatest integer and modulus functions with their graphs, and find the domain and range of each.

Answer Key (Marking Scheme)

- Q1 — (A) ordered pairs (a, b) with $a \in A$, $b \in B$. Q2 — (A) all second elements. Q3 — (A) domain. Q4 — (A) not injective.
 Q5 — (A) bijective. Q6 — (A) $[1, \infty)$. Q7 — (A) $x + 1$. Q8 — (A) modulus function.
 Q9 — Domain = set of first elements; range = set of second elements.
 Q10 — f is bijective if it is both injective and surjective.
 Q11 — 6.
 Q12 — Domain $\{1, 2, 3\}$; range $\{1, 4, 9\}$.
 Q13 — $\mathbb{R} - \{0\}$.
 Q14 — $2x$.
 Q15 — As in Q15 of Test 1.
 Q16 — $1/x$: domain $\mathbb{R} - \{0\}$, range $\mathbb{R} - \{0\}$; $\sqrt{x-1}$: domain $[1, \infty)$, range $[0, \infty)$.
 Q17 — Injective proof and examples as in notes.
 Q18 — $(f+g)=3x+1$; $(f-g)=-x+3$; $(fg)=2x^2+3x-2$.

Q19 — Definitions and proof as in notes.

Q20 — Graphs and domain/range as in notes.