

## Relations and Functions — CBSE Pattern Test 1

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

### Test 1 — 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 ( $1 \times 10$ ), Section B ( $2 \times 4$ ), Section C ( $3 \times 4$ ) and Section D ( $5 \times 2$ ) — 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. If  $A = \{1, 2\}$  and  $B = \{3, 4\}$ , then  $A \times B$  has
  - (A) 4 elements
  - (B) 2 elements
  - (C) 3 elements
  - (D) 6 elements
2. A relation from A to B is a subset of
  - (A)  $A \times B$
  - (B)  $A * B$
  - (C)  $A \cap B$
  - (D)  $B \times A$
3. The domain of a relation R from A to B is the set of
  - (A) all first elements of the ordered pairs in R
  - (B) all second elements of the ordered pairs in R
  - (C) all elements of A
  - (D) all elements of B
4. A relation f from A to B is a function if
  - (A) every element of A has exactly one image in B
  - (B) every element of B has one preimage
  - (C) f is a subset of A
  - (D) every element of A has two images
5. The function  $f(x) = x + 1$  is
  - (A) injective
  - (B) constant
  - (C) modulus
  - (D) identity
6. The domain of  $f(x) = 1/x$  is
  - (A)  $\mathbb{R} - \{0\}$
  - (B)  $\mathbb{R}$
  - (C)  $(0, \infty)$
  - (D)  $[0, \infty)$
7. The domain of  $f(x) = \sqrt{x - 1}$  is
  - (A)  $[1, \infty)$

- (B)  $\mathbb{R}$   
 (C)  $(1, \infty)$   
 (D)  $(-\infty, 1]$
8. If  $f(x) = x + 1$  and  $g(x) = x - 1$ , then  $(f + g)(x)$  is  
 (A)  $2x$   
 (B)  $x^2 - 1$   
 (C)  $2$   
 (D)  $x$
9. Define the Cartesian product of two sets A and B.
10. Define an injective function.

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

11. If  $A = \{1, 2\}$  and  $B = \{3, 4\}$ , find  $A \times B$ .
12. Define the domain and range of a relation.
13. Find  $f(2)$  if  $f(x) = 3x + 1$ .
14. If  $f(x) = x + 2$  and  $g(x) = 2x - 1$ , 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. If  $A = \{1, 2, 3, 4, 5\}$ , define  $R = \{(a, b) : a + b = 6\}$ . Write R in roster form and find its domain and range.
17. Find the domain and range of  $f(x) = \sqrt{x - 1}$ .
18. Show that  $f : \mathbb{R} \rightarrow \mathbb{R}$ ,  $f(x) = 2x$  is injective.

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

19. Explain injective, surjective and bijective functions with one example of each. Show that  $f : \mathbb{R} \rightarrow \mathbb{R}$ ,  $f(x) = 3x + 2$  is a bijection.
20. If  $f(x) = x + 1$  and  $g(x) = 2x - 3$ , find  $(f + g)$ ,  $(f - g)$ ,  $(fg)$  and  $(f/g)$ , stating the domain of  $(f/g)$ .

### Answer Key (Marking Scheme)

- Q1 — (A) 4 elements. Q2 — (A)  $A \times B$ . Q3 — (A) all first elements of the ordered pairs in R. Q4 — (A) every element of A has exactly one image in B.
- Q5 — (A) injective. Q6 — (A)  $\mathbb{R} - \{0\}$ . Q7 — (A)  $[1, \infty)$ . Q8 — (A)  $2x$ .
- Q9 — The set of all ordered pairs  $(a, b)$  with  $a \in A$ ,  $b \in B$ .
- Q10 — A function  $f$  is injective if  $f(x_1) = f(x_2) \Rightarrow x_1 = x_2$ .
- Q11 —  $\{(1,3), (1,4), (2,3), (2,4)\}$ .
- Q12 — Domain = set of first elements; range = set of second elements.
- Q13 — 7.
- Q14 —  $3x + 1$ .
- Q15 —  $A \times B = \{(1,4), (1,5), (2,4), (2,5), (3,4), (3,5)\}$ ;  $B \times A = \{(4,1), (4,2), (4,3), (5,1), (5,2), (5,3)\}$ .
- Q16 —  $R = \{(1,5), (2,4), (3,3), (4,2), (5,1)\}$ ; domain = range =  $\{1, 2, 3, 4, 5\}$ .
- Q17 — Domain  $[1, \infty)$ , range  $[0, \infty)$ .

Q18 —  $2x_1 = 2x_2 \Rightarrow x_1 = x_2$ .

Q19 — Examples as in notes;  $f(x) = 3x + 2$  is a bijection.

Q20 —  $(f+g)=3x-2$ ;  $(f-g)=-x+4$ ;  $(fg)=2x^2-x-3$ ;  $(f/g)=(x+1)/(2x-3)$ ,  $x \neq 3/2$ .