

CHAPTER 2

Relations and Functions

CBSE · Mathematics · Class 11

WHAT THIS CHAPTER DOES

Boards prep that builds confidence, not anxiety.

TODAY'S MISSION

What you will own by the end of this chapter

WHY THIS MATTERS

Why this chapter sits at the bottom of every later chapter

TOPIC

A

Part A — Ordered Pairs and Cartesian Product

TOPIC

Ordered pair — the smallest data structure of this chapter

POINT 1

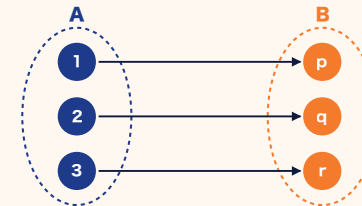
POINT 2

POINT 3

POINT 4

WORKED EXAMPLE

Worked example — $A \times B$ with motif



TOPIC

Quick checkpoint — ordered pairs and $A \times B$

TOPIC

B

Part B — Relations: A subset of $A \times B$

TOPIC

What is a relation?

POINT 1

POINT 2

POINT 3

POINT 4

TOPIC

Types of relations on a single set A — at a glance

WORKED EXAMPLE

Worked example — write R in roster form, find domain & range

TRY IT · SOLVE BEFORE YOU PEEK

30-second check — Part B

Work it out before you flip the answer.

SOLUTION

TOPIC

C

Part C — Functions: the well-behaved relations

TOPIC

Function — definition and types

POINT 1

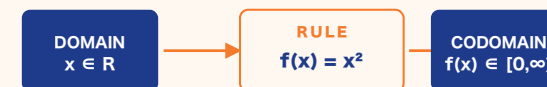
POINT 2

POINT 3

POINT 4

WORKED EXAMPLE

Worked example — classify $f(x) = 2x$ on $\mathbb{N}$



TOPIC

The five standard real functions — domain & range

TOPIC

Algebra and composition of functions

POINT 1

POINT 2

POINT 3

POINT 4

WORKED EXAMPLE

Worked example — composition of two functions

TOPPER TEMPLATE · MARK-BY-MARK

Topper template — '3-mark domain/range answer'

PYQ PATTERNS

Top-5 PYQ patterns — what comes from this chapter

MARKS DISTRIBUTION

Where the marks come from — sub-topic weightage

TOPIC

Final pre-exam checklist

TOPPER TEMPLATE · MARK-BY-MARK

Find $A \times B$ or list a relation in roster form (2 marks)

1 SETUP
0.5 m

Given $A = \{1, 2, 3\}$, $B = \{a, b\}$. $|A| = 3$, $|B| = 2$, so $|A \times B| = 6$.

2 LIST
1.0 m

$A \times B = \{(1,a), (1,b), (2,a), (2,b), (3,a), (3,b)\}$.

3 FILTER + STATE
0.5 m

If $R = \{(x,y) : y \text{ is a vowel}\}$, both a and b are listed but only the ones with $y \in \{a\}$ qualify. Hence $R = \{(1,a), (2,a), (3,a)\}$.

TOPPER TEMPLATE · MARK-BY-MARK

Find domain and range of a real function (3 marks)

1 **CONDITION**
0.5 m

$f(x) = \sqrt{9 - x^2}$. For $\sqrt{\quad}$ to be defined we need $9 - x^2 \geq 0$.

2 **SOLVE**
1.0 m

$$9 - x^2 \geq 0 \Rightarrow x^2 \leq 9 \Rightarrow -3 \leq x \leq 3.$$

3 **DOMAIN**

Domain = $[-3, 3]$.

TOPPER TEMPLATE · MARK-BY-MARK

Show f is one-one / onto / bijective (3 marks)

- | | | |
|---|-----------------------------|---|
| 1 | DEFINITIONS
0.5 m | f is one-one if $f(a) = f(b) \Rightarrow a = b$. f is onto if every y in codomain has some x with $f(x) = y$. |
| 2 | ONE-ONE
1.0 m | Let $f(a) = f(b)$. Then $2a = 2b \Rightarrow a = b$. Hence f is one-one. |
| 3 | ONTO
1.0 m | Take $y = 1 \in \mathbb{N}$ (codomain). We need $x \in \mathbb{N}$ with $2x = 1$, i.e. $x = 1/2 \notin \mathbb{N}$. So 1 has no pre-image. Hence f is NOT onto. |
| 4 | CONCLUDE
0.5 m | Therefore $f : \mathbb{N} \rightarrow \mathbb{N}$, $f(x) = 2x$ is one-one but not onto. Hence not bijective. |

PYQ PATTERNS

Top PYQ patterns to drill

#1	Find $A \times B$ (or $B \times A$) given two small sets; sometimes asked to count elements of $A \times A$ or list a relation R defined by a rule. (2 marks)	90%
#2	Find domain and/or range of a real function	typical $f(x) = 1/(x-a)$, $\sqrt{x-a}$, $ x $, $[x]$ or a small piecewise rule. (3 marks) — 85%
#3	Identify whether a given correspondence is a function; if yes, classify as one-one / onto / bijective. (3 marks)	70%
#4	Algebra of functions / composition: given f and g , compute $(f+g)$, $(f \cdot g)$, (f/g) at a point, or $(f \circ g)(x)$. (2 marks)	60%
#5	Sketch / identify a standard real function	modulus, signum, greatest integer $[x]$, or identity — and read its domain

RECAP · MEMORISE THESE

Chapter 2 summary — one screen

WHAT'S NEXT

What comes next



Action items

readyforboards.com

Helpline: Stuck on a concept? Call +91 70330 05444 — our faculty replies in 30 min.

Boards prep that builds confidence, not anxiety.