

PART 1 - MATHEMATICS

Topic : Relations and functions (class 12)

SECTION-A : (Maximum Marks : 4)

This section contains **ONE** question.

Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).

For each question, choose the option(s) corresponding to (all) the correct answer(s).

Answer to each question will be evaluated according to the following marking scheme :

Full Marks : +4 ONLY if (all) the correct option(s) is(are) chosen;

Partial Marks : +3 If all the four options are correct but ONLY three options are chosen;

Partial Marks : +2 If three or more options are correct but ONLY two options are chosen, both of which are correct;

Partial Marks : +1 If two or more options are correct but ONLY one option is chosen and it is a correct option;

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);

Negative Marks : -1 In all other cases.

For example, in a question, if (A), (B) and (D) are the ONLY three options corresponding to correct answers, then choosing ONLY (A), (B) and (D) will get +4 marks; choosing ONLY (A) and (B) will get +2 marks; choosing ONLY (A) and (D) will get +2 marks; choosing ONLY (B) and (D) will get +2 marks; choosing ONLY (A) will get +1 mark; choosing ONLY (B) will get +1 mark; choosing ONLY (D) will get +1 mark; choosing no option (i.e. the question is unanswered) will get 0 marks; and choosing any other combination of options will get -1 marks.

1. Let N denote the set of all natural numbers, and Z denote the set of all integers. Consider the functions $f: N \rightarrow Z$ and $g: Z \rightarrow N$ defined by

$$f(n) = \begin{cases} (n+1)/2 & \text{if } n \text{ is odd,} \\ (4-n)/2 & \text{if } n \text{ is even,} \end{cases}$$

and

$$g(n) = \begin{cases} 3 + 2n & \text{if } n \geq 0, \\ -2n & \text{if } n < 0. \end{cases}$$

Define $(g \circ f)(n) = g(f(n))$ for all $n \in N$, and $(f \circ g)(n) = f(g(n))$ for all $n \in Z$.

Then which of the following statements is (are) TRUE? [JEE Advanced 2025 Paper 1]

- (A) $g \circ f$ is NOT one-one and $g \circ f$ is NOT onto (B) $f \circ g$ is NOT one-one but $f \circ g$ is onto
(C) g is one-one and g is onto (D) f is NOT one-one but f is onto

Scan or tap for the
full solution



Space for Rough Work

SECTION-B : (Maximum Marks : 24)

This section contains **ONE** paragraph.

Based on each paragraph, there are **SIX** questions.

The answer to each question is a **NON-NEGATIVE INTEGER**.

For each question, enter the correct integer corresponding to the answer in the place designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme :

Full Marks : +4 If ONLY the correct answer is entered;

Zero Marks : 0 In all other cases.

2. Let $S = \{1, 2, 3, \dots, 10\}$. Consider the set $X = \{R: R \text{ is an equivalence relation on the set } S \text{ such that } R \text{ has exactly 42 elements}\}$. Then the number of elements in X is _____. [JEE Advanced 2026 Paper 1]
- Scan or tap for the full solution 
3. Let N denote the set of all positive integers. Consider the sets $A = \{1, 2, 3, 4, 5\}$ and $B = \{1, 2, 3, 4, 5, 6, 7\}$. Let S be the set of all functions $f: A \rightarrow B$ such that $f(2) \neq 2$ and $f(4) \neq 4$. Consider the set $T = \{f \in S: \text{there exists a function } g: B \rightarrow N \text{ such that } g(f(x)) = 2^x \text{ for all } x \in A\}$. Then the number of elements in the set T is _____. [JEE Advanced 2026 Paper 2]
- Scan or tap for the full solution 
4. Let the set of all relations R on the set $\{a, b, c, d, e, f\}$, such that R is reflexive and symmetric, and R contains exactly 10 elements, be denoted by S . Then the number of elements in S is _____. [JEE Advanced 2025 Paper 1]
- Scan or tap for the full solution 
5. Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be a function such that $f(x + y) = f(x) + f(y)$ for all $x, y \in \mathbb{R}$, and $g: \mathbb{R} \rightarrow (0, \infty)$ be a function such that $g(x + y) = g(x)g(y)$ for all $x, y \in \mathbb{R}$. If $f\left(\frac{-3}{5}\right) = 12$ and $g\left(\frac{-1}{3}\right) = 2$, then the value of $\left(f\left(\frac{1}{4}\right) + g(-2) - 8\right)g(0)$ is _____. [JEE Advanced 2024 Paper 2]
- Scan or tap for the full solution 

Paragraph for Questions 6 and 7

Let $S = \{1, 2, 3, 4, 5, 6\}$ and X be the set of all relations R from S to S that satisfy both the following properties:

- R has exactly 6 elements.
- For each $(a, b) \in R$, we have $|a - b| \geq 2$.

Let $Y = \{R \in X: \text{The range of } R \text{ has exactly one element}\}$ and

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$Z = \{R \in X : R \text{ is a function from } S \text{ to } S\}$.

Let $n(A)$ denote the number of elements in a set A .

6. If $n(X) = {}^m C_6$, then the value of m is _____.

[JEE Advanced 2024 Paper 2]

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7. If the value of $n(Y) + n(Z)$ is k^2 , then $|k|$ is _____.

[JEE Advanced 2024 Paper 2]

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JEE ADVANCED RELATIONS AND FUNCTIONS (CLASS 12) — PYQS

Test Pattern : **JEE (Advanced)**

ANSWER KEY

SECTION-A

[illegible]

SECTION-B

[illegible]