

MATHEMATICS · JEE MAIN

Relations & Functions (Basic)

Chapter-wise previous year questions, with answer key

113

PYQS

2020–2025

PAPERS

5

TOPICS

Types of Functions

Types of Relations

Composition of Functions

Greatest Integer and Fractional Part

Cartesian Product

- 1 Attempt each question on paper first — they're grouped by topic, newest papers first.
- 2 Check yourself against the answer key at the end.
- 3 Got one wrong? Tap “Step-by-step solution” under it for the full working.

Stuck on a question?

Every question has a free step-by-step solution on PrepWiser — tap “Step-by-step solution” under it.

Practise this chapter online with instant answer checking: prepwiser.in/learn · No signup needed to browse

Types of Functions · 17 PYQs

Q1 JEE Main 2025 · 4 Apr · Shift 1

Consider the sets $A = \{(x, y) \in \mathbb{R} \times \mathbb{R} : x^2 + y^2 = 25\}$, $B = \{(x, y) \in \mathbb{R} \times \mathbb{R} : x^2 + 9y^2 = 144\}$, $C = \{(x, y) \in \mathbb{Z} \times \mathbb{Z} : x^2 + y^2 \leq 4\}$ and $D = A \cap B$. The total number of one-one functions from the set D to the set C is:

- (A) 15120 (B) 18290
(C) 17160 (D) 19320

[Step-by-step solution ► prepwisser.in/questions/hik_t6ybb](https://www.prepwisser.in/questions/hik_t6ybb)

Q2 JEE Main 2025 · 24 Jan · Shift 2

The function $f : (-\infty, \infty) \rightarrow (-\infty, 1)$, defined by $f(x) = \frac{2^x - 2^{-x}}{2^x + 2^{-x}}$ is :

- (A) One-one but not onto (B) Onto but not one-one
(C) Both one-one and onto (D) Neither one-one nor onto

[Step-by-step solution ► prepwisser.in/questions/uOOkn2SiRU](https://www.prepwisser.in/questions/uOOkn2SiRU)

Q3 JEE Main 2025 · 22 Jan · Shift 2

Let $A = \{1, 2, 3, 4\}$ and $B = \{1, 4, 9, 16\}$. Then the number of many-one functions $f : A \rightarrow B$ such that $1 \in f(A)$ is equal to :

- (A) 151 (B) 139
(C) 163 (D) 127

[Step-by-step solution ► prepwisser.in/questions/3D2WD5zYTy](https://www.prepwisser.in/questions/3D2WD5zYTy)

Q4 JEE Main 2024 · 9 Apr · Shift 2

Let $A = \{(x, y) : 2x + 3y = 23, x, y \in \mathbb{N}\}$ and $B = \{x : (x, y) \in A\}$. Then the number of one-one functions from A to B is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/Z_kRmhNcht](https://www.prepwisser.in/questions/Z_kRmhNcht)

Q5 JEE Main 2024 · 27 Jan · Shift 1

The function $f : \mathbb{N} - \{1\} \rightarrow \mathbb{N}$; defined by $f(n)$ = the highest prime factor of n , is :

- (A) one-one only (B) neither one-one nor onto
(C) onto only (D) both one-one and onto

[Step-by-step solution ► prepwisser.in/questions/7C3elSZQGw](https://www.prepwisser.in/questions/7C3elSZQGw)

Q6 JEE Main 2023 · 11 Apr · Shift 2

Let $A = \{1, 2, 3, 4, 5\}$ and $B = \{1, 2, 3, 4, 5, 6\}$. Then the number of functions $f : A \rightarrow B$ satisfying $f(1) + f(2) = f(4) - 1$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/t3JHpEo2R8](https://www.prepwisser.in/questions/t3JHpEo2R8)

Q7 JEE Main 2023 · 8 Apr · Shift 2

Let $R = \{a, b, c, d, e\}$ and $S = \{1, 2, 3, 4\}$. Total number of onto functions $f : R \rightarrow S$ such that $f(a) \neq 1$, is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/ejcHniML4G](https://www.prepwiser.in/questions/ejcHniML4G)

Q8 JEE Main 2023 · 25 Jan · Shift 1

Let $f : (0, 1) \rightarrow \mathbb{R}$ be a function defined $f(x) = \frac{1}{1-e^{-x}}$, and $g(x) = (f(-x) - f(x))$. Consider two statements

(I) g is an increasing function in $(0, 1)$

(II) g is one-one in $(0, 1)$

Then,

(A) Both (I) and (II) are true

(B) Neither (I) nor (II) is true

(C) Only (II) is true

(D) Only (I) is true

[Step-by-step solution ► prepwiser.in/questions/-RCZZk80d8](https://www.prepwiser.in/questions/-RCZZk80d8)

Q9 JEE Main 2023 · 25 Jan · Shift 2

Let $f(x) = 2x^n + \lambda$, $\lambda \in \mathbb{R}$, $n \in \mathbb{N}$, and $f(4) = 133$, $f(5) = 255$. Then the sum of all the positive integer divisors of $(f(3) - f(2))$ is

(A) 60

(B) 58

(C) 61

(D) 59

[Step-by-step solution ► prepwiser.in/questions/xU0iuKaspO](https://www.prepwiser.in/questions/xU0iuKaspO)

Q10 JEE Main 2022 · 27 Jul · Shift 2

The number of functions f , from the set $A = \{x \in \mathbb{N} : x^2 - 10x + 9 \leq 0\}$ to the set $B = \{n^2 : n \in \mathbb{N}\}$ such that $f(x) \leq (x - 3)^2 + 1$, for every $x \in A$, is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/Qf1tea_261](https://www.prepwiser.in/questions/Qf1tea_261)

Q11 JEE Main 2022 · 27 Jul · Shift 1

Let $f, g : \mathbb{N} - \{1\} \rightarrow \mathbb{N}$ be functions defined by $f(a) = \alpha$, where α is the maximum of the powers of those primes p such that p^α divides a , and $g(a) = a + 1$, for all $a \in \mathbb{N} - \{1\}$. Then, the function $f + g$ is

(A) one-one but not onto

(B) onto but not one-one

(C) both one-one and onto

(D) neither one-one nor onto

[Step-by-step solution ► prepwiser.in/questions/REOm5Y9nYQ](https://www.prepwiser.in/questions/REOm5Y9nYQ)

Q12 JEE Main 2022 · 28 Jun · Shift 1

Let a function $f : \mathbb{N} \rightarrow \mathbb{N}$ be defined by

$$f(n) = \begin{cases} 2n, & n = 2, 4, 6, 8, \dots \\ n-1, & n = 3, 7, 11, 15, \dots \\ \frac{n+1}{2}, & n = 1, 5, 9, 13, \dots \end{cases}$$

then, f is

- (A) one-one but not onto (B) onto but not one-one
(C) neither one-one nor onto (D) one-one and onto

[Step-by-step solution ► prepwiset.in/questions/RLEEski07j](https://www.prepwiset.in/questions/RLEEski07j)

Q13 JEE Main 2022 · 24 Jun · Shift 1

The number of one-one functions $f : \{a, b, c, d\} \rightarrow \{0, 1, 2, \dots, 10\}$ such

that $2f(a) - f(b) + 3f(c) + f(d) = 0$ is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiset.in/questions/FtM76VkdK0](https://www.prepwiset.in/questions/FtM76VkdK0)

Q14 JEE Main 2021 · 25 Jul · Shift 1

Let $g : \mathbb{N} \rightarrow \mathbb{N}$ be defined as

$$g(3n + 1) = 3n + 2,$$

$$g(3n + 2) = 3n + 3,$$

$$g(3n + 3) = 3n + 1, \text{ for all } n \geq 0.$$

Then which of the following statements is true?

- (A) There exists an onto function $f : \mathbb{N} \rightarrow \mathbb{N}$ such that $f \circ g = f$
(B) There exists a one-one function $f : \mathbb{N} \rightarrow \mathbb{N}$ such that $f \circ g = f$
(C) $g \circ g \circ g = g$
(D) There exists a function $f : \mathbb{N} \rightarrow \mathbb{N}$ such that $g \circ f = f$

[Step-by-step solution ► prepwiset.in/questions/n5AbvPwgWw](https://www.prepwiset.in/questions/n5AbvPwgWw)

Q15 JEE Main 2021 · 22 Jul · Shift 2

Let $A = \{0, 1, 2, 3, 4, 5, 6, 7\}$. Then the number of bijective functions $f : A \rightarrow A$ such that $f(1) + f(2) = 3 - f(3)$ is equal to

Numerical answer — enter the value.

[Step-by-step solution ► prepwiset.in/questions/uAb-icKc_R](https://www.prepwiset.in/questions/uAb-icKc_R)

Q16 JEE Main 2021 · 25 Feb · Shift 1

Let $f, g : \mathbb{N} \rightarrow \mathbb{N}$ such that $f(n+1) = f(n) + f(1) \forall n \in \mathbb{N}$ and g be any arbitrary function. Which of the following statements is NOT true?

- (A) If g is onto, then $f \circ g$ is one-one
- (B) f is one-one
- (C) If f is onto, then $f(n) = n \forall n \in \mathbb{N}$
- (D) If $f \circ g$ is one-one, then g is one-one

[Step-by-step solution ► prepwisser.in/questions/b5OTJNPx00](https://www.prepwisser.in/questions/b5OTJNPx00)

Q17 JEE Main 2020 · 5 Sep · Shift 2

Let $A = \{a, b, c\}$ and $B = \{1, 2, 3, 4\}$. Then the number of elements in the set $C = \{f : A \rightarrow B \mid 2 \in f(A) \text{ and } f \text{ is not one-one}\}$ is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/zd0RaNMC4T](https://www.prepwisser.in/questions/zd0RaNMC4T)

Types of Relations · 54 PYQs

Q18 JEE Main 2025 · 8 Apr · Shift 2

Let $A = \{0, 1, 2, 3, 4, 5\}$. Let R be a relation on A defined by $(x, y) \in R$ if and only if $\max\{x, y\} \in \{3, 4\}$. Then among the statements

- (S₁): The number of elements in R is 18, and
- (S₂): The relation R is symmetric but neither reflexive nor transitive

- (A) both are false
- (B) only (S₁) is true
- (C) only (S₂) is true
- (D) both are true

[Step-by-step solution ► prepwisser.in/questions/CbdAbCV9AY](https://www.prepwisser.in/questions/CbdAbCV9AY)

Q19 JEE Main 2025 · 7 Apr · Shift 1

The number of relations on the set $A = \{1, 2, 3\}$, containing at most 6 elements including $(1, 2)$, which are reflexive and transitive but not symmetric, is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/K0Tgy8qdiL](https://www.prepwisser.in/questions/K0Tgy8qdiL)

Q20 JEE Main 2025 · 4 Apr · Shift 2

Let $A = \{-3, -2, -1, 0, 1, 2, 3\}$ and R be a relation on A defined by xRy if and only if $2x - y \in \{0, 1\}$. Let l be the number of elements in R . Let m and n be the minimum number of elements required to be added in R to make it reflexive and symmetric relations, respectively. Then $l + m + n$ is equal to:

- | | |
|--------|--------|
| (A) 17 | (B) 18 |
| (C) 15 | (D) 16 |

[Step-by-step solution ► prepwisser.in/questions/KZxhiHtV7N](https://www.prepwisser.in/questions/KZxhiHtV7N)

Q21 JEE Main 2025 · 3 Apr · Shift 2

Let $A = \{-2, -1, 0, 1, 2, 3\}$. Let R be a relation on A defined by xRy if and only if $y = \max\{x, 1\}$. Let l be the number of elements in R . Let m and n be the minimum number of elements required to be added in R to make it reflexive and symmetric relations, respectively. Then $l + m + n$ is equal to

- (A) 11 (B) 12
(C) 14 (D) 13

Step-by-step solution ► [prepwisser.in/questions/EJjq5nxhit](https://www.prepwisser.in/questions/EJjq5nxhit)

Q22 JEE Main 2025 · 3 Apr · Shift 1

Let $A = \{-3, -2, -1, 0, 1, 2, 3\}$. Let R be a relation on A defined by xRy if and only if $0 \leq x^2 + 2y \leq 4$. Let l be the number of elements in R and m be the minimum number of elements required to be added in R to make it a reflexive relation. Then $l + m$ is equal to

- (A) 18 (B) 20
(C) 17 (D) 19

Step-by-step solution ► [prepwisser.in/questions/Ij7azwWttV](https://www.prepwisser.in/questions/Ij7azwWttV)

Q23 JEE Main 2025 · 2 Apr · Shift 1

Let A be the set of all functions $f : \mathbb{Z} \rightarrow \mathbb{Z}$ and R be a relation on A such that $R = \{(f, g) : f(0) = g(1) \text{ and } f(1) = g(0)\}$. Then R is :

- (A) Symmetric and transitive but not reflexive
(B) Symmetric but neither reflexive nor transitive
(C) Transitive but neither reflexive nor symmetric
(D) Reflexive but neither symmetric nor transitive

Step-by-step solution ► [prepwisser.in/questions/hDOnBeECw0](https://www.prepwisser.in/questions/hDOnBeECw0)

Q24 JEE Main 2025 · 2 Apr · Shift 2

Let $A = \{1, 2, 3, \dots, 100\}$ and R be a relation on A such that $R = \{(a, b) : a = 2b + 1\}$. Let $(a_1, a_2), (a_2, a_3), (a_3, a_4), \dots, (a_k, a_{k+1})$ be a sequence of k elements of R such that the second entry of an ordered pair is equal to the first entry of the next ordered pair. Then the largest integer k , for which such a sequence exists, is equal to :

- (A) 6 (B) 8
(C) 7 (D) 5

Step-by-step solution ► [prepwisser.in/questions/bPaBjnETjH](https://www.prepwisser.in/questions/bPaBjnETjH)

Q25 JEE Main 2025 · 29 Jan · Shift 1

Define a relation R on the interval $[0, \frac{\pi}{2})$ by xRy if and only if $\sec^2 x - \tan^2 y = 1$. Then R is :

- (A) both reflexive and symmetric but not transitive
(B) both reflexive and transitive but not symmetric
(C) reflexive but neither symmetric nor transitive
(D) an equivalence relation

Step-by-step solution ► [prepwisser.in/questions/aCtrjG3At3](https://www.prepwisser.in/questions/aCtrjG3At3)

Q26 JEE Main 2025 · 28 Jan · Shift 1

The relation $R = \{(x, y) : x, y \in \mathbb{Z} \text{ and } x + y \text{ is even}\}$ is:

- (A) reflexive and transitive but not symmetric
- (B) reflexive and symmetric but not transitive
- (C) an equivalence relation
- (D) symmetric and transitive but not reflexive

[Step-by-step solution ► prepwiser.in/questions/vcJFGPK_qS](https://www.prepwiser.in/questions/vcJFGPK_qS)

Q27 JEE Main 2025 · 23 Jan · Shift 2

Let $X = \mathbf{R} \times \mathbf{R}$. Define a relation R on X as :

$$(a_1, b_1) R (a_2, b_2) \Leftrightarrow b_1 = b_2$$

Statement I: R is an equivalence relation.

Statement II : For some $(a, b) \in X$, the set $S = \{(x, y) \in X : (x, y)R(a, b)\}$ represents a line parallel to $y = x$.

In the light of the above statements, choose the correct answer from the options given below :

- (A) Both Statement I and Statement II are true
- (B) Statement I is true but Statement II is false
- (C) Both Statement I and Statement II are false
- (D) Statement I is false but Statement II is true

[Step-by-step solution ► prepwiser.in/questions/3Vv5NqIfpC](https://www.prepwiser.in/questions/3Vv5NqIfpC)

Q28 JEE Main 2025 · 23 Jan · Shift 1

Let $R = \{(1, 2), (2, 3), (3, 3)\}$ be a relation defined on the set $\{1, 2, 3, 4\}$. Then the minimum number of elements, needed to be added in R so that R becomes an equivalence relation, is:

- | | |
|-------|--------|
| (A) 9 | (B) 8 |
| (C) 7 | (D) 10 |

[Step-by-step solution ► prepwiser.in/questions/dzISQ5Frb4](https://www.prepwiser.in/questions/dzISQ5Frb4)

Q29 JEE Main 2025 · 22 Jan · Shift 2

Let $A = \{1, 2, 3\}$. The number of relations on A , containing $(1, 2)$ and $(2, 3)$, which are reflexive and transitive but not symmetric, is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/LwUdOk2jxa](https://www.prepwiser.in/questions/LwUdOk2jxa)

Q30 JEE Main 2025 · 22 Jan · Shift 1

The number of non-empty equivalence relations on the set $\{1, 2, 3\}$ is :

- | | |
|-------|-------|
| (A) 7 | (B) 4 |
| (C) 5 | (D) 6 |

[Step-by-step solution ► prepwiser.in/questions/MSDwDDpGIT](https://www.prepwiser.in/questions/MSDwDDpGIT)

Q31 JEE Main 2024 · 9 Apr · Shift 1

Let $A = \{2, 3, 6, 7\}$ and $B = \{4, 5, 6, 8\}$. Let R be a relation defined on $A \times B$ by $(a_1, b_1)R(a_2, b_2)$ if and only if $a_1 + a_2 = b_1 + b_2$. Then the number of elements in R is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/sMac5FTKIL](https://www.prepwiser.in/questions/sMac5FTKIL)

Q32 JEE Main 2024 · 6 Apr · Shift 2

Let $A = \{1, 2, 3, 4, 5\}$. Let R be a relation on A defined by xRy if and only if $4x \leq 5y$. Let m be the number of elements in R and n be the minimum number of elements from $A \times A$ that are required to be added to R to make it a symmetric relation. Then $m + n$ is equal to :

- (A) 23 (B) 26
(C) 25 (D) 24

[Step-by-step solution ► prepwiser.in/questions/S14SD_yB1o](https://www.prepwiser.in/questions/S14SD_yB1o)

Q33 JEE Main 2024 · 6 Apr · Shift 1

Let the relations R_1 and R_2 on the set $X = \{1, 2, 3, \dots, 20\}$ be given by $R_1 = \{(x, y) : 2x - 3y = 2\}$ and $R_2 = \{(x, y) : -5x + 4y = 0\}$. If M and N be the minimum number of elements required to be added in R_1 and R_2 , respectively, in order to make the relations symmetric, then $M + N$ equals

- (A) 16 (B) 12
(C) 8 (D) 10

[Step-by-step solution ► prepwiser.in/questions/U_l4m_K3Iv](https://www.prepwiser.in/questions/U_l4m_K3Iv)

Q34 JEE Main 2024 · 4 Apr · Shift 2

Let a relation R on $\mathbb{N} \times \mathbb{N}$ be defined as: $(x_1, y_1) R (x_2, y_2)$ if and only if $x_1 \leq x_2$ or $y_1 \leq y_2$. Consider the two statements:

(I) R is reflexive but not symmetric.

(II) R is transitive

Then which one of the following is true?

- (A) Only (II) is correct. (B) Both (I) and (II) are correct.
(C) Neither (I) nor (II) is correct. (D) Only (I) is correct.

[Step-by-step solution ► prepwiser.in/questions/luVvyEkjU0](https://www.prepwiser.in/questions/luVvyEkjU0)

Q35 JEE Main 2024 · 1 Feb · Shift 1

Let $A = \{1, 2, 3, \dots, 20\}$. Let R_1 and R_2 two relation on A such that

$$R_1 = \{(a, b) : b \text{ is divisible by } a\}$$

$$R_2 = \{(a, b) : a \text{ is an integral multiple of } b\}.$$

Then, number of elements in $R_1 - R_2$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/iBWjE17nSY](https://www.prepwiser.in/questions/iBWjE17nSY)

Q36 JEE Main 2024 · 1 Feb · Shift 2

Consider the relations R_1 and R_2 defined as $aR_1b \Leftrightarrow a^2 + b^2 = 1$ for all $a, b \in \mathbf{R}$ and $(a, b)R_2(c, d) \Leftrightarrow a + d = b + c$ for all $(a, b), (c, d) \in \mathbf{N} \times \mathbf{N}$. Then :

- (A) R_1 and R_2 both are equivalence relations
- (B) Only R_1 is an equivalence relation
- (C) Only R_2 is an equivalence relation
- (D) Neither R_1 nor R_2 is an equivalence relation

[Step-by-step solution ► prepwiser.in/questions/CSRs8brL9I](https://www.prepwiser.in/questions/CSRs8brL9I)

Q37 JEE Main 2024 · 31 Jan · Shift 2

Let $A = \{1, 2, 3, \dots, 100\}$. Let R be a relation on A defined by $(x, y) \in R$ if and only if $2x = 3y$. Let R_1 be a symmetric relation on A such that $R \subset R_1$ and the number of elements in R_1 is n . Then, the minimum value of n is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/FmBCf1TsH3](https://www.prepwiser.in/questions/FmBCf1TsH3)

Q38 JEE Main 2024 · 31 Jan · Shift 1

Let $A = \{1, 2, 3, 4\}$ and $R = \{(1, 2), (2, 3), (1, 4)\}$ be a relation on A . Let S be the equivalence relation on A such that $R \subset S$ and the number of elements in S is n . Then, the minimum value of n is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/hwhb3DFNqF](https://www.prepwiser.in/questions/hwhb3DFNqF)

Q39 JEE Main 2024 · 30 Jan · Shift 2

The number of symmetric relations defined on the set $\{1, 2, 3, 4\}$ which are not reflexive is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/47_ypxTsxK](https://www.prepwiser.in/questions/47_ypxTsxK)

Q40 JEE Main 2024 · 29 Jan · Shift 1

Let R be a relation on $Z \times Z$ defined by $(a, b)R(c, d)$ if and only if $ad - bc$ is divisible by 5. Then R is

- (A) Reflexive and transitive but not symmetric
- (B) Reflexive and symmetric but not transitive
- (C) Reflexive but neither symmetric nor transitive
- (D) Reflexive, symmetric and transitive

[Step-by-step solution ► prepwiser.in/questions/Gxto1kvEwj](https://www.prepwiser.in/questions/Gxto1kvEwj)

Q41 JEE Main 2024 · 29 Jan · Shift 2

If R is the smallest equivalence relation on the set $\{1, 2, 3, 4\}$ such that $\{(1, 2), (1, 3)\} \subset R$, then the number of elements in R is _____.

- (A) 15
- (B) 10
- (C) 12
- (D) 8

[Step-by-step solution ► prepwiser.in/questions/nN_Oyza5Zm](https://www.prepwiser.in/questions/nN_Oyza5Zm)

Q42 JEE Main 2024 · 27 Jan · Shift 1

Let $S = \{1, 2, 3, \dots, 10\}$. Suppose M is the set of all the subsets of S , then the relation

$R = \{(A, B) : A \cap B \neq \phi; A, B \in M\}$ is :

(A) symmetric only

(B) reflexive only

(C) symmetric and reflexive only

(D) symmetric and transitive only

[Step-by-step solution ► prepwiser.in/questions/zcKUth9_Kx](https://www.prepwiser.in/questions/zcKUth9_Kx)

Q43 JEE Main 2023 · 15 Apr · Shift 1

Let $A = \{1, 2, 3, 4\}$ and R be a relation on the set $A \times A$ defined by

$R = \{((a, b), (c, d)) : 2a + 3b = 4c + 5d\}$. Then the number of elements in R is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/Wa9tEyuIpH](https://www.prepwiser.in/questions/Wa9tEyuIpH)

Q44 JEE Main 2023 · 13 Apr · Shift 2

Let $A = \{-4, -3, -2, 0, 1, 3, 4\}$ and $R = \{(a, b) \in A \times A : b = |a| \text{ or } b^2 = a + 1\}$ be a relation on A . Then the minimum number of elements, that must be added to the relation R so that it becomes reflexive and symmetric, is _____

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/wEaMNikFDs](https://www.prepwiser.in/questions/wEaMNikFDs)

Q45 JEE Main 2023 · 12 Apr · Shift 1

The number of relations, on the set $\{1, 2, 3\}$ containing $(1, 2)$ and $(2, 3)$, which are reflexive and transitive but not symmetric, is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/4SFb_lxkKi](https://www.prepwiser.in/questions/4SFb_lxkKi)

Q46 JEE Main 2023 · 11 Apr · Shift 2

Let $A = \{1, 3, 4, 6, 9\}$ and $B = \{2, 4, 5, 8, 10\}$. Let R be a relation defined on $A \times B$ such that

$$R = \{((a_1, b_1), (a_2, b_2)) : a_1 \leq b_2$$

and $b_1 \leq a_2\}$. Then the number of elements in the set R is :

(A) 180

(B) 26

(C) 52

(D) 160

[Step-by-step solution ► prepwiser.in/questions/iL_miUBnqr](https://www.prepwiser.in/questions/iL_miUBnqr)

Q47 JEE Main 2023 · 10 Apr · Shift 2

Let $A = \{2, 3, 4\}$ and $B = \{8, 9, 12\}$. Then the number of elements in the relation

$$R = \{((a_1, b_1), (a_2, b_2)) \in (A \times B, A \times B) : a_1$$

divides b_2 and a_2 divides $b_1\}$ is :

- (A) 18 (B) 24
(C) 36 (D) 12

[Step-by-step solution ► prepwisser.in/questions/PB-IfFnwWX](https://www.prepwisser.in/questions/PB-IfFnwWX)

Q48 JEE Main 2023 · 8 Apr · Shift 1

Let $A = \{0, 3, 4, 6, 7, 8, 9, 10\}$ and R be the relation defined on A such that $R = \{(x, y) \in A \times A : x - y \text{ is odd positive integer or } x - y = 2\}$. The minimum number of elements that must be added to the relation R , so that it is a symmetric relation, is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/b8l9yf5Hkz](https://www.prepwisser.in/questions/b8l9yf5Hkz)

Q49 JEE Main 2023 · 8 Apr · Shift 2

Let $A = \{1, 2, 3, 4, 5, 6, 7\}$. Then the relation $R = \{(x, y) \in A \times A : x + y = 7\}$ is :

- (A) reflexive but neither symmetric nor transitive
(B) transitive but neither symmetric nor reflexive
(C) symmetric but neither reflexive nor transitive
(D) an equivalence relation

[Step-by-step solution ► prepwisser.in/questions/eccecV5PKls](https://www.prepwisser.in/questions/eccecV5PKls)

Q50 JEE Main 2023 · 6 Apr · Shift 1

Let $A = \{1, 2, 3, 4, \dots, 10\}$ and $B = \{0, 1, 2, 3, 4\}$. The number of elements in the relation $R = \{(a, b) \in A \times A : 2(a - b)^2 + 3(a - b) \in B\}$ is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/FZtL5BMsno](https://www.prepwisser.in/questions/FZtL5BMsno)

Q51 JEE Main 2023 · 1 Feb · Shift 1

Let R be a relation on $\mathbb{R}$, given by $R = \{(a, b) : 3a - 3b + \sqrt{7} \text{ is an irrational number}\}$. Then R is

- (A) an equivalence relation
(B) reflexive and symmetric but not transitive
(C) reflexive and transitive but not symmetric
(D) reflexive but neither symmetric nor transitive

[Step-by-step solution ► prepwisser.in/questions/ChcGvp3CIM](https://www.prepwisser.in/questions/ChcGvp3CIM)

Q52 JEE Main 2023 · 31 Jan · Shift 2

Among the relations

$$S = \{(a, b) : a, b \in \mathbb{R} - \{0\}, 2 + \frac{a}{b} > 0\}$$

$$\text{and } T = \{(a, b) : a, b \in \mathbb{R}, a^2 - b^2 \in \mathbb{Z}\},$$

- (A) S is transitive but T is not
- (B) both S and T are symmetric
- (C) neither S nor T is transitive
- (D) T is symmetric but S is not

[Step-by-step solution ► prepwiser.in/questions/b9rZneqm0l](https://www.prepwiser.in/questions/b9rZneqm0l)

Q53 JEE Main 2023 · 31 Jan · Shift 1

Let R be a relation on $\mathbb{N} \times \mathbb{N}$ defined by $(a, b)R(c, d)$ if and only if $ad(b - c) = bc(a - d)$. Then R is

- (A) symmetric and transitive but not reflexive
- (B) reflexive and symmetric but not transitive
- (C) transitive but neither reflexive nor symmetric
- (D) symmetric but neither reflexive nor transitive

[Step-by-step solution ► prepwiser.in/questions/RoqhX--7qi](https://www.prepwiser.in/questions/RoqhX--7qi)

Q54 JEE Main 2023 · 30 Jan · Shift 1

The minimum number of elements that must be added to the relation $R = \{(a, b), (b, c)\}$ on the set $\{a, b, c\}$ so that it becomes symmetric and transitive is :

- (A) 7
- (B) 3
- (C) 4
- (D) 5

[Step-by-step solution ► prepwiser.in/questions/Fa5aj93DK5](https://www.prepwiser.in/questions/Fa5aj93DK5)

Q55 JEE Main 2023 · 29 Jan · Shift 2

Let R be a relation defined on $\mathbb{N}$ as aRb if $2a + 3b$ is a multiple of 5, $a, b \in \mathbb{N}$. Then R is

- (A) an equivalence relation
- (B) non reflexive
- (C) symmetric but not transitive
- (D) transitive but not symmetric

[Step-by-step solution ► prepwiser.in/questions/NWGpqqVWXXK](https://www.prepwiser.in/questions/NWGpqqVWXXK)

Q56 JEE Main 2023 · 24 Jan · Shift 1

The relation $R = \{(a, b) : \gcd(a, b) = 1, 2a \neq b, a, b \in \mathbb{Z}\}$ is :

- (A) reflexive but not symmetric
- (B) transitive but not reflexive
- (C) symmetric but not transitive
- (D) neither symmetric nor transitive

[Step-by-step solution ► prepwiser.in/questions/xO17zGmEnK](https://www.prepwiser.in/questions/xO17zGmEnK)

Q57 JEE Main 2023 · 24 Jan · Shift 2

The minimum number of elements that must be added to the relation $R = \{(a, b), (b, c), (b, d)\}$ on the set $\{a, b, c, d\}$ so that it is an equivalence relation, is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/KXn0YTGQLS](https://www.prepwiser.in/questions/KXn0YTGQLS)

Q58 JEE Main 2022 · 29 Jul · Shift 1

Let R be a relation from the set $\{1, 2, 3, \dots, 60\}$ to itself such that $R = \{(a, b) : b = pq, \text{ where } p, q \geq 3 \text{ are prime numbers}\}$. Then, the number of elements in R is :

- (A) 600 (B) 660
(C) 540 (D) 720

[Step-by-step solution ► prepwiser.in/questions/l-svWnEAXT](https://www.prepwiser.in/questions/l-svWnEAXT)

Q59 JEE Main 2022 · 28 Jul · Shift 1

For $\alpha \in \mathbb{N}$, consider a relation R on $\mathbb{N}$ given by $R = \{(x, y) : 3x + \alpha y \text{ is a multiple of } 7\}$. The relation R is an equivalence relation if and only if :

- (A) $\alpha = 14$
(B) α is a multiple of 4
(C) 4 is the remainder when α is divided by 10
(D) 4 is the remainder when α is divided by 7

[Step-by-step solution ► prepwiser.in/questions/m2-7jjjUZI](https://www.prepwiser.in/questions/m2-7jjjUZI)

Q60 JEE Main 2022 · 27 Jul · Shift 1

Let R_1 and R_2 be two relations defined on $\mathbb{R}$ by

$$a R_1 b \Leftrightarrow ab \geq 0 \text{ and } a R_2 b \Leftrightarrow a \geq b$$

Then,

- (A) R_1 is an equivalence relation but not R_2
(B) R_2 is an equivalence relation but not R_1
(C) both R_1 and R_2 are equivalence relations
(D) neither R_1 nor R_2 is an equivalence relation

[Step-by-step solution ► prepwiser.in/questions/icjYnf54e9](https://www.prepwiser.in/questions/icjYnf54e9)

Q61 JEE Main 2022 · 29 Jun · Shift 2

The probability that a relation R from $\{x, y\}$ to $\{x, y\}$ is both symmetric and transitive, is equal to :

- (A) $\frac{5}{16}$ (B) $\frac{9}{16}$
(C) $\frac{11}{16}$ (D) $\frac{13}{16}$

[Step-by-step solution ► prepwiser.in/questions/tccp5uFeKe](https://www.prepwiser.in/questions/tccp5uFeKe)

Q62 JEE Main 2022 · 29 Jun · Shift 1

Let a set $A = A_1 \cup A_2 \cup \dots \cup A_k$, where $A_i \cap A_j = \phi$ for $i \neq j$, $1 \leq j, j \leq k$. Define the relation R from A to A by $R = \{(x, y) : y \in A_i \text{ if and only if } x \in A_i, 1 \leq i \leq k\}$. Then, R is :

- (A) reflexive, symmetric but not transitive.
- (B) reflexive, transitive but not symmetric.
- (C) reflexive but not symmetric and transitive.
- (D) an equivalence relation.

[Step-by-step solution ► prepwisers.in/questions/iAaGWdJb0f](https://www.prepwisers.in/questions/iAaGWdJb0f)

Q63 JEE Main 2022 · 28 Jun · Shift 1

Let R_1 and R_2 be relations on the set $\{1, 2, \dots, 50\}$ such that

$R_1 = \{(p, p^n) : p \text{ is a prime and } n \geq 0 \text{ is an integer}\}$ and

$R_2 = \{(p, p^n) : p \text{ is a prime and } n = 0 \text{ or } 1\}$.

Then, the number of elements in $R_1 - R_2$ is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisers.in/questions/CRPkYYB82P](https://www.prepwisers.in/questions/CRPkYYB82P)

Q64 JEE Main 2022 · 28 Jun · Shift 2

Let $R_1 = \{(a, b) \in \mathbb{N} \times \mathbb{N} : |a - b| \leq 13\}$ and

$R_2 = \{(a, b) \in \mathbb{N} \times \mathbb{N} : |a - b| \neq 13\}$. Then on $\mathbb{N}$:

- (A) Both R_1 and R_2 are equivalence relations
- (B) Neither R_1 nor R_2 is an equivalence relation
- (C) R_1 is an equivalence relation but R_2 is not
- (D) R_2 is an equivalence relation but R_1 is not

[Step-by-step solution ► prepwisers.in/questions/jhDvsDa7FU](https://www.prepwisers.in/questions/jhDvsDa7FU)

Q65 JEE Main 2021 · 31 Aug · Shift 1

Which of the following is not correct for relation R on the set of real numbers ?

- (A) $(x, y) \in R \Leftrightarrow 0 < |x| - |y| \leq 1$ is neither transitive nor symmetric.
- (B) $(x, y) \in R \Leftrightarrow 0 < |x - y| \leq 1$ is symmetric and transitive.
- (C) $(x, y) \in R \Leftrightarrow |x| - |y| \leq 1$ is reflexive but not symmetric.
- (D) $(x, y) \in R \Leftrightarrow |x - y| \leq 1$ is reflexive and symmetric.

[Step-by-step solution ► prepwisers.in/questions/UbEuOY91F1](https://www.prepwisers.in/questions/UbEuOY91F1)

Q66 JEE Main 2021 · 27 Jul · Shift 2

Let N be the set of natural numbers and a relation R on N be defined by $R = \{(x, y) \in N \times N : x^3 - 3x^2y - xy^2 + 3y^3 = 0\}$. Then the relation R is :

- (A) symmetric but neither reflexive nor transitive
- (B) reflexive but neither symmetric nor transitive
- (C) reflexive and symmetric, but not transitive
- (D) an equivalence relation

[Step-by-step solution ► prepwisser.in/questions/xdCECWozvD](https://www.prepwisser.in/questions/xdCECWozvD)

Q67 JEE Main 2021 · 18 Mar · Shift 2

Define a relation R over a class of $n \times n$ real matrices A and B as

" ARB iff there exists a non-singular matrix P such that $PAP^{-1} = B$ ".

Then which of the following is true?

- (A) R is reflexive, transitive but not symmetric
- (B) R is symmetric, transitive but not reflexive.
- (C) R is reflexive, symmetric but not transitive
- (D) R is an equivalence relation

[Step-by-step solution ► prepwisser.in/questions/eMx8OEj7IZ](https://www.prepwisser.in/questions/eMx8OEj7IZ)

Q68 JEE Main 2021 · 16 Mar · Shift 2

Let $A = \{2, 3, 4, 5, \dots, 30\}$ and ' $\simeq$ ' be an equivalence relation on $A \times A$, defined by $(a, b) \simeq (c, d)$, if and only if $ad = bc$. Then the number of ordered pairs which satisfy this equivalence relation with ordered pair $(4, 3)$ is equal to :

- (A) 5
- (B) 6
- (C) 8
- (D) 7

[Step-by-step solution ► prepwisser.in/questions/3Uh619bEW1](https://www.prepwisser.in/questions/3Uh619bEW1)

Q69 JEE Main 2021 · 26 Feb · Shift 1

Let $R = \{(P, Q) \mid P \text{ and } Q \text{ are at the same distance from the origin}\}$ be a relation, then the equivalence class of $(1, -1)$ is the set :

- (A) $S = \{(x, y) \mid x^2 + y^2 = \sqrt{2}\}$
- (B) $S = \{(x, y) \mid x^2 + y^2 = 2\}$
- (C) $S = \{(x, y) \mid x^2 + y^2 = 1\}$
- (D) $S = \{(x, y) \mid x^2 + y^2 = 4\}$

[Step-by-step solution ► prepwisser.in/questions/7D-fSg2KM4](https://www.prepwisser.in/questions/7D-fSg2KM4)

Q70 JEE Main 2020 · 3 Sep · Shift 2

Let R_1 and R_2 be two relation defined as follows :

$$R_1 = \{(a, b) \in \mathbb{R}^2 : a^2 + b^2 \in \mathbb{Q}\} \text{ and}$$

$$R_2 = \{(a, b) \in \mathbb{R}^2 : a^2 + b^2 \notin \mathbb{Q}\},$$

where $\mathbb{Q}$ is the set of all rational numbers. Then :

- (A) Neither R_1 nor R_2 is transitive.
(B) R_2 is transitive but R_1 is not transitive.
(C) R_1 and R_2 are both transitive.
(D) R_1 is transitive but R_2 is not transitive.

[Step-by-step solution ► prepwiser.in/questions/GrbKUVkem7](https://www.prepwiser.in/questions/GrbKUVkem7)

Q71 JEE Main 2020 · 2 Sep · Shift 1

If $R = \{(x, y) : x, y \in \mathbb{Z}, x^2 + 3y^2 \leq 8\}$ is a relation on the set of integers $\mathbb{Z}$, then the domain of R^{-1} is :

- (A) $\{0, 1\}$ (B) $\{-2, -1, 1, 2\}$
(C) $\{-1, 0, 1\}$ (D) $\{-2, -1, 0, 1, 2\}$

[Step-by-step solution ► prepwiser.in/questions/CH-AP_mweF](https://www.prepwiser.in/questions/CH-AP_mweF)

Composition of Functions · 16 PYQs

Q72 JEE Main 2025 · 4 Apr · Shift 1

Let $f, g : (1, \infty) \rightarrow \mathbb{R}$ be defined as $f(x) = \frac{2x+3}{5x+2}$ and $g(x) = \frac{2-3x}{1-x}$. If the range of the function $\text{fog} : [2, 4] \rightarrow \mathbb{R}$ is $[\alpha, \beta]$, then $\frac{1}{\beta-\alpha}$ is equal to

- (A) 56 (B) 2
(C) 29 (D) 68

[Step-by-step solution ► prepwiser.in/questions/_Ks8rVq-jf](https://www.prepwiser.in/questions/_Ks8rVq-jf)

Q73 JEE Main 2025 · 23 Jan · Shift 1

Let $f(x) = \log_e x$ and $g(x) = \frac{x^4 - 2x^3 + 3x^2 - 2x + 2}{2x^2 - 2x + 1}$. Then the domain of $f \circ g$ is

- (A) $(0, \infty)$ (B) $[1, \infty)$
(C) $\mathbb{R}$ (D) $[0, \infty)$

[Step-by-step solution ► prepwiser.in/questions/neQ5CSPKE3](https://www.prepwiser.in/questions/neQ5CSPKE3)

Q74 JEE Main 2024 · 4 Apr · Shift 2

Consider the function $f : \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = \frac{2x}{\sqrt{1+9x^2}}$. If the composition of

$$f, \underbrace{(f \circ f \circ f \circ \dots \circ f)}_{10 \text{ times}}(x) = \frac{2^{10}x}{\sqrt{1+9\alpha x^2}}$$

, then the value of $\sqrt{3\alpha + 1}$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/YCmx4CAp4Y](https://www.prepwiser.in/questions/YCmx4CAp4Y)

Q75 JEE Main 2024 · 31 Jan · Shift 1

If $f(x) = \frac{4x+3}{6x-4}$, $x \neq \frac{2}{3}$ and $(f \circ f)(x) = g(x)$, where

$$g : \mathbb{R} - \left\{ \frac{2}{3} \right\} \rightarrow \mathbb{R} - \left\{ \frac{2}{3} \right\}$$

, then $(g \circ g)(4)$ is equal to

- (A) -4 (B) $\frac{19}{20}$
(C) $-\frac{19}{20}$ (D) 4

[Step-by-step solution ► prepwisser.in/questions/dtFZe4n5JA](https://www.prepwisser.in/questions/dtFZe4n5JA)

Q76 JEE Main 2024 · 27 Jan · Shift 2

Let $f : \mathbb{R} - \left\{ \frac{-1}{2} \right\} \rightarrow \mathbb{R}$ and $g : \mathbb{R} - \left\{ \frac{-5}{2} \right\} \rightarrow \mathbb{R}$ be defined as $f(x) = \frac{2x+3}{2x+1}$ and $g(x) = \frac{|x|+1}{2x+5}$. Then, the domain of the function $f \circ g$ is :

- (A) $\mathbb{R} - \left\{ -\frac{7}{4} \right\}$
(B) $\mathbb{R}$
(C) $\mathbb{R} - \left\{ -\frac{5}{2}, -\frac{7}{4} \right\}$
(D) $\mathbb{R} - \left\{ -\frac{5}{2} \right\}$

[Step-by-step solution ► prepwisser.in/questions/tkv0gYnMtO](https://www.prepwisser.in/questions/tkv0gYnMtO)

Q77 JEE Main 2023 · 13 Apr · Shift 1

For $x \in \mathbb{R}$, two real valued functions $f(x)$ and $g(x)$ are such that, $g(x) = \sqrt{x} + 1$ and $f \circ g(x) = x + 3 - \sqrt{x}$. Then $f(0)$ is equal to

- (A) 5 (B) 0
(C) -3 (D) 1

[Step-by-step solution ► prepwisser.in/questions/nmpBPZjRen](https://www.prepwisser.in/questions/nmpBPZjRen)

Q78 JEE Main 2023 · 30 Jan · Shift 1

Let $f^1(x) = \frac{3x+2}{2x+3}$, $x \in \mathbb{R} - \left\{ \frac{-3}{2} \right\}$ For $n \geq 2$, define $f^n(x) = f^1 \circ f^{n-1}(x)$. If

$$f^5(x) = \frac{ax+b}{bx+a}, \gcd(a,b) = 1$$

, then $a + b$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/HUNKQGXNoA](https://www.prepwisser.in/questions/HUNKQGXNoA)

Q79 JEE Main 2023 · 25 Jan · Shift 1

For some $a, b, c \in \mathbb{N}$, let $f(x) = ax - 3$ and $g(x) = x^b + c$, $x \in \mathbb{R}$. If $(f \circ g)^{-1}(x) = \left(\frac{x-7}{2} \right)^{1/3}$, then $(f \circ g)(ac) + (g \circ f)(b)$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/9i37KNdULI](https://www.prepwisser.in/questions/9i37KNdULI)

Q80 JEE Main 2022 · 27 Jun · Shift 2

Let $S = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$. Define $f : S \rightarrow S$ as

$$f(n) = \begin{cases} 2n & , \quad \text{if } n = 1, 2, 3, 4, 5 \\ 2n - 11 & , \quad \text{if } n = 6, 7, 8, 9, 10 \end{cases}$$

.

Let $g : S \rightarrow S$ be a function such that

$$fog(n) = \begin{cases} n + 1 & , \quad \text{if } n \text{ is odd} \\ n - 1 & , \quad \text{if } n \text{ is even} \end{cases}$$

.

Then $g(10)g(1) + g(2) + g(3) + g(4) + g(5)$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisar.in/questions/yswQ6ed2Qp](https://www.prepwisar.in/questions/yswQ6ed2Qp)

Q81 JEE Main 2022 · 26 Jun · Shift 1

Let $f(x) = \frac{x-1}{x+1}$, $x \in \mathbb{R} - \{0, -1, 1\}$. If $f^{n+1}(x) = f(f^n(x))$ for all $n \in \mathbb{N}$, then $f^6(6) + f^7(7)$ is equal to :

(A) $\frac{7}{6}$

(B) $-\frac{3}{2}$

(C) $\frac{7}{12}$

(D) $-\frac{11}{12}$

[Step-by-step solution ► prepwisar.in/questions/CZltMsZSgr](https://www.prepwisar.in/questions/CZltMsZSgr)

Q82 JEE Main 2022 · 26 Jun · Shift 2

Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be defined as $f(x) = x - 1$ and $g : \mathbb{R} - \{1, -1\} \rightarrow \mathbb{R}$ be defined as $g(x) = \frac{x^2}{x^2 - 1}$.

Then the function fog is :

(A) one-one but not onto

(B) onto but not one-one

(C) both one-one and onto

(D) neither one-one nor onto

[Step-by-step solution ► prepwisar.in/questions/TyRJUCwL5c](https://www.prepwisar.in/questions/TyRJUCwL5c)

Q83 JEE Main 2022 · 25 Jun · Shift 1

Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be a function defined by

$$f(x) = \left(2 \left(1 - \frac{x^{25}}{2} \right) (2 + x^{25}) \right)^{\frac{1}{50}}$$

. If the function $g(x) = f(f(f(x))) + f(f(x))$, then the greatest integer less than or equal to $g(1)$ is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisar.in/questions/rO4MWGPpTI](https://www.prepwisar.in/questions/rO4MWGPpTI)

Q84 JEE Main 2021 · 25 Jul · Shift 2

Consider function $f : A \rightarrow B$ and $g : B \rightarrow C$ ($A, B, C \subseteq \mathbb{R}$) such that $(gof)^{-1}$ exists, then :

(A) f and g both are one-one

(B) f and g both are onto

(C) f is one-one and g is onto

(D) f is onto and g is one-one

[Step-by-step solution ► prepwisar.in/questions/W038t15ow_](https://www.prepwisar.in/questions/W038t15ow_)

Q85 JEE Main 2021 · 20 Jul · Shift 2

Let $f : R - \left\{ \frac{\alpha}{6} \right\} \rightarrow R$ be defined by $f(x) = \frac{5x+3}{6x-\alpha}$. Then the value of α for which $(f \circ f)(x) = x$, for all $x \in R - \left\{ \frac{\alpha}{6} \right\}$, is :

- (A) No such α exists (B) 5
(C) 8 (D) 6

[Step-by-step solution ► prepwiser.in/questions/q0zM3CNv7_](https://www.prepwiser.in/questions/q0zM3CNv7_)

Q86 JEE Main 2021 · 26 Feb · Shift 2

Let $f(x) = \sin^{-1}x$ and $g(x) = \frac{x^2-x-2}{2x^2-x-6}$. If $g(2) = \lim_{x \rightarrow 2} g(x)$, then the domain of the function $f \circ g$ is :

- (A) $(-\infty, -2] \cup \left[-\frac{4}{3}, \infty\right)$
(B) $(-\infty, -2] \cup [-1, \infty)$
(C) $(-\infty, -2] \cup \left[-\frac{3}{2}, \infty\right)$
(D) $(-\infty, -1] \cup [2, \infty)$

[Step-by-step solution ► prepwiser.in/questions/48bq5lnHxt](https://www.prepwiser.in/questions/48bq5lnHxt)

Q87 JEE Main 2020 · 7 Jan · Shift 1

If $g(x) = x^2 + x - 1$ and

$(g \circ f)(x) = 4x^2 - 10x + 5$, then $f\left(\frac{5}{4}\right)$ is equal to:

- (A) $\frac{1}{2}$ (B) $\frac{3}{2}$
(C) $-\frac{1}{2}$ (D) $-\frac{3}{2}$

[Step-by-step solution ► prepwiser.in/questions/JgupcoY8dA](https://www.prepwiser.in/questions/JgupcoY8dA)

Greatest Integer and Fractional Part · 25 PYQs

Q88 JEE Main 2025 · 24 Jan · Shift 2

Let $[x]$ denote the greatest integer function, and let m and n respectively be the numbers of the points, where the function $f(x) = [x] + |x - 2|$, $-2 < x < 3$, is not continuous and not differentiable. Then $m + n$ is equal to :

- (A) 6 (B) 9
(C) 8 (D) 7

[Step-by-step solution ► prepwiser.in/questions/QUD4I54LtE](https://www.prepwiser.in/questions/QUD4I54LtE)

Q89 JEE Main 2024 · 5 Apr · Shift 1

If $S = \{a \in \mathbf{R} : |2a - 1| = 3[a] + 2\{a\}\}$, where $[t]$ denotes the greatest integer less than or equal to t and $\{t\}$ represents the fractional part of t , then $72 \sum_{a \in S} a$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/kIEtSADOIM](https://www.prepwiser.in/questions/kIEtSADOIM)

Q90 JEE Main 2023 · 13 Apr · Shift 2

Let $[\alpha]$ denote the greatest integer $\leq \alpha$. Then $[\sqrt{1}] + [\sqrt{2}] + [\sqrt{3}] + \dots + [\sqrt{120}]$ is equal to _____

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/y263nNiVAd](https://www.prepwiser.in/questions/y263nNiVAd)

Q91 JEE Main 2023 · 13 Apr · Shift 1

Fractional part of the number $\frac{4^{2022}}{15}$ is equal to

(A) $\frac{8}{15}$

(B) $\frac{4}{15}$

(C) $\frac{1}{15}$

(D) $\frac{14}{15}$

[Step-by-step solution ► prepwisar.in/questions/0DK8EMVTKX](https://www.prepwisar.in/questions/0DK8EMVTKX)

Q92 JEE Main 2023 · 12 Apr · Shift 1

Let $[x]$ be the greatest integer $\leq x$. Then the number of points in the interval $(-2, 1)$, where the function $f(x) = |[x]| + \sqrt{x - [x]}$ is discontinuous, is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisar.in/questions/S2OpLIFn63](https://www.prepwisar.in/questions/S2OpLIFn63)

Q93 JEE Main 2023 · 12 Apr · Shift 1

Let D be the domain of the function $f(x) = \sin^{-1} \left(\log_{3x} \left(\frac{6+2\log_3 x}{-5x} \right) \right)$. If the range of the function $g : D \rightarrow \mathbb{R}$ defined by $g(x) = x - [x]$, ($[x]$ is the greatest integer function), is (α, β) , then $\alpha^2 + \frac{5}{\beta}$ is equal to

(A) 45

(B) 136

(C) 46

(D) nearly 135

[Step-by-step solution ► prepwisar.in/questions/G7P3KhoPNz](https://www.prepwisar.in/questions/G7P3KhoPNz)

Q94 JEE Main 2023 · 11 Apr · Shift 1

Let $f(x) = [x^2 - x] + |-x + [x]|$, where $x \in \mathbb{R}$ and $[t]$ denotes the greatest integer less than or equal to t . Then, f is :

(A) continuous at $x = 0$, but not continuous at $x = 1$

(B) continuous at $x = 0$ and $x = 1$

(C) continuous at $x = 1$, but not continuous at $x = 0$

(D) not continuous at $x = 0$ and $x = 1$

[Step-by-step solution ► prepwisar.in/questions/SUqj2ivbF7](https://www.prepwisar.in/questions/SUqj2ivbF7)

Q95 JEE Main 2023 · 11 Apr · Shift 2

The domain of the function $f(x) = \frac{1}{\sqrt{[x]^2 - 3[x] - 10}}$ is : (where $[x]$ denotes the greatest integer less than or equal to x)

(A) $(-\infty, -2) \cup [6, \infty)$

(B) $(-\infty, -3] \cup [6, \infty)$

(C) $(-\infty, -2) \cup (5, \infty)$

(D) $(-\infty, -3] \cup (5, \infty)$

[Step-by-step solution ► prepwisar.in/questions/liX00KBbpa](https://www.prepwisar.in/questions/liX00KBbpa)

Q96 JEE Main 2023 · 6 Apr · Shift 2

Let the sets A and B denote the domain and range respectively of the function $f(x) = \frac{1}{\sqrt{[x]-x}}$, where $[x]$ denotes the smallest integer greater than or equal to x . Then among the statements

(S1) : $A \cap B = (1, \infty) - \mathbb{N}$ and

(S2) : $A \cup B = (1, \infty)$

(A) only (S2) is true

(B) only (S1) is true

(C) neither (S1) nor (S2) is true

(D) both (S1) and (S2) are true

[Step-by-step solution ► prepwisar.in/questions/uY3l0UgFoh](https://www.prepwisar.in/questions/uY3l0UgFoh)

Q97 JEE Main 2023 · 31 Jan · Shift 2

The absolute minimum value, of the function

$$f(x) = |x^2 - x + 1| + [x^2 - x + 1],$$

where $[t]$ denotes the greatest integer function, in the interval $[-1, 2]$, is :

(A) $\frac{3}{4}$

(B) $\frac{3}{2}$

(C) $\frac{1}{4}$

(D) $\frac{5}{4}$

[Step-by-step solution ► prepwisar.in/questions/hTAHHhH9yW](https://www.prepwisar.in/questions/hTAHHhH9yW)

Q98 JEE Main 2023 · 31 Jan · Shift 1

If the domain of the function $f(x) = \frac{[x]}{1+x^2}$, where $[x]$ is greatest integer $\leq x$, is $[2, 6)$, then its range is

(A) $\left(\frac{5}{37}, \frac{2}{5}\right] - \left\{\frac{9}{29}, \frac{27}{109}, \frac{18}{89}, \frac{9}{53}\right\}$

(B) $\left(\frac{5}{37}, \frac{2}{5}\right]$

(C) $\left(\frac{5}{26}, \frac{2}{5}\right]$

(D) $\left(\frac{5}{26}, \frac{2}{5}\right] - \left\{\frac{9}{29}, \frac{27}{109}, \frac{18}{89}, \frac{9}{53}\right\}$

[Step-by-step solution ► prepwisar.in/questions/64nrA-jnTj](https://www.prepwisar.in/questions/64nrA-jnTj)

Q99 JEE Main 2023 · 24 Jan · Shift 1

The equation $x^2 - 4x + [x] + 3 = x[x]$, where $[x]$ denotes the greatest integer function, has :

(A) exactly two solutions in $(-\infty, \infty)$

(B) no solution

(C) a unique solution in $(-\infty, \infty)$

(D) a unique solution in $(-\infty, 1)$

[Step-by-step solution ► prepwisar.in/questions/moYb8dBZM1](https://www.prepwisar.in/questions/moYb8dBZM1)

Q100 JEE Main 2022 · 27 Jul · Shift 2

Let $f(x) = \min\{[x-1], [x-2], \dots, [x-10]\}$ where $[t]$ denotes the greatest integer $\leq t$. Then

$$\int_0^{10} f(x) dx + \int_0^{10} (f(x))^2 dx + \int_0^{10} |f(x)| dx$$

is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/DCKiBmjxSX](https://www.prepwiser.in/questions/DCKiBmjxSX)

Q101 JEE Main 2022 · 27 Jul · Shift 1

Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be a function defined as

$f(x) = a \sin\left(\frac{\pi[x]}{2}\right) + [2-x]$, $a \in \mathbb{R}$ where $[t]$ is the greatest integer less than or equal to t . If $\lim_{x \rightarrow -1} f(x)$ exists, then the value of $\int_0^4 f(x) dx$ is equal to

(A) -1

(B) -2

(C) 1

(D) 2

[Step-by-step solution ► prepwiser.in/questions/bs6n9udyD_](https://www.prepwiser.in/questions/bs6n9udyD_)

Q102 JEE Main 2022 · 25 Jul · Shift 2

The sum of the maximum and minimum values of the function $f(x) = |5x-7| + [x^2+2x]$ in the interval $[\frac{5}{4}, 2]$, where $[t]$ is the greatest integer $\leq t$, is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/iee7586OL2](https://www.prepwiser.in/questions/iee7586OL2)

Q103 JEE Main 2022 · 28 Jun · Shift 1

Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be defined as

$$f(x) = \begin{cases} [e^x], & x < 0 \\ ae^x + [x-1], & 0 \leq x < 1 \\ b + [\sin(\pi x)], & 1 \leq x < 2 \\ [e^{-x}] - c, & x \geq 2 \end{cases}$$

where $a, b, c \in \mathbb{R}$ and $[t]$ denotes greatest integer less than or equal to t . Then, which of the following statements is true?

(A) There exists $a, b, c \in \mathbb{R}$ such that f is continuous on $\mathbb{R}$.

(B) If f is discontinuous at exactly one point, then $a + b + c = 1$

(C) If f is discontinuous at exactly one point, then $a + b + c \neq 1$

(D) f is discontinuous at at least two points, for any values of a, b and c

[Step-by-step solution ► prepwiser.in/questions/sPhYlPyFXo](https://www.prepwiser.in/questions/sPhYlPyFXo)

Q104 JEE Main 2022 · 25 Jun · Shift 2

Let $f(x) = [2x^2 + 1]$ and

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

, where $[t]$ is the greatest integer $\leq t$. Then, in the open interval $(-1, 1)$, the number of points where $f \circ g$ is discontinuous is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/wIxI5m_b89](https://www.prepwiser.in/questions/wIxI5m_b89)

Q105 JEE Main 2021 · 25 Jul · Shift 1

Let $f : [0, \infty) \rightarrow [0, \infty)$ be defined as $f(x) = \int_0^x [y] dy$

where $[x]$ is the greatest integer less than or equal to x . Which of the following is true?

- (A) f is continuous at every point in $[0, \infty)$ and differentiable except at the integer points.
- (B) f is both continuous and differentiable except at the integer points in $[0, \infty)$.
- (C) f is continuous everywhere except at the integer points in $[0, \infty)$.
- (D) f is differentiable at every point in $[0, \infty)$.

[Step-by-step solution ► prepwiser.in/questions/wR8LxGaEah](https://www.prepwiser.in/questions/wR8LxGaEah)

Q106 JEE Main 2021 · 25 Jul · Shift 2

If $[x]$ be the greatest integer less than or equal to x ,

then $\sum_{n=8}^{100} \left[\frac{(-1)^n n}{2} \right]$ is equal to :

- (A) 0
- (B) 4
- (C) -2
- (D) 2

[Step-by-step solution ► prepwiser.in/questions/1xWw_K_9CS](https://www.prepwiser.in/questions/1xWw_K_9CS)

Q107 JEE Main 2021 · 22 Jul · Shift 2

Let $[x]$ denote the greatest integer less than or equal to x . Then, the values of $x \in \mathbb{R}$ satisfying the equation $[e^x]^2 + [e^x + 1] - 3 = 0$ lie in the interval :

- (A) $[0, \frac{1}{e})$
- (B) $[\log_e 2, \log_e 3)$
- (C) $[1, e)$
- (D) $[0, \log_e 2)$

[Step-by-step solution ► prepwiser.in/questions/EJ4y2sR3Wu](https://www.prepwiser.in/questions/EJ4y2sR3Wu)

Q108 JEE Main 2021 · 20 Jul · Shift 1

Let $[x]$ denote the greatest integer $\leq x$, where $x \in \mathbb{R}$. If the domain of the real valued function $f(x) = \sqrt{\frac{[x]-2}{[x]-3}}$ is $(-\infty, a) \cup [b, c) \cup [4, \infty)$, $a < b < c$, then the value of $a + b + c$ is :

- (A) 8
- (B) 1
- (C) -2
- (D) -3

[Step-by-step solution ► prepwiser.in/questions/RAdzwGa0J_](https://www.prepwiser.in/questions/RAdzwGa0J_)

Q109 JEE Main 2021 · 18 Mar · Shift 1

The real valued function

$f(x) = \frac{\cos e^{x-1}}{\sqrt{x-[x]}}$, where $[x]$ denotes the greatest integer less than or equal to x , is defined for all x belonging to :

- (A) all real except integers
- (B) all non-integers except the interval $[-1, 1]$
- (C) all integers except 0, $-1, 1$
- (D) all real except the interval $[-1, 1]$

[Step-by-step solution ► prepwiser.in/questions/rPxBpkFHMI](https://www.prepwiser.in/questions/rPxBpkFHMI)

Q110 JEE Main 2021 · 24 Feb · Shift 1

If $f: \mathbb{R} \rightarrow \mathbb{R}$ is a function defined by $f(x) = [x - 1] \cos\left(\frac{2x-1}{2}\pi\right)$, where $[.]$ denotes the greatest integer function, then f is :

- (A) continuous for every real x
- (B) discontinuous at all integral values of x except at $x = 1$
- (C) discontinuous only at $x = 1$
- (D) continuous only at $x = 1$

[Step-by-step solution ► prepwiser.in/questions/hTSqcix5e9](https://www.prepwiser.in/questions/hTSqcix5e9)

Q111 JEE Main 2020 · 4 Sep · Shift 1

Let $[t]$ denote the greatest integer $\leq t$. Then the equation in x , $[x]^2 + 2[x+2] - 7 = 0$ has :

- (A) no integral solution.
- (B) exactly two solutions.
- (C) exactly four integral solutions.
- (D) infinitely many solutions.

[Step-by-step solution ► prepwiser.in/questions/jNOT6ghoIt](https://www.prepwiser.in/questions/jNOT6ghoIt)

Q112 JEE Main 2020 · 8 Jan · Shift 2

Let $f: (1, 3) \rightarrow \mathbb{R}$ be a function defined by

$f(x) = \frac{x[x]}{1+x^2}$, where $[x]$ denotes the greatest integer $\leq x$. Then the range of f is

- (A) $\left(\frac{2}{5}, \frac{1}{2}\right) \cup \left(\frac{3}{4}, \frac{4}{5}\right]$
- (B) $\left(\frac{3}{5}, \frac{4}{5}\right)$
- (C) $\left(\frac{2}{5}, \frac{4}{5}\right]$
- (D) $\left(\frac{2}{5}, \frac{3}{5}\right] \cup \left(\frac{3}{4}, \frac{4}{5}\right)$

[Step-by-step solution ► prepwiser.in/questions/oqQ9mR_The](https://www.prepwiser.in/questions/oqQ9mR_The)

Q113 JEE Main 2023 · 29 Jan · Shift 1

Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be a function such that $f(x) = \frac{x^2+2x+1}{x^2+1}$. Then

- (A) $f(x)$ is many-one in $(-\infty, -1)$
- (B) $f(x)$ is one-one in $(-\infty, \infty)$
- (C) $f(x)$ is one-one in $[1, \infty)$ but not in $(-\infty, \infty)$
- (D) $f(x)$ is many-one in $(1, \infty)$

Step-by-step solution ► [prepwisar.in/questions/v5KmJudmsI](https://www.prepwisar.in/questions/v5KmJudmsI)

Answer key — Relations & Functions (Basic)

Numbers match the question numbers above. For full working, open the solution link under each question.

1	C	2	A	3	A	4	24	5	B	6	360	7	180	8	A
9	A	10	1440	11	D	12	D	13	31	14	A	15	720	16	A
17	19	18	C	19	6	20	A	21	B	22	A	23	B	24	D
25	D	26	C	27	B	28	C	29	3	30	C	31	25	32	C
33	D	34	D	35	46	36	C	37	66	38	16	39	960	40	B
41	B	42	A	43	6	44	7	45	3	46	D	47	C	48	19
49	C	50	18	51	D	52	D	53	D	54	A	55	A	56	D
57	13	58	B	59	D	60	D	61	A	62	D	63	8	64	B
65	B	66	B	67	D	68	D	69	B	70	A	71	C	72	A
73	C	74	1024	75	D	76	D	77	A	78	3125	79	2039	80	190
81	B	82	D	83	2	84	C	85	B	86	A	87	C	88	C
89	18	90	825	91	C	92	2	93	D	94	C	95	A	96	B
97	A	98	B	99	C	100	385	101	B	102	15	103	C	104	62
105	A	106	B	107	D	108	C	109	B	110	A	111	D	112	A
113	C														

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