

Q1. JEE Main 2026 (21 January Shift 2)

Let $A = \{x : |x^2 - 10| \leq 6\}$ and $B = \{x : |x - 2| > 1\}$. Then

- (1) $A \cup B = (-\infty, 1] \cup (2, \infty)$
- (2) $B - A = (-\infty, -4) \cup (-2, 1) \cup (4, \infty)$
- (3) $A - B = [2, 3]$
- (4) $A \cap B = [-4, -2] \cup [3, 4]$

Q2. JEE Main 2026 (21 January Shift 2)

Let $A = \{2, 3, 5, 7, 9\}$. Let R be the relation on A defined by xRy if and only if $2x \leq 3y$. 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 symmetric relation. Then $l + m$ is equal to :

- (1) 21
- (2) 27
- (3) 23
- (4) 25

Q3. JEE Main 2026 (23 January Shift 1)

Let $A = \{-2, -1, 0, 1, 2, 3, 4\}$. Let R be a relation on A defined by xRy if and only if $2x + y \leq 2$. 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 :

- (1) 35
- (2) 34
- (3) 33
- (4) 32

Q4. JEE Main 2026 (22 January Shift 2)

The number of elements in the relation $R = \{(x, y) : 4x^2 + y^2 < 52, x, y \in \mathbf{Z}\}$ is

- (1) 77
- (2) 67
- (3) 86
- (4) 89

Q5. JEE Main 2026 (22 January Shift 2)

Let S be the set of the first 11 natural numbers. Then the number of elements in $A = \{B \subseteq S : n(B) \geq 2 \text{ and the product of all elements of } B \text{ is even}\}$ is _____.

Q6. JEE Main 2026 (22 January Shift 1)

Let the relation R on the set $M = \{1, 2, 3, \dots, 16\}$ be given by $R = \{(x, y) : 4y = 5x - 3, x, y \in M\}$. Then the minimum number of elements required to be added in R , in order to make the relation symmetric, is equal to

- (1) 4
- (2) 1
- (3) 2
- (4) 3

Q7. JEE Main 2026 (23 January Shift 2)

Let $A = \{0, 1, 2, \dots, 9\}$. Let R be a relation on A defined by $(x, y) \in R$ if and only if $|x - y|$ is a multiple of 3.

Given below are two statements:

Statement I: $n(R) = 36$.

Statement II: R is an equivalence relation.

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

- (1) Statement I is incorrect but Statement II is correct
- (2) Statement I is correct but Statement II is incorrect
- (3) Both Statement I and Statement II are incorrect
- (4) Both Statement I and Statement II are correct

Q8. JEE Main 2026 (21 January Shift 1)

The number of relations, defined on the set $\{a, b, c, d\}$, which are both reflexive and symmetric, is equal to:

- (1) 16
- (2) 1024
- (3) 64
- (4) 256

Q9. JEE Main 2026 (24 January Shift 1)

Let R be a relation defined on the set $\{1, 2, 3, 4\} \times \{1, 2, 3, 4\}$ by $R = \{((a, b), (c, d)) : 2a + 3b = 3c + 4d\}$. Then the number of elements in R is

- (1) 18
- (2) 6
- (3) 15
- (4) 12

ANSWERS AND SOLUTIONS

1. (2) 2. (4) 3. (3) 4. (1) 5. 1979 6. (3) 7. (1) 8. (3)
9. (4)

1. (2) $A = \{x : |x^2 - 10| \leq 6\}$: $-6 \leq x^2 - 10 \leq 6 \Rightarrow 4 \leq x^2 \leq 16$, so $A = [-4, -2] \cup [2, 4]$.

$$B = \{x : |x - 2| > 1\} = (-\infty, 1) \cup (3, \infty).$$

$$A^c = (-\infty, -4) \cup (-2, 2) \cup (4, \infty).$$

$$B - A = B \cap A^c = [(-\infty, 1) \cap A^c] \cup [(3, \infty) \cap A^c]$$

$$= [(-\infty, -4) \cup (-2, 1)] \cup [(4, \infty)]$$

$$= (-\infty, -4) \cup (-2, 1) \cup (4, \infty).$$

2. (4) Given $A = \{2, 3, 5, 7, 9\}$ and xRy iff $2x \leq 3y$, i.e., $y \geq \frac{2x}{3}$.

$$\text{For } x = 2: y \in \{2, 3, 5, 7, 9\} \rightarrow 5 \text{ pairs}$$

$$\text{For } x = 3: y \in \{2, 3, 5, 7, 9\} \rightarrow 5 \text{ pairs}$$

$$\text{For } x = 5: y \in \{5, 7, 9\} \rightarrow 3 \text{ pairs}$$

$$\text{For } x = 7: y \in \{5, 7, 9\} \rightarrow 3 \text{ pairs}$$

$$\text{For } x = 9: y \in \{7, 9\} \rightarrow 2 \text{ pairs}$$

$$\text{So } l = 18.$$

For symmetry, pairs in R whose reversal is missing: $(2, 5), (2, 7), (2, 9), (3, 5), (3, 7), (3, 9), (5, 9)$ require adding $(5, 2), (7, 2), (9, 2), (5, 3), (7, 3), (9, 3), (9, 5) \rightarrow m = 7$.

$$l + m = 18 + 7 = 25.$$

3. (3) Given $A = \{-2, -1, 0, 1, 2, 3, 4\}$ and xRy iff $2x + y \leq 2$.

$$\text{For } x = -2: y \leq 6, \text{ all 7 elements valid (7 pairs).}$$

$$\text{For } x = -1: y \leq 4, \text{ all 7 elements valid (7 pairs).}$$

$$\text{For } x = 0: y \leq 2 \Rightarrow y \in \{-2, -1, 0, 1, 2\} \text{ (5 pairs).}$$

$$\text{For } x = 1: y \leq 0 \Rightarrow y \in \{-2, -1, 0\} \text{ (3 pairs).}$$

$$\text{For } x = 2: y \leq -2 \Rightarrow y \in \{-2\} \text{ (1 pair).}$$

$$\text{For } x = 3, 4: \text{ no valid } y.$$

$$\text{So } l = 7 + 7 + 5 + 3 + 1 = 23.$$

For reflexive: $(x, x) \in R \Rightarrow 3x \leq 2 \Rightarrow x \leq 2/3$. Already present for $x = -2, -1, 0$. Missing for $x = 1, 2, 3, 4$, so $m = 4$.

For symmetric: need $(y, x) \in R$ for every $(x, y) \in R$. Missing pairs:

$$(3, -2), (4, -2), (2, -1), (3, -1), (4, -1), (2, 0), \text{ so } n = 6.$$

$$l + m + n = 23 + 4 + 6 = 33.$$

4. (1) We need $4x^2 + y^2 < 52$ with $x, y \in \mathbb{Z}$. This requires $x^2 < 13$, so $x \in \{-3, -2, -1, 0, 1, 2, 3\}$.

$$x = 0: y^2 < 52 \Rightarrow y \in \{-7, \dots, 7\} \rightarrow 15 \text{ values}$$

$$x = \pm 1: y^2 < 48 \Rightarrow |y| \leq 6 \rightarrow 13 \text{ each} \rightarrow 26 \text{ values}$$

$$x = \pm 2: y^2 < 36 \Rightarrow |y| \leq 5 \rightarrow 11 \text{ each} \rightarrow 22 \text{ values}$$

$$x = \pm 3: y^2 < 16 \Rightarrow |y| \leq 3 \rightarrow 7 \text{ each} \rightarrow 14 \text{ values}$$

$$\text{Total} = 15 + 26 + 22 + 14 = 77$$

5. (1979) The set $S = \{1, 2, 3, \dots, 11\}$ has 11 elements.

We need to count subsets B with $n(B) \geq 2$ and even product.

A product is even iff at least one element is even.

Equivalently, count complements: a product is odd iff all elements are odd.

The odd numbers in S are $\{1, 3, 5, 7, 9, 11\}$ (6 elements).

Subsets of odd numbers: $2^6 = 64$.

Among these, those with $n(B) \geq 2$ are all except empty set (1) and singletons (6): $64 - 7 = 57$.

Total subsets with $n(B) \geq 2$: $2^{11} - 1 - 11 = 2036$.

Subsets with even product and $n(B) \geq 2$: $2036 - 57 = 1979$.

6. (3) Given $R = \{(x, y) : 4y = 5x - 3, x, y \in M\}$ where $M = \{1, 2, \dots, 16\}$.

From $4y = 5x - 3$, we get $y = \frac{5x-3}{4}$.

For y to be a positive integer, $5x - 3 \equiv 0 \pmod{4}$, i.e., $x \equiv 3 \pmod{4}$.

So $x = 3, 7, 11, 15$.

$$x = 3 \Rightarrow y = 3,$$

$$x = 7 \Rightarrow y = 8,$$

$$x = 11 \Rightarrow y = 13,$$

$$x = 15 \Rightarrow y = 18 \notin M.$$

$$R = \{(3, 3), (7, 8), (11, 13)\}.$$

For symmetry, $(7, 8) \in R$ requires $(8, 7) \in R$ and $(11, 13) \in R$ requires $(13, 11) \in R$.

$(3, 3)$ is already symmetric.

Minimum elements to be added = 2.

7. (1) The relation R on $A = \{0, 1, 2, \dots, 9\}$ is defined by $(x, y) \in R$ iff $|x - y|$ is a multiple of 3, i.e.,

$$x \equiv y \pmod{3}.$$

Statement II:

R is reflexive ($|x - x| = 0$, a multiple of 3), symmetric ($|x - y| = |y - x|$), and transitive (if $x \equiv y$ and $y \equiv z \pmod{3}$, then $x \equiv z \pmod{3}$). So R is an equivalence relation. Statement II is correct.

Statement I:

The equivalence classes are $\{0, 3, 6, 9\}$ (4 elements), $\{1, 4, 7\}$ (3 elements), $\{2, 5, 8\}$ (3 elements).

$$n(R) = 4^2 + 3^2 + 3^2 = 16 + 9 + 9 = 34 \neq 36. \text{ Statement I is incorrect.}$$

8. (3) For a set with $n = 4$ elements, reflexive condition requires all diagonal pairs $(a, a), (b, b), (c, c), (d, d)$ to be included.

For symmetric relations, non-diagonal pairs come in symmetric pairs. Number of such pairs = $\binom{4}{2} = 6$.

For each pair, we either include both elements or exclude both $\rightarrow$ 2 choices each.

Total reflexive and symmetric relations $= 2^6 = 64$.

9. (4) We need $2a + 3b = 3c + 4d$ where $a, b, c, d \in \{1, 2, 3, 4\}$.

Possible values of $2a + 3b$: range from 5 to 20.

Possible values of $3c + 4d$: range from 7 to 28.

For each common value k , the number of elements in R equals (number of (a, b) with $2a + 3b = k$) $\times$ (number of (c, d) with $3c + 4d = k$).

$k = 7$: $(a, b) = (2, 1), (c, d) = (1, 1) \Rightarrow 1 \times 1 = 1$

$k = 10$: $(2, 2), (2, 1) \Rightarrow 1$

$k = 11$: $(1, 3), (4, 1), (1, 2) \Rightarrow 2$

$k = 13$: $(2, 3), (3, 1) \Rightarrow 1$

$k = 14$: $(1, 4), (4, 2), (2, 2) \Rightarrow 2$

$k = 15$: $(3, 3), (1, 3) \Rightarrow 1$

$k = 16$: $(2, 4), (4, 1) \Rightarrow 1$

$k = 17$: $(4, 3), (3, 2) \Rightarrow 1$

$k = 18$: $(3, 4), (2, 3) \Rightarrow 1$

$k = 20$: $(4, 4), (4, 2) \Rightarrow 1$

Total $= 1 + 1 + 2 + 1 + 2 + 1 + 1 + 1 + 1 + 1 = 12$