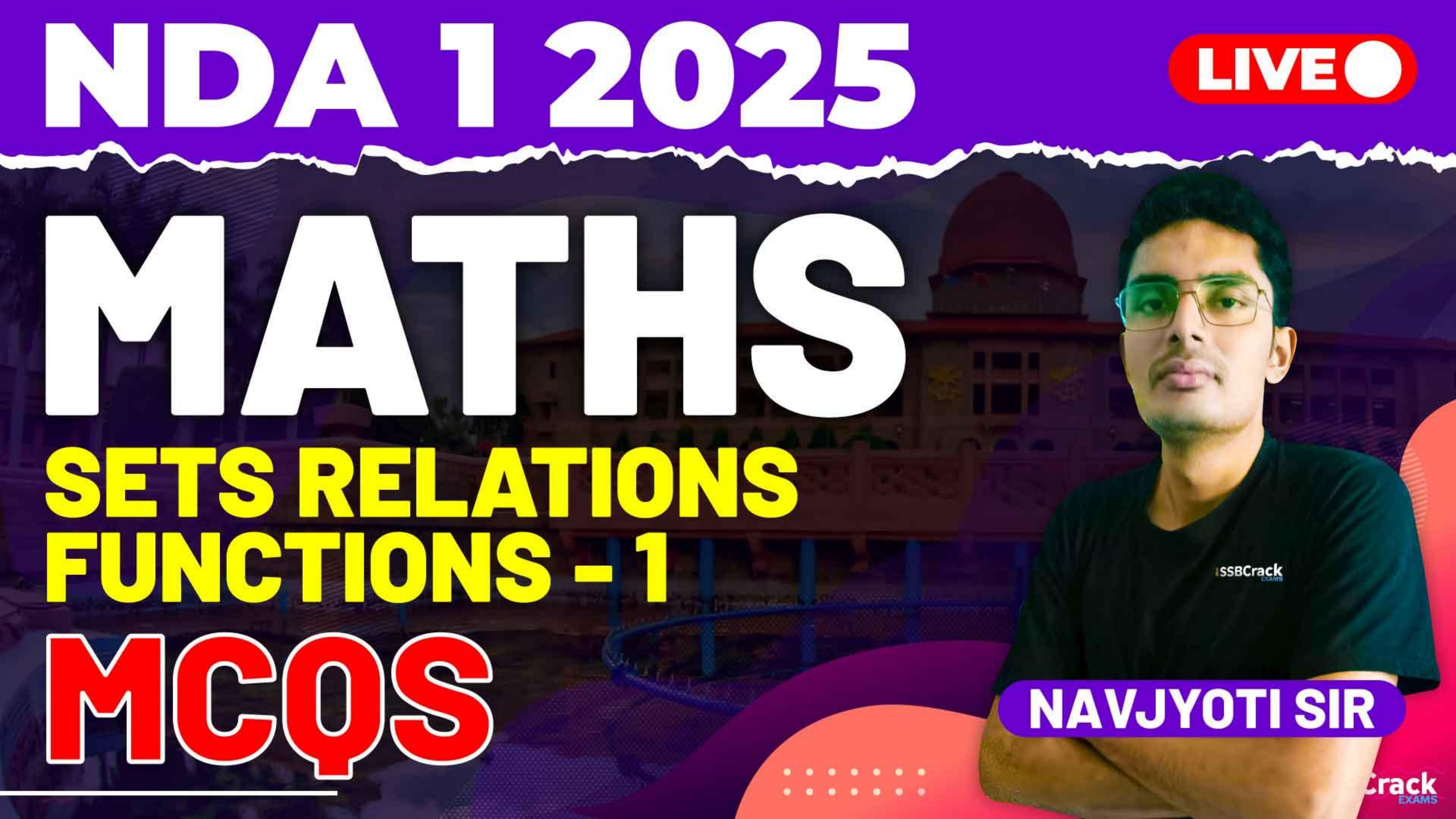

NDA 1 2025
LIVE
MATHS
SETS RELATIONS
FUNCTIONS - 1
MCQS
NAVJYOTI SIR
SSBCrack
EXAMS
Crack
EXAMS

21 Jan 2025 Live Classes Schedule

9:00AM	21 JANUARY 2025 DAILY DEFENCE UPDATES	DIVYANSHU SIR
10:00AM	21 JANUARY 2025 DAILY CURRENT AFFAIRS	RUBY MA'AM

SSB INTERVIEW LIVE CLASSES

9:30AM	OVERVIEW OF GROUP TASKS	ANURADHA MA'AM

AFCAT 1 2025 LIVE CLASSES

12:30PM	REASONING - VERBAL ANALOGY	RUBY MA'AM
3:00PM	STATIC GK - KNOW YOUR ARMED FORCES	DIVYANSHU SIR
4:30PM	ENGLISH - SPOTTING ERRORS - CLASS 2	ANURADHA MA'AM
5:30PM	MATHS - PERCENTAGE	NAVJYOTI SIR

NDA 1 2025 LIVE CLASSES

10:00AM	MATHS - SETS, RELATION AND FUNCTION - CLASS 1	NAVJYOTI SIR
11:30AM	ANCIENT HISTORY - CLASS 1	RUBY MA'AM
1:00PM	PHYSICS - UNITS & DIMENSIONS	NAVJYOTI SIR
4:30PM	ENGLISH - SPOTTING ERRORS - CLASS 2	ANURADHA MA'AM

CDS 1 2025 LIVE CLASSES

11:30AM	ANCIENT HISTORY - CLASS 1	RUBY MA'AM
1:00PM	PHYSICS - UNITS & DIMENSIONS	NAVJYOTI SIR
4:30PM	ENGLISH - SPOTTING ERRORS - CLASS 2	ANURADHA MA'AM
5:30PM	MATHS - PERCENTAGE	NAVJYOTI SIR

Q) Consider the following statements : (PYQ)

1. The set of all irrational numbers between $\sqrt{2}$ and $\sqrt{5}$ is an infinite set. ✓

2. The set of all odd integers less than 100 is a finite set. X

$$\underbrace{\ldots -5, -3, -1, 1, 3, 5 \ldots 99}_{\text{infinite sets}}$$

Which of the statements given above is/are correct ?

(a) 1 only ✓

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

Q) Consider the following statements :

1. The set of all irrational numbers between $\sqrt{2}$ and $\sqrt{5}$ is an infinite set.
2. The set of all odd integers less than 100 is a finite set.

Which of the statements given above is/are correct ?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

Ans: (a)

SSBCrack EXAMS

Q) What is the range of the function $f(x)=\frac{|x|}{x}, x \neq 0$?

(a) Set of all real numbers (b) Set of all integers

(c) $\{-1, 1\}$ (d) $\{-1, 0, 1\}$

$$\frac{|-4|}{-4} = \frac{4}{-4} = -1$$

$$(x < 0 \Rightarrow f(x) = -1)$$

$$(x > 0 \Rightarrow f(x) = 1)$$

Range $= \{-1, 1\}$

SSBCrack EXAMS

Q) What is the range of the function $f(x) = \frac{|x|}{x}, x \neq 0$?

(a) Set of all real numbers (b) Set of all integers

(c) $\{-1, 1\}$ (d) $\{-1, 0, 1\}$

Ans: (c)

Q) Let A = {x ∈ W, the set of whole numbers and x < 3}, B = {x ∈ N, the set of natural numbers and $2 \le x < 4$} and C = {3, 4}, then how many elements will $(A \cup B) \times C$ contain?

(a) 6 (b) 8

(c) 10 (d) 12

$n(E \times F) = n(E) \times n(F)$

$A = \{0, 1, 2\}$

$B = \{2, 3\}$

$C = \{3, 4\} \Rightarrow n(C) = 2$

$(A \cup B) = \{0, 1, 2, 3\} \Rightarrow n(A \cup B) = 4$

$n((A \cup B) \times C) = n(A \cup B) \times n(C)$

$= 4 \times 2 = 8$

Q) Let $A = \{x \in W$, the set of whole numbers and $x < 3\}$, $B = \{x \in N$, the set of natural numbers and $2 \leq x < 4\}$ and $C = \{3, 4\}$, then how many elements will $(A \cup B) \times C$ contain?

(a) 6 (b) 8

(c) 10 (d) 12

Ans: (b)

Q) The relation R in the set Z of integers given by $R = \{(a, b) : a - b \text{ is divisible by } 5\}$ is

(a) reflexive

(b) reflexive but not symmetric

(c) symmetric and transitive

(d) an equivalence relation ✓

$a - b = 5m \Rightarrow a = 5p \quad (p - q = m)$

$b = 5q$

$c = 5r$

① Reflexive : $a - a = 5p - 5p = 0$

As 0 is divisible by 5,

② Symmetric : consider a & b,

$a - b = 5p - 5q = 5(p - q)$

$b - a = 5q - 5p = 5(q - p)$

$\Rightarrow$ As $b - a$ is also divisible by 5,

(3) Transitive

$a = 5p$

$b = 5q$

$c = 5r$

$a - b$

$b - c$

$a - c = 5p - 5r = 5(p - r)$

divisible by 5,

Q) The relation R in the set Z of integers given by $R = \{(a, b) : a - b \text{ is divisible by } 5\}$ is

(a) reflexive

(b) reflexive but not symmetric

(c) symmetric and transitive

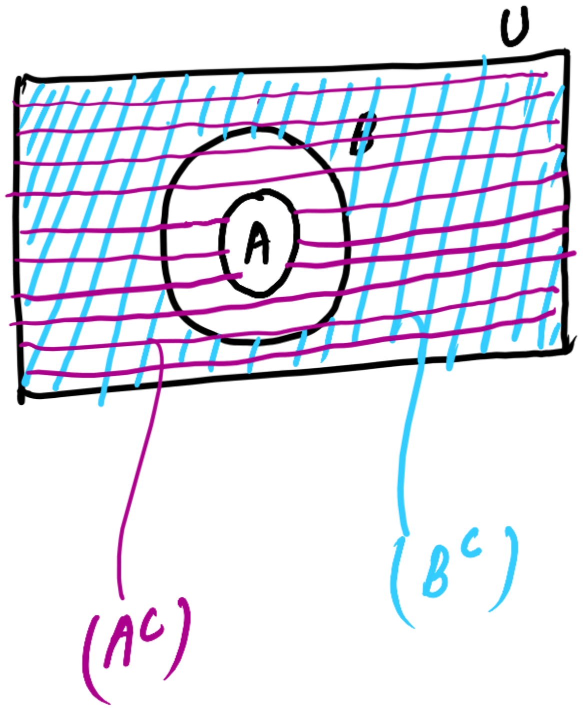
(d) an equivalence relation

Ans: (d)

Q) If A is a subset of B, then which one of the following is correct ?

(a) $A^c \subseteq B^c$ (b) $B^c \subseteq A^c$

(c) $A^c = B^c$ (d) $A \subseteq A \cap B$



$A \subseteq B$

$A^c \supseteq B^c \Rightarrow \boxed{B^c \subseteq A^c}$

Q) If A is a subset of B, then which one of the following is correct ?

(a) $A^c \subseteq B^c$

(b) $B^c \subseteq A^c$

(c) $A^c = B^c$

(d) $A \subseteq A \cap B$

Ans: (b)

Q) What is the range of the function $y = \frac{x^2}{1+x^2}$, where $x \in \mathbf{R}$?

(a) $[0, 1)$ (b) $[0, 1]$ (c) $(0, 1)$ $\times$ (d) $(0, 1]$ $\times$

$y = \frac{x^2}{1+x^2}$ (proper fraction)

As x^2 is always positive, so y will always be a positive rational number.

$[0, 1)$

$$\left[\begin{array}{l} x^2 < 1 + x^2 \\ \frac{x^2}{1+x^2} < 1 \end{array}\right.$$

$$y = \frac{x^2}{1+x^2}$$

$$y(1+x^2) = x^2$$

$$y + x^2 y = x^2$$

$$y = x^2(1-y)$$ (express as $x = f(y)$)

$$x^2 = \frac{y}{1-y} \Rightarrow x = \pm\sqrt{\frac{y}{1-y}}$$

(Domain) = Range of given function $f(x)$

$$x = \pm\sqrt{\frac{y}{1-y}}$$

$$\frac{y}{1-y} \geq 0$$

$$1 - y \neq 0$$

$$y \neq 1 \qquad y \geq 0$$

$$[0, 1)$$

Q) What is the range of the function $y = \dfrac{x^2}{1+x^2}$, where $x \in \mathbf{R}$?

(a) $[0, 1)$ (b) $[0, 1]$ (c) $(0, 1)$ (d) $(0, 1]$

Ans: (a)

Q) Let R be the set of real numbers.

Statement-1: $A = \{(x, y) \in R \times R : y - x \text{ is an integer}\}$ is an equivalence relation on R.

Statement-2: $B = \{(x, y) \in R \times R : x = \alpha y \text{ for some rational number } \alpha\}$ is an equivalence relation on R.

(a) Statement-1 is true, Statement-2 is true; Statement-2 is not a correct explanation for Statement-1.

(b) Statement-1 is true, Statement-2 is false.

(c) Statement-1 is false, Statement-2 is true.

(d) Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for Statement-1.

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Statement-1: $A = \{(x, y) \in R \times R : y - x$ is an integer$\}$ is an equivalence relation on R.

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(b) Statement-1 is true, Statement-2 is false.

(c) Statement-1 is false, Statement-2 is true.

(d) Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for Statement-1.

Ans: (b)

Q) Let A and B two sets containing 2 elements and 4 elements respectively. The number of subsets of A × B having 3 or more elements is

(a) 256 (b) 220 (c) 219 (d) 211

$n(A \times B) = n(A) \times n(B) = 2 \times 4 = 8$

Total number of subsets possible $= 2^n = 2^8 = \underline{256}$

Total subsets − (subsets having 0 element + subs. hav. 1 element + sub. hav. 2 elements)

$256 - (\underset{(\phi)}{1} + {}^8C_1 + {}^8C_2) = 256 - \left(1 + 8 + \frac{8 \times 7}{2}\right) = 256 - 37$

$= \boxed{219}$

Q) Let A and B two sets containing 2 elements and 4 elements respectively. The number of subsets of $A \times B$ having 3 or more elements is

(a) 256 (b) 220 (c) 219 (d) 211

Ans: (c)

Q) If $f(x) + 2f\left(\frac{1}{x}\right) = 3x$, $x \neq 0$ and

$S = \{x \in R : f(x) = f(-x)\}$; then S:

(a) contains exactly two elements.

(b) contains more than two elements.

(c) is an empty set.

(d) contains exactly one element.

$f(x) + 2f\left(\frac{1}{x}\right) = 3x$ — 1

$f\left(\frac{1}{x}\right) + 2f\left(\frac{1}{\frac{1}{x}}\right) = 3\left(\frac{1}{x}\right) \Rightarrow f\left(\frac{1}{x}\right) + 2f(x) = \frac{3}{x}$ — 2

1 + 2 $\Rightarrow 3f\left(\frac{1}{x}\right) + 3f(x) = 3\left(x + \frac{1}{x}\right)$ — 3

1 − 2,

$f\left(\frac{1}{x}\right) - f(x) = 3x - \frac{3}{x}$ — 4 from 3 and 4,

$$3f\left(\frac{1}{x}\right) + 3f(x) = 3\left(x + \frac{1}{x}\right) \Rightarrow f\left(\frac{1}{x}\right) + f(x) = x + \frac{1}{x} \quad \text{— } (5)$$

$$f\left(\frac{1}{x}\right) - f(x) = 3x - \frac{3}{x} \quad \text{— } (6)$$

5 - 6,

$$2f(x) = x + \frac{1}{x} - \left(3x - \frac{3}{x}\right) = x + \frac{1}{x} - 3x + \frac{3}{x} = -2x + \frac{4}{x}$$

$$2f(x) = -2x + \frac{4}{x} \Rightarrow f(x) = -x + \frac{2}{x}$$

$$f(x) = -x + \frac{2}{x}$$

$$f(-x) = x - \frac{2}{x}$$

$$f(x) = f(-x)$$

$$-x + \frac{2}{x} = x - \frac{2}{x}$$

$$2x = \frac{4}{x} \Rightarrow x = \frac{2}{x} \Rightarrow x^2 = 2$$

$$x = \sqrt{2}, -\sqrt{2}$$

$$S = \{\sqrt{2}, -\sqrt{2}\}$$

Q) If $f(x) + 2f\left(\frac{1}{x}\right) = 3x$, $x \neq 0$ and

$S = \{x \in R : f(x) = f(-x)\}$; then S:

(a) contains exactly two elements.

(b) contains more than two elements.

(c) is an empty set.

(d) contains exactly one element.

Ans: (a)

Q) If A, B and C are three sets such that $A \cap B = A \cap C$ and $A \cup B = A \cup C$, then

(a) $A = C$

(b) $B = C$

(c) $A \cap B = \phi$

(d) $A = B$

$$\left.\begin{aligned} \underline{A} \cap B &= \underline{A} \cap C \\ \underline{A} \cup B &= \underline{A} \cup C \end{aligned}\right] \Rightarrow B = C$$

SSBCrack EXAMS

Q) If A, B and C are three sets such that $A \cap B = A \cap C$ and $A \cup B = A \cup C$, then

(a) $A = C$ (b) $B = C$

(c) $A \cap B = \phi$ (d) $A = B$

Ans: (b)

Q) Let $R = \{(3, 3), (6, 6), (9, 9), (12, 12), (6, 12), (3, 9), (3, 12), (3, 6)\}$ be a relation on the set $A = \{3, 6, 9, 12\}$. The relation is

(a) reflexive and transitive only

(b) reflexive only

(c) an equivalence relation

(d) reflexive and symmetric only

$R \subset A \times A$

reflexive $\rightarrow$ $(3,3), (6,6), (9,9), (12,12)$ — ✓

symmetric $\rightarrow$ ✗ $(6,12) \in R$ but $(12,6) \notin R$

transitive $\rightarrow$ ✓

Q) Let $R = \{(3, 3), (6, 6), (9, 9), (12, 12), (6, 12), (3, 9), (3, 12), (3, 6)\}$ be a relation on the set $A = \{3, 6, 9, 12\}$. The relation is

(a) reflexive and transitive only

(b) reflexive only

(c) an equivalence relation

(d) reflexive and symmetric only

Ans: (a)

Q) If X and Y are two sets, then $X \cap (X \cup Y)^c$ equals.

(a) X (b) Y

(c) ϕ (d) None of these.

$X \cap (X^c \cap Y^c)$

$(X \cap X^c) \cap (X \cap Y^c)$

$\phi \cap (X \cap Y^c)$

$= \phi$

$(A \cup B)^c = A^c \cap B^c$

$(A \cap B)^c = A^c \cup B^c$

$(A \cap A^c) = \phi$

$\phi \cap A = \phi$

Q) If X and Y are two sets, then $X \cap (X \cup Y)^c$ equals.

(a) X (b) Y

(c) ϕ (d) None of these.

Ans: (c)

Q) Let $f(x) = x^2 + 2x - 5$

and $g(x) = 5x + 30$

What are the roots of the equation $g[(f(x)] = 0$?

(a) 1, –1
(b) –1, – 1
(c) 1, 1
(d) 0, 1

Q) Let $f(x) = x^2 + 2x - 5$

and $g(x) = 5x + 30$

What are the roots of the equation $g[(f(x)] = 0$?

(a) 1, –1 (b) –1, – 1

(c) 1, 1 (d) 0, 1

Ans: (b)

Q) If a set X contains n (n > 5) elements, then what is the number of subsets of X containing less than 5 elements ?

(a) C (n, 4) (b) C (n, 5)

(c) $\sum_{r=0}^{5} C(n,r)$ (d) $\sum_{r=0}^{4} C(n,r)$

0 1 2 3 4

ϕ (1) $^nC_0$ $^nC_1$ $^nC_2$ $^nC_3$ $^nC_4$

$$^nC_0 + {}^nC_1 + {}^nC_2 + {}^nC_3 + {}^nC_4 = \sum_{r=0}^{4} {}^nC_r = \underline{\sum_{r=0}^{4} C(n,r)}$$

Q) If a set X contains n ($n > 5$) elements, then what is the number of subsets of X containing less than 5 elements ?

(a) $C(n, 4)$

(b) $C(n, 5)$

(c) $\sum_{r=0}^{5} C(n, r)$

(d) $\sum_{r=0}^{4} C(n, r)$

Ans: (d)

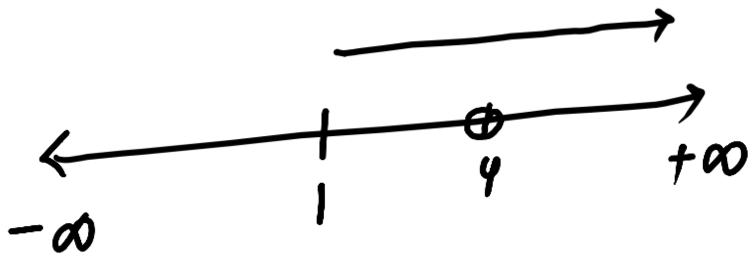
Q) If $f(x) = \dfrac{\sqrt{x-1}}{x-4}$, defines a function on $\boldsymbol{R}$, then what is its domain ?

(a) $(-\infty, 4) \cup (4, \infty)$

(b) $[4, \infty)$

(c) $(1, 4) \cup (4, \infty)$

(d) $[1, 4) \cup (4, \infty)$



$x - 4 \neq 0 \Rightarrow x \neq 4$

$x - 1 \geq 0 \Rightarrow x \geq 1$

$[1, 4) \cup (4, \infty)$

SSBCrack EXAMS

Q) If $f(x) = \dfrac{\sqrt{x-1}}{x-4}$, defines a function on $\boldsymbol{R}$, then what is its domain ?

(a) $(-\infty, 4) \cup (4, \infty)$
(b) $[4, \infty)$
(c) $(1, 4) \cup (4, \infty)$
(d) $[1, 4) \cup (4, \infty)$

Ans: (d)

SSBCrack EXAMS

Q) For f to be a function, what is the domain of f, if

$$f(x) = \frac{1}{\sqrt{|x| - x}}\text{?} \quad (PYQ)$$

(a) $(-\infty, 0)$ (b) $(0, \infty)$ (c) $(-\infty, \infty)$ (d) $(-\infty, 0)$

$$x \geq 0 \Rightarrow f(x) = \frac{1}{\sqrt{0}} = \frac{1}{0} \text{ (not defined)}$$

$$x < 0 \Rightarrow$$

$$f(-4) = \frac{1}{\sqrt{|-4| - (-4)}} = \frac{1}{\sqrt{4+4}} = \frac{1}{\sqrt{8}} \text{ (defined)}$$

$(-\infty, 0)$

"0 is not included"

Q) For f to be a function, what is the domain of f, if

$$f(x) = \frac{1}{\sqrt{|x| - x}} ?$$

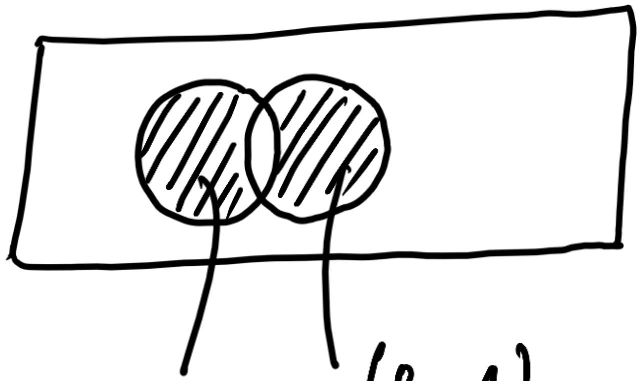
(a) $(-\infty, 0)$ (b) $(0, \infty)$ (c) $(-\infty, \infty)$ (d) $(-\infty, 0)$

Ans: (a) / (d)

Q) In an examination out of 100 students, 75 passed in English 60 passed in Mathematics and 45 passed in both English and Mathematics. What is the number of students passed in exactly one of the two subjects?

(a) 45 (b) 60

(c) 75 (d) 90



$(A - B)$ — $(A - A \cap B)$

$(B - A)$ — $(B - A \cap B)$

$(75 - 45) + (60 - 45)$

$30 + 15$

45

Q) In an examination out of 100 students, 75 passed in English 60 passed in Mathematics and 45 passed in both English and Mathematics. What is the number of students passed in exactly one of the two subjects?

(a) 45
(b) 60
(c) 75
(d) 90

Ans: (a)

Q) Let $R = \{x \mid x \in N, x \text{ is a multiple of } 3 \text{ and } x \le 100\}$

$S = \{x \mid x \in N, x \text{ is a multiple of } 5 \text{ and } x \le 100\}$

What is the number of elements in $(R \times S) \cap (S \times R)$?

(a) 36 ✓ (b) 33

(c) 20 (d) 6

number of elements is always a perfect square

Q) Let $R = \{x \mid x \in N, x \text{ is a multiple of } 3 \text{ and } x \leq 100\}$

$S = \{x \mid x \in N, x \text{ is a multiple of } 5 \text{ and } x \leq 100\}$

What is the number of elements in $(R \times S) \cap (S \times R)$?

(a) 36 (b) 33

(c) 20 (d) 6

Ans: (a)

If A and B are two non-empty sets having 10 elements in common, then how many elements do $A \times B$ and $B \times A$ have in common?

(a) 10

(b) 20

(c) 40

(d) 100 ✓

only perfect square in the option.

If A and B are two non-empty sets having 10 elements in common, then how many elements do $A \times B$ and $B \times A$ have in common?

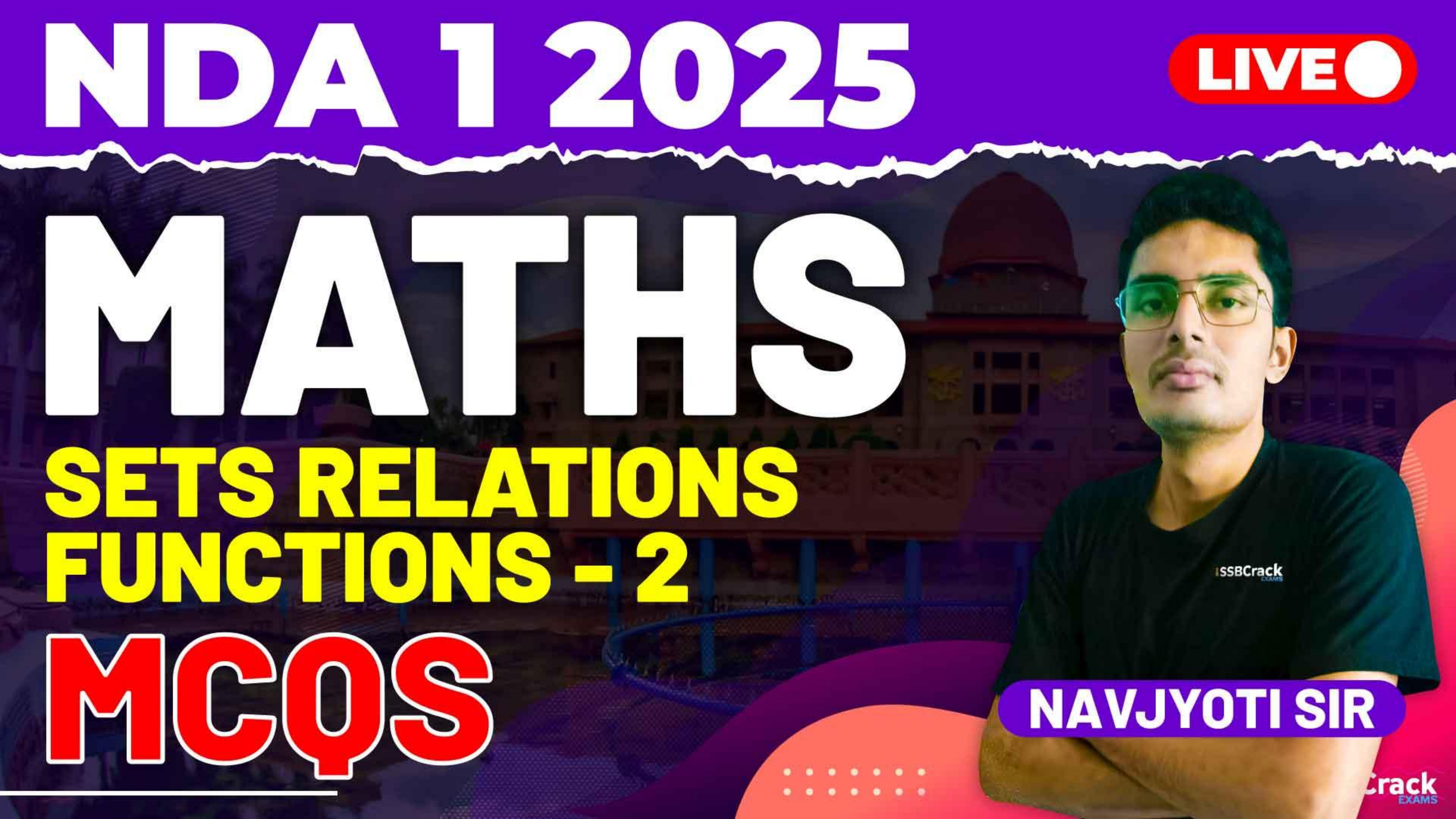
(a) 10

(b) 20

(c) 40

(d) 100

Ans: (d)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