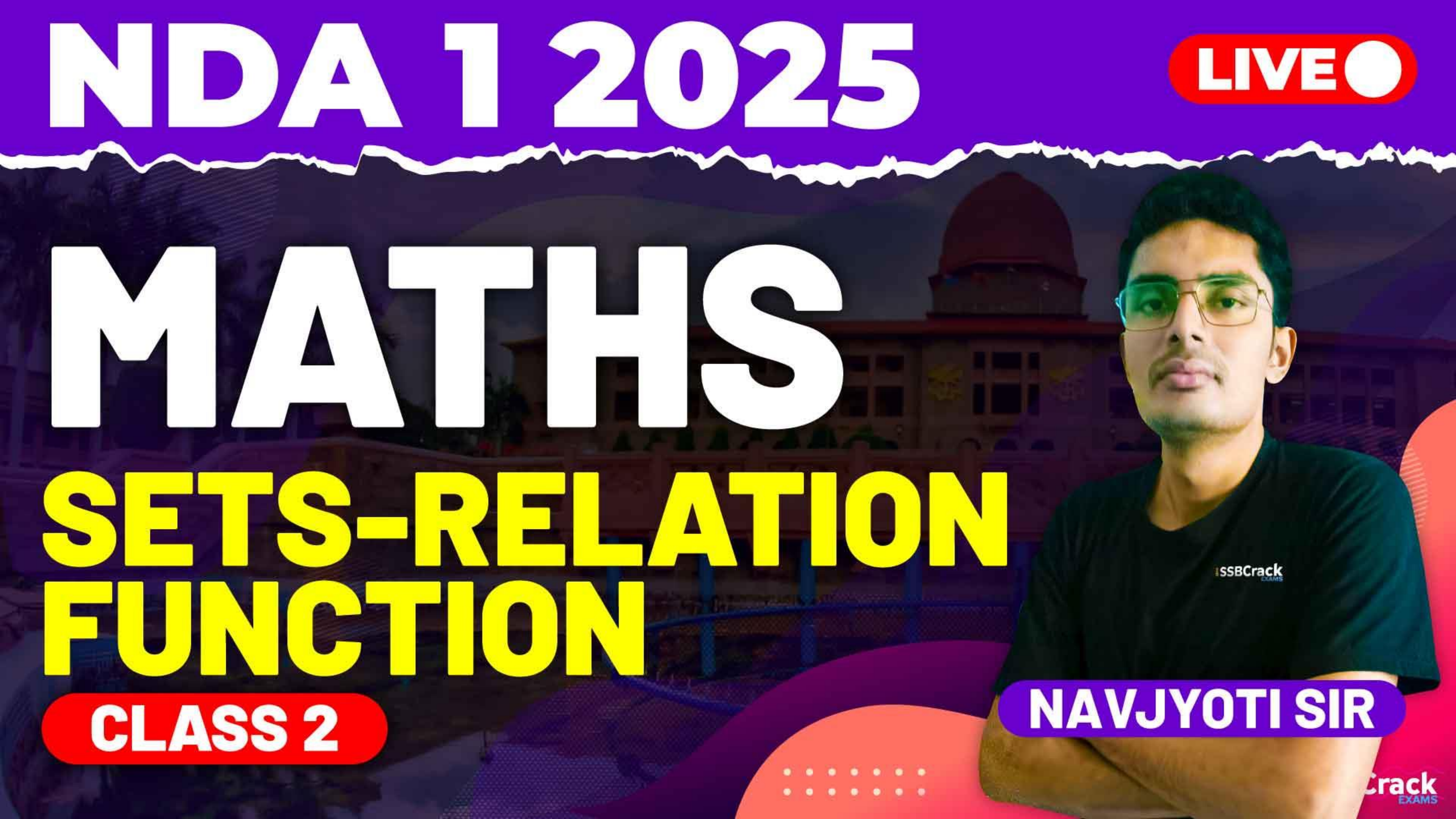
NDA 1 2025
LIVE
MATHS
SETS-RELATION
FUNCTION
CLASS 2
NAVJYOTI SIR
SSBCrack EXAMS

04 Oct 2024 Live Classes Schedule

9:00AM	04 OCTOBER 2024 DAILY DEFENCE UPDATES	DIVYANSHU SIR

SSB INTERVIEW LIVE CLASSES

9:00AM	OVERVIEW ON OIR & PRACTICE	ANURADHA MA'AM

NDA 1 2025 LIVE CLASSES

1:00PM	BIOLOGY - ANIMAL KINGDOM	SHIVANGI MA'AM
4:00PM	MATHS - SETS, RELATION & FUNCTION - CLASS 2	NAVJYOTI SIR
5:30PM	ENGLISH - SPOTTING ERRORS - CLASS 2	ANURADHA MA'AM

CDS 1 2025 LIVE CLASSES

1:00PM	BIOLOGY - ANIMAL KINGDOM	SHIVANGI MA'AM
2:30PM	MATHS - SI & CI - CLASS 3	NAVJYOTI SIR
5:30PM	ENGLISH - SPOTTING ERRORS - CLASS 2	ANURADHA MA'AM

AFCAT 1 2025 LIVE CLASSES

2:30PM	MATHS - SI & CI - CLASS 3	NAVJYOTI SIR
4:00PM	STATIC GK - SPORTS & GAMES TERMINOLOGY - 2	DIVYANSHU SIR
5:30PM	ENGLISH - SPOTTING ERRORS - CLASS 2	ANURADHA MA'AM

SSBCrack EXAMS

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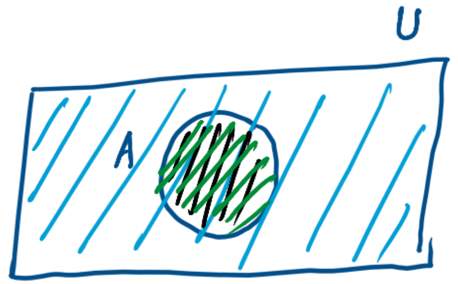
SSBCrack EXAMS

LAW OF ALGEBRA OF SETS

1. Idempotent laws
   (a) $A \cup A = A$ (b) $A \cap A = A$
2. Identity laws
   (a) $A \cup \phi = A$ (b) $A \cap U = A$



3. Commutative laws
   (a) $A \cup B = B \cup A$
   (b) $A \cap B = B \cap A$

SSBCrack EXAMS

LAW OF ALGEBRA OF SETS

$a \times (b+c) = a \times b + a \times c$

5. Distributive laws

(a) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

(b) $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$

6. De-Morgan's laws

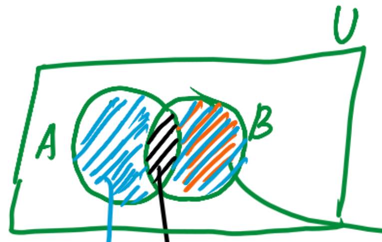
(a) $(A \cup B)' = A' \cap B'$ (b) $(A \cap B)' = A' \cup B'$

$(A \cup B)' = A' \cap B'$

IMPORTANT RESULTS

If A, B and C are any three finite sets, then

1. $n(A \cup B) = n(A) + n(B) - n(A \cap B)$ ✓
2. $n(A \cup B) = n(A) + n(B)$, if and only if $A \cap B = \phi$
3. $n(A - B) = n(A) - n(A \cap B)$



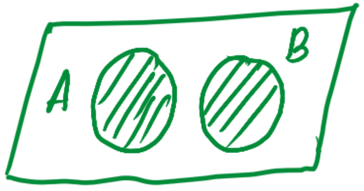
$(B - A)$

$(A \cap B)$

$[(A - B) = A - A \cap B]$

$n(A \cup B) = n(A) + n(B) - n(A \cap B)$

If $A \cap B = \phi$ (A & B are disjoint sets) $n(A \cap B) = 0$



$n(A \cup B) = n(A) + n(B)$

$n(A - B) = n(A) - n(A \cap B)$

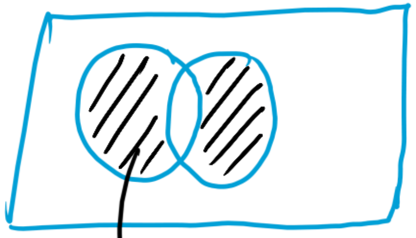
IMPORTANT RESULTS

4. $n(A \Delta B) = n(A - B) + n(B - A) = n(A) + n(B) - 2n(A \cap B)$

5. $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(A \cap C) + n(A \cap B \cap C)$

6. $n(A' \cup B') = n(U) - n(A \cap B)$

7. $n(A' \cap B') = n(U) - n(A \cup B)$

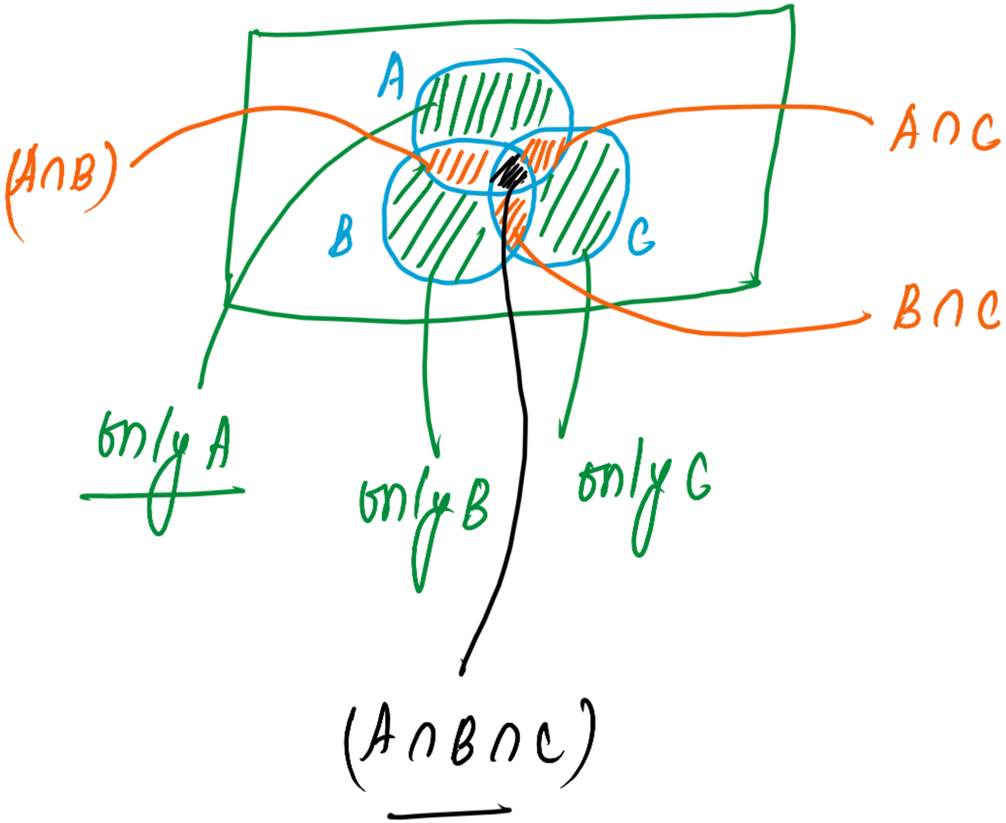


$(A - B) \cup (B - A)$

$[A - (A \cap B)] \cup [B - (B \cap A)]$

4.) $n(A \Delta B) = n(A - B) + n(B - A) = n(A) + n(B) - 2n(A \cap B)$

$$n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(C \cap A) + n(A \cap B \cap C)$$



$$n(A \cup B \cup C \cup D) = ?$$

NDA 1 2025 LIVE CLASS - MATHS - PART 2

6.) $n(A' \cap B') = n(A \cup B)'$

$A' \cap B' = (A \cup B)'$

(For any set A, $A' = U - A) \longrightarrow n(A') = n(U) - n(A)$

$= n(U) - n(A \cup B)$

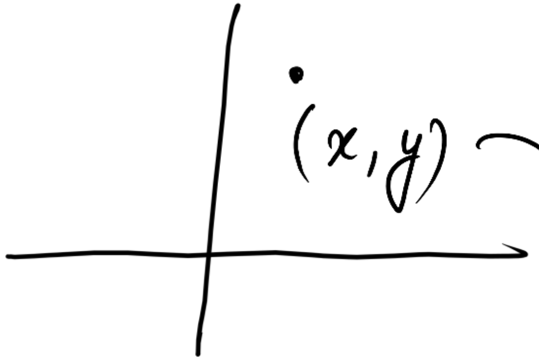
7.) $n(A' \cup B') = n(A \cap B)' = n(U) - n(A \cap B)$

SSBCrack EXAMS

CARTESIAN PRODUCT

$A = \{1, 2, 3\}$

$B = \{a, b\}$



ordered pair

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

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

cartesian product is set of ordered pairs,

→ $A \times B \neq B \times A$ (not commutative)

→ $(x+2, y+3) = (1, 3)$

$\Rightarrow x + 2 = 1 \qquad y + 3 = 3$

$x = -1$

$y = 0$

$A = \{1, 2, 3\} \qquad A = \{1, 2, 3\}$

$A \times A = \{(1,1), (1,2), (1,3), (2,1), (2,2), (2,3), (3,1), (3,2), (3,3)\}$

* $A \times B \times C = \{(a, b, c) : a \in A, b \in B \text{ and } c \in C\}$

ordered triplet

* If $n(A) = m$; $n(B) = n$

$$n(A \times B) = m \times n$$

SSBCrack EXAMS

RELATION

$A = \{1, 2, 3\}$ $B = \{a, b\}$

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

$R \subseteq A \times B$

(Any subset of $A \times B$ (cartesian product) is a relation from A to B.

Eg : $R_1 = \{(1, a), (2, b)\}$ $R_3 = \{\ \} = \phi$

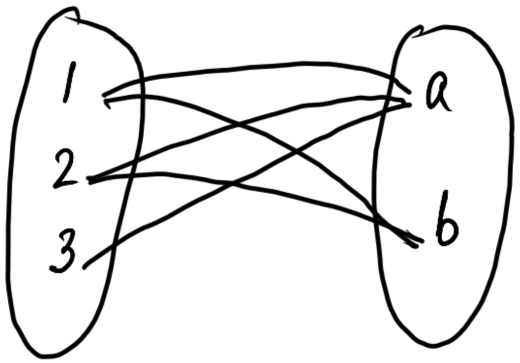
$R_2 = \{(2, a), (3, a), (3, b)\}$ $R_4 = A \times B$

SSBCrack EXAMS

RELATION

$R = \{(1,a), (1,b), (2,a), (2,b), (3,a)\}$

$A \xrightarrow{R} B$ $\longrightarrow$ R is a relation from A to B.



R is a relation in N; where, $R = \{(a,b) : a > b,\ a, b \in N\}$

$R = \{(2,1), (3,2), (3,1) \ldots\}$

DOMAIN AND RANGE

SSBCrack EXAMS

$R = \{(1, a), (2, b), (3, c)\}$

(R from A to B)

$A = \{1, 2, 3\}$

$B = \{a, b, c\}$

$\{1, 2, 3\} \longrightarrow$ Domain — set of first elements of the ordered pairs in R.

$\{a, b, c\} \longrightarrow$ Range — set of second elements of the ordered pairs in R.

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TYPES OF RELATION

(1) Empty relation : $\phi = \{\ \}$

(2) Universal relation : $A \times B$ = The whole cartesian product.

(3) Identity relation :

$R = \{(1,1), (2,2), (3,3) \ldots\}$

first element = second element.

SSBCrack EXAMS

TYPES OF RELATION

Inverse relation If R is a relation on A, then the relation R^{-1} on A, defined by $R^{-1} = \{(b, a) : (a, b) \in R\}$ is called an inverse relation to A.

Clearly, domain (R^{-1}) = range (R)

and range (R^{-1}) = domain (R)

Domain

Range

$R = \{(1, a), (2, b)\}$

$R^{-1} = \{(a, 1), (b, 2)\}$

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TYPES OF RELATION

① Reflexive Relation :

$\boxed{A = \{1, 2, 3\}}$

R_1 on A = $\{(1,1), (2,2), (3,3)\}$

$R_2 = \{(1,1), (2,3)\}$

if $a \in A \Rightarrow (a,a) \in R$

R_1 is reflexive ; R_2 is not reflexive.

② symmetric :

$R_1 = \{(1,1), (2,3), (3,2)\}$ ✓

$R_2 = \{(1,3), (1,2), (2,2), (3,1), (3,2)\}$

if $(a,b) \in R \ \forall\ a,b \in A$

$\Rightarrow (b,a) \in R$

R_1 is symmetric ; R_2 is not.

$A = \{1, 2, 3, 4\}$

Transitive :

$R_1 = \{(1,2), (3,3), (4,3), (3,2), (4,2), (2,2)\}$

if (a, b) and $(b, c) \in R$, then $(a, c) \in R$

R_1 is transitive.

$R_2 = \{(1,2), (3,4), (1,4)\} \longrightarrow$ (a,b) ✓ present $\longrightarrow$ but correspondingly $(b,c) \notin R$,

R_2 is transitive

$R_3 = \{(1,2), (2,4), (1,3)\} \longrightarrow$ R_3 is not transitive,

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TYPES OF RELATION

(iii) **Transitive relations** A relation R on a set A is said to be a transitive relation, if $(a,b) \in R$, $(b,c) \in R \Rightarrow (a,c) \in R$.

In other words, if a is related to b, b is related to c, then a is related to c.

Transitivity fails only when there exists a, b and c such that aRb, bRc but $a \not{R} c$.

e.g., let $A = \{1, 2, 3\}$ and the relation

$$R = \{(1,2),(2,1),(1,1)\}.$$

Then, R is not transitive, since R,

$$(2,1) \in R, (1,2) \in R \text{ but } (2,2) \notin R.$$

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TYPES OF RELATION

EQUIVALENCE RELATION

A relation R on a set A is said to be an equivalence relation, if

(i) R is reflexive *i.e.,* $(a,a)\in R, \forall\ a\in A$

(ii) R is symmetric *i.e.,* $(a,b)\in R \Rightarrow (b,a)\in R, \forall\ a,b\in A$

(iii) R is transitive *i.e.,* $(a,b),(b,c)\in R \Rightarrow (a,c)\in R$

- **Universal and Identity relation are equivalence relation.**

Q) Which of the following statements is not correct for the relation R defined by aRb if and only if b lives within one kilometer from a?

(a) R is reflexive
(b) R is symmetric
(c) R is not anti-symmetric
(d) None of the above

SSBCrack EXAMS

Q) Which of the following statements is not correct for the relation R defined by aRb if and only if b lives within one kilometer from a?

(a) R is reflexive (b) R is symmetric

(c) R is not anti-symmetric (d) None of the above

Ans: (b)

SSBCrack EXAMS

Q) A relation R is defined on the set Z of integers as follows :

$$mRn \Leftrightarrow m+n \text{ is odd.}$$

Which of the following statements is/are true for R ?

1. R is reflexive
2. R is symmetric
3. R is transitive

Select the correct answer using the code given below :

(a) 2 only

(b) 2 and 3

(c) 1 and 2

(d) 1 and 3

SSBCrack EXAMS

Q) A relation R is defined on the set Z of integers as follows :

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Which of the following statements is/are true for R ?

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Select the correct answer using the code given below :

(a) 2 only

(b) 2 and 3

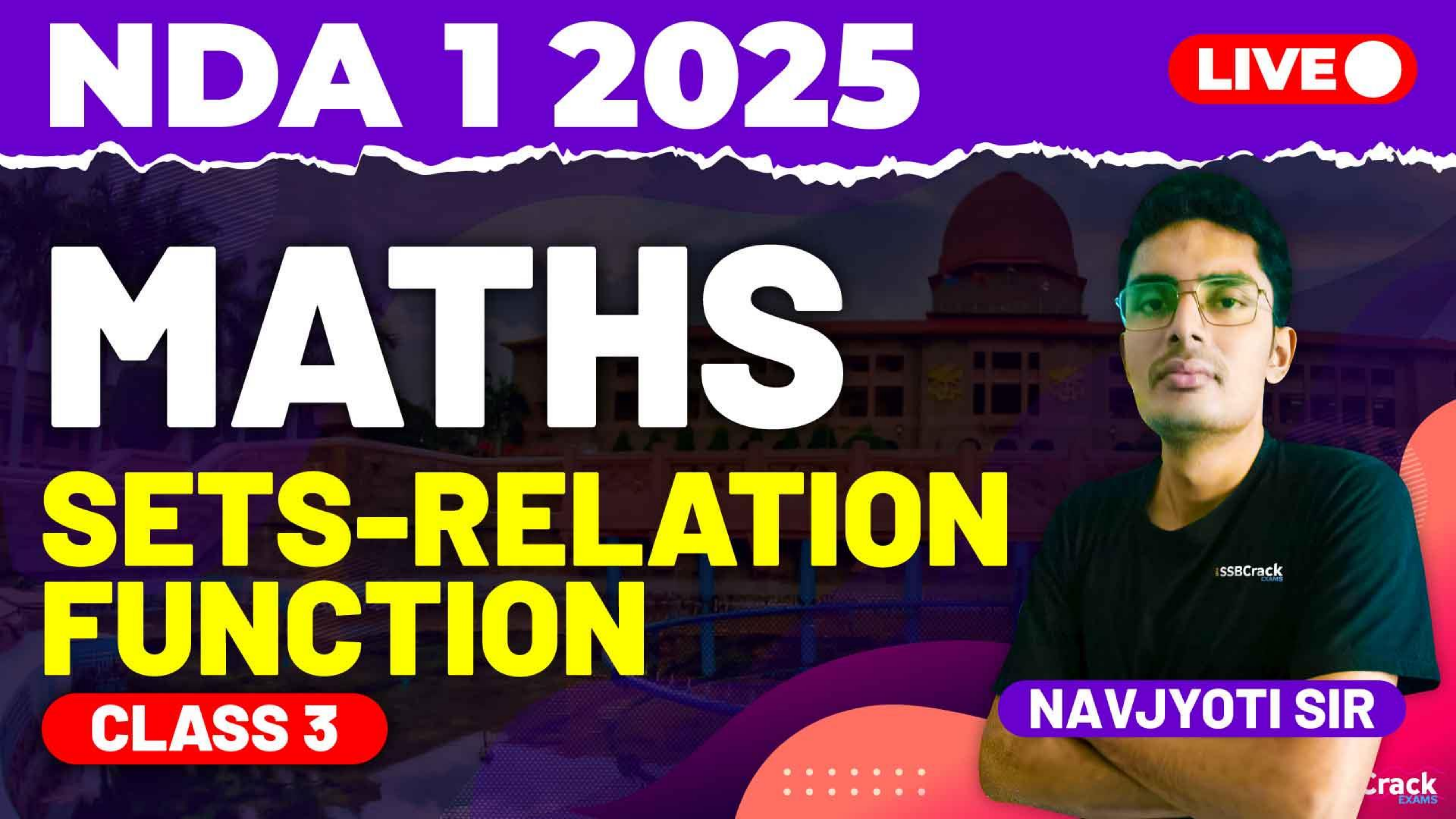
(c) 1 and 2

(d) 1 and 3

Ans: (a)

Summary

- Cartesian Product
- Relations
- Types of Relations
- Practise Questions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