CS & IT ENGINEERING

Discussion notes

Discrete Mathematics

Set Theory

DPP 04

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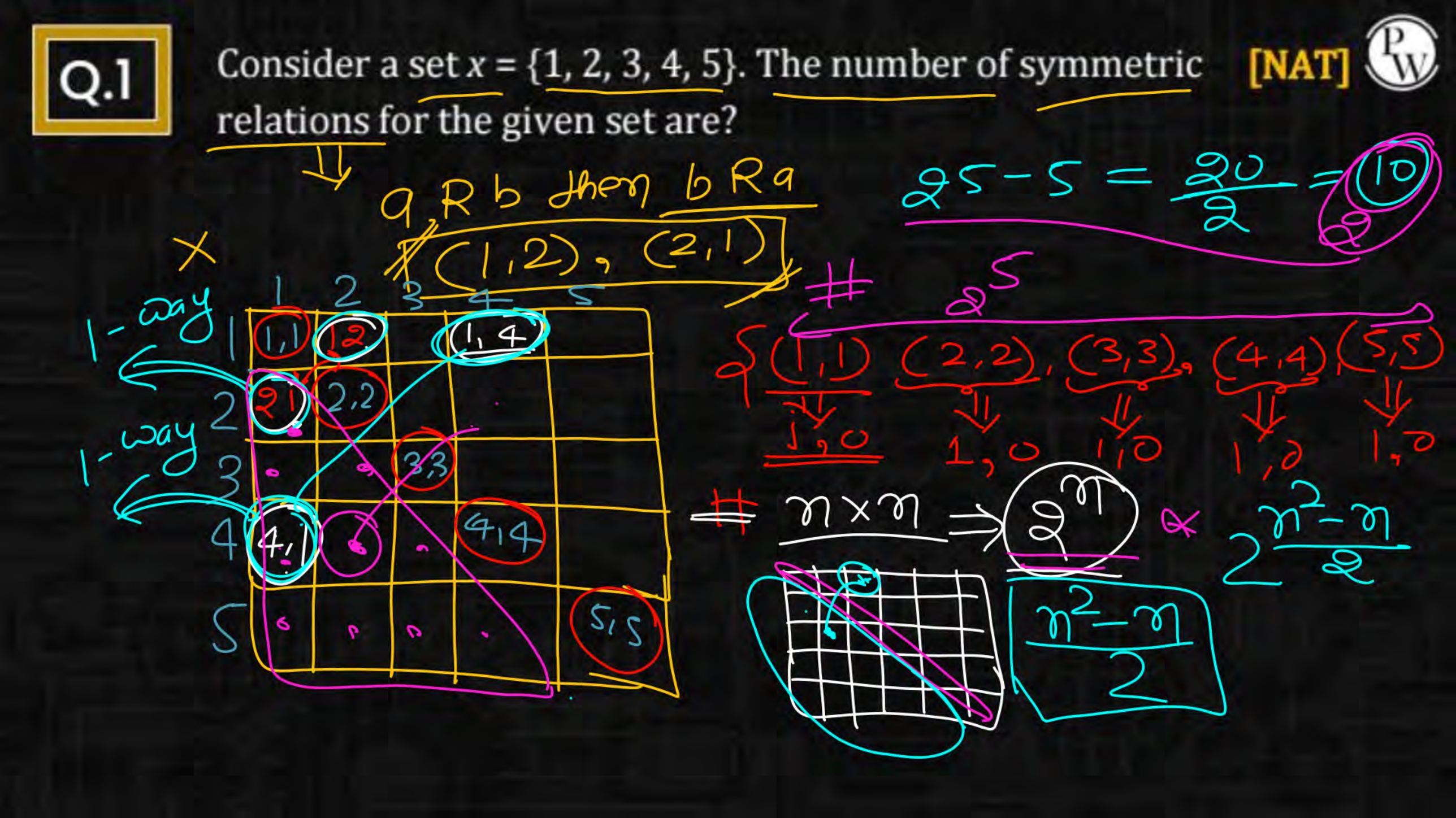
01 Question

02 Discussion

Q.1 Consider a set $x = \{1, 2, 3, 4, 5\}$. The number of symmetric relations for the given set are? **[NAT]**



$\# \; 2^n * 2^{\frac{n^2-n}{2}}$

$n = 5$

$2^5 * 2^{\frac{5^2-5}{2}}$

$\Rightarrow 2^5 * 2^{\frac{20}{2}}$

$\Rightarrow \boxed{2^5 * 2^{10}} = \boxed{32768}$

$\# \boxed{2^5 * 2^{10}}$

Q.2

Consider the cross product of a set A = {1, 2, 3}, set B = {x, y, z} and set C. The resultant cross product is ϕ. Then the elements of set C is?

[MCQ]

A. {a, b}

B. {0}

C. ϕ

D. None of these

$A \times B \times C = \phi$

$\{1,2,3\} \quad \{x,y,z\} \quad \phi$

$n = 2$

1, x, a	1, x, 0
1, x, b	1, y, 0
1, y, a	1, z, 0
1, y, b	2, x, 0
	⋮

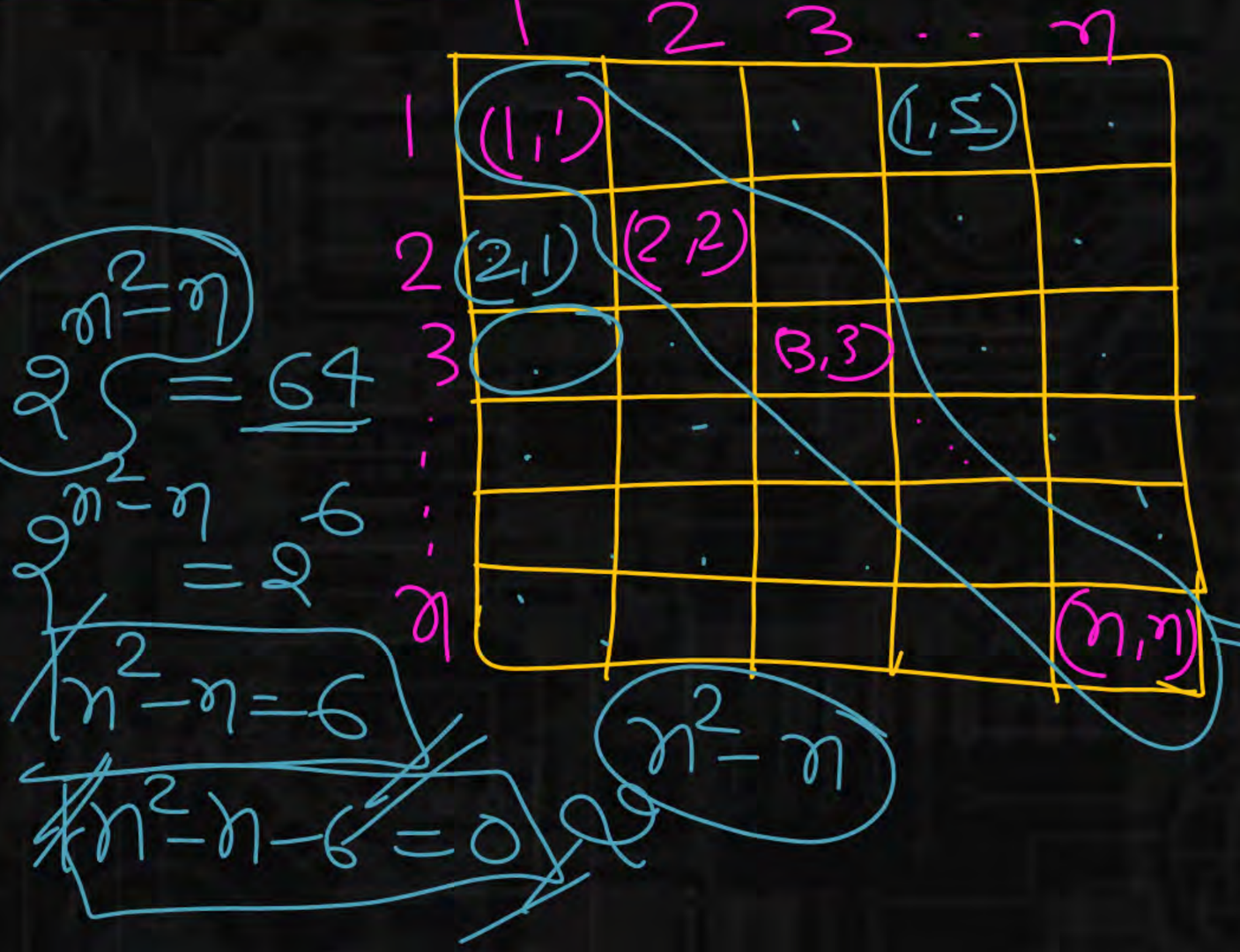
Q.3 If the number of reflexive relations for a set is 64 then what is the cardinality of the set? [MCQ]

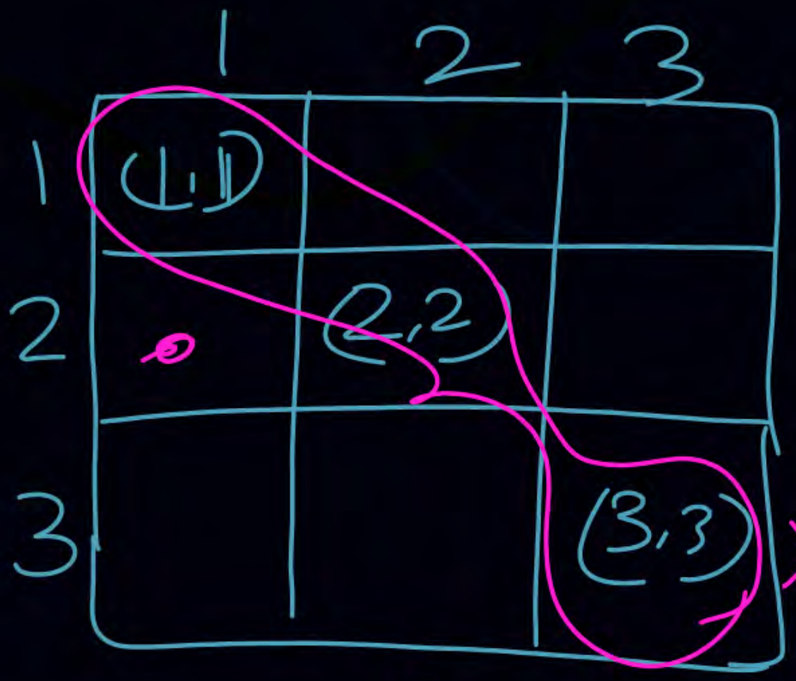
A. 3

B. 4

C. 6

D. 16





$$\therefore \quad 2^6 = 64$$

$$9 - 3 = 6$$

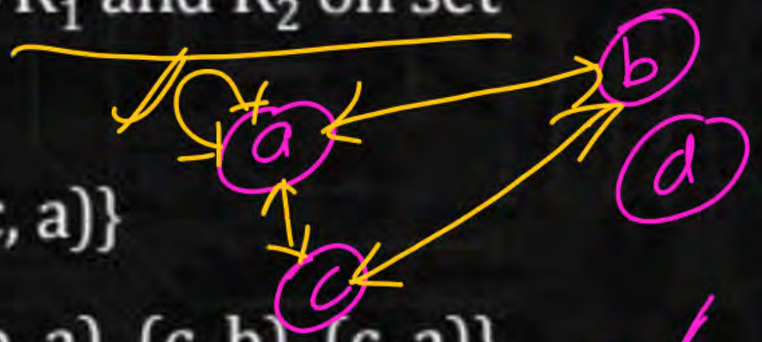
Q.4 [MCQ]

Consider the following relations R_1 and R_2 on set

$A = \{a, b, c, d\}$

R_1: {(a, a), (a, b), (a, c), (b, c), (c, a)}

R_2: {(a, a), (a, b), (a, c), (b, c), (b, a), (c, b), (c, a)}



(a,b), (b,a) ✗

Choose the correct statement from the following:

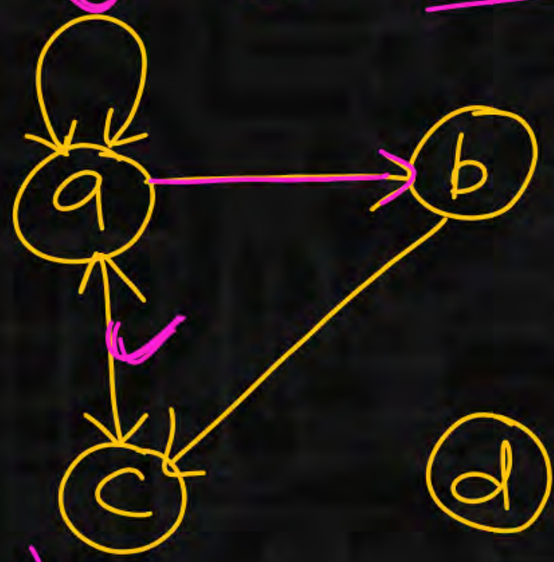
A. R_1 is a symmetric relation but not R_2.

B. R_2 is a symmetric relation but not R_1.

C. Both R_1 and R_2 are symmetric.

D. Neither R_1 nor R_2 is symmetric.

R_1 :



(a,c) (c,a)

Q.5 [MCQ]

Consider the following relation:

I. Relation R_1 = "Has the same birthday" defined on the set of people.

II. Relation R_2 = "Has the same absolute value" defined on the set of real number.

III. Relation R_3 = "Congruence module n(≡)" defined on the set of integers.

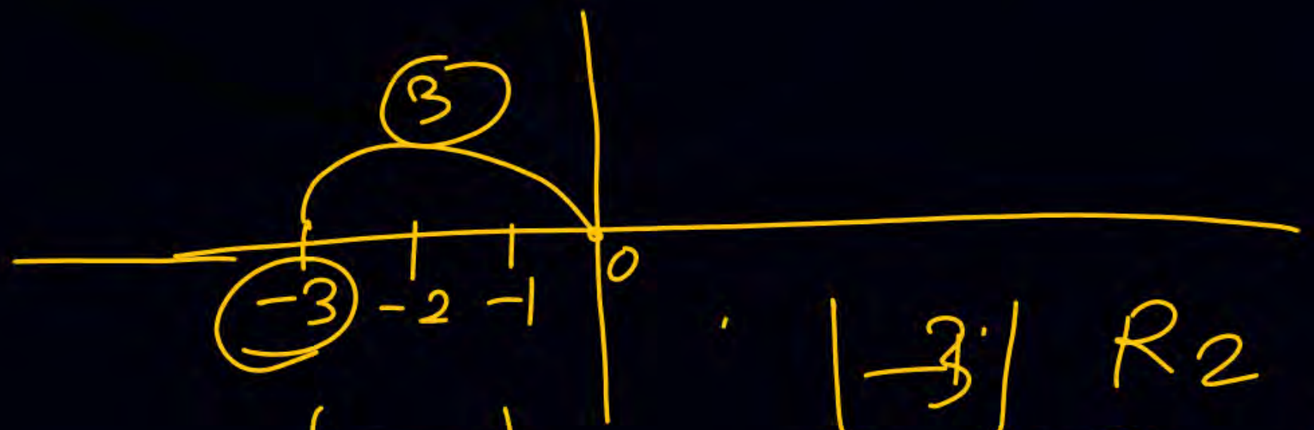
Choose the correct statement regarding the given relations.

A. Only R_1 and R_2 are equivalence relations.

B. Only R_2 and R_3 are equivalence relations.

C. Only R_1 and R_3 are equivalence relations.

D. All R_1, R_2 and R_3 are equivalence relations.



$|-3|$ R_2 $|-3|$: Ref.

$|-3|$ R_2 $|3|$ then $|3|$ R_2 $|-3|$

Sym.

$|-3|$ R_2 $|3|$ R_2 $|3.0|$

$|-3|$ R_2 $|3.0| = 3$

$a \equiv b \pmod{n}$

$rem(a, n) = rem(b, n) = rem(c, n)$

Q.6 [NAT]

Consider the given statements:

I: Every reflexive relation is always symmetric. (F)

II: "Is a subset of" is a transitive relation defined on a power set of sets. (True)

III: The inverse of a transitive relation is a transitive relation. (True)

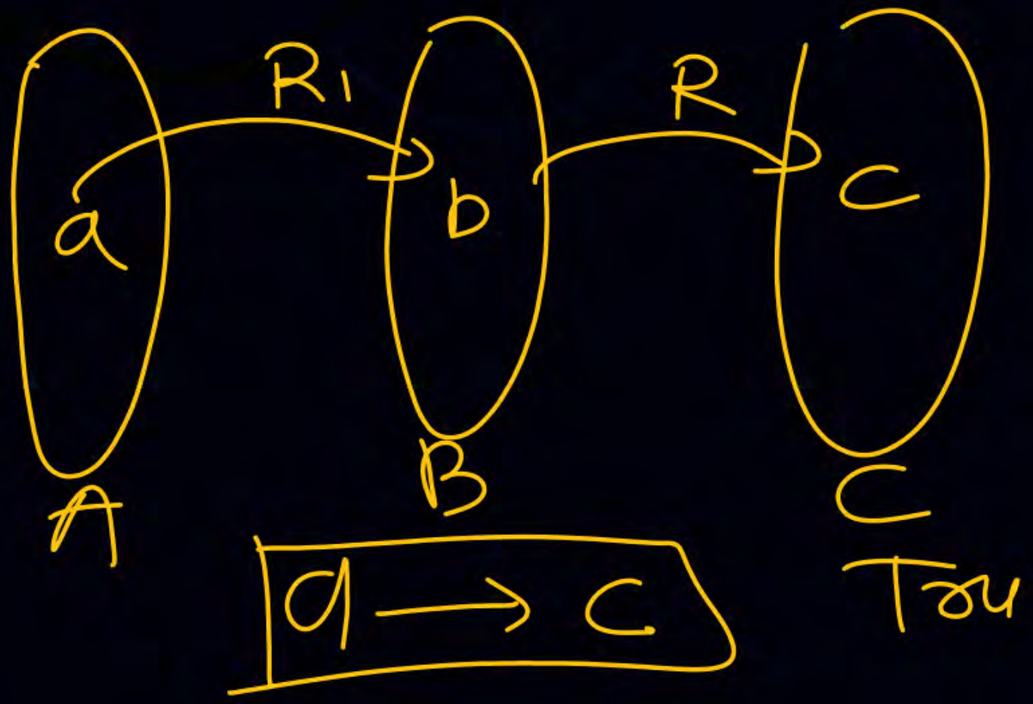
The number of incorrect statements are?

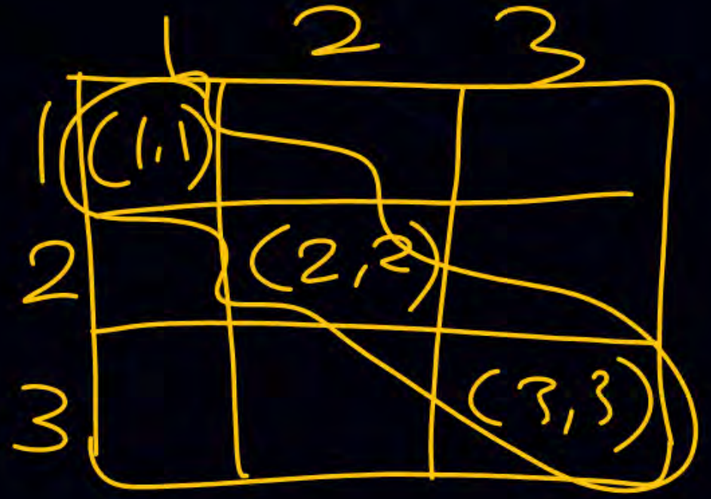
$A = \{1, 2, 3\}$: $2^3 = 8$

Ref: $\{(1,1), (2,2), (3,3), (2,1)\}$

$B = \{2\}$ $\quad P = \{1, 2, 3\}$

$C = \{2, 3\}$ $\quad B \subseteq C \subset P$: $B \subseteq P$

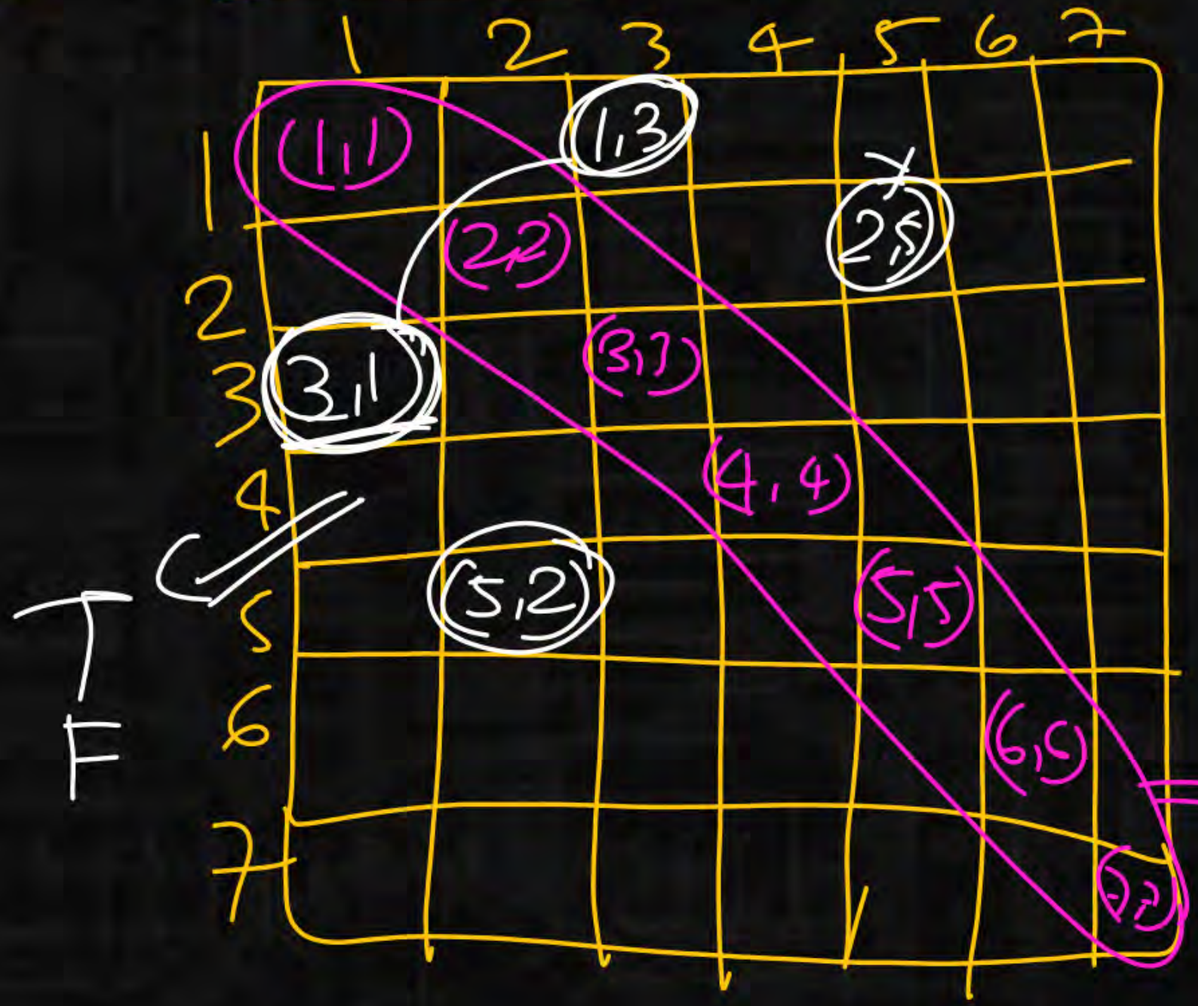

R1
R
a
b
c
A
B
C
a → c
Tou



Eg.

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

Q.7 For a set a with cardinality 7, what is the total number of reflexive and symmetric relations? **[NAT]**



$\Longrightarrow$ 1-ways

∴ No. Relation : 2^{21}

$= 2097152$

$7 \times 7 = 49$

Remaining ele : $49 - 7$

$= 42$

Set = n elements

Relation (Ref as well as Sym) : $2^{\frac{n^2-n}{2}}$

$2^{\frac{7^2-7}{2}}$

$2^{\frac{49-7}{2}}$

$= 2^{\frac{42}{2}}$

$= 2^{21}$


THANK YOU GW
SOLDIERS !