DPP - DM - 28 - Group Theory

Special class

Satish Yadav • Oct 31, 2020

SATISH KUMAR YADAV

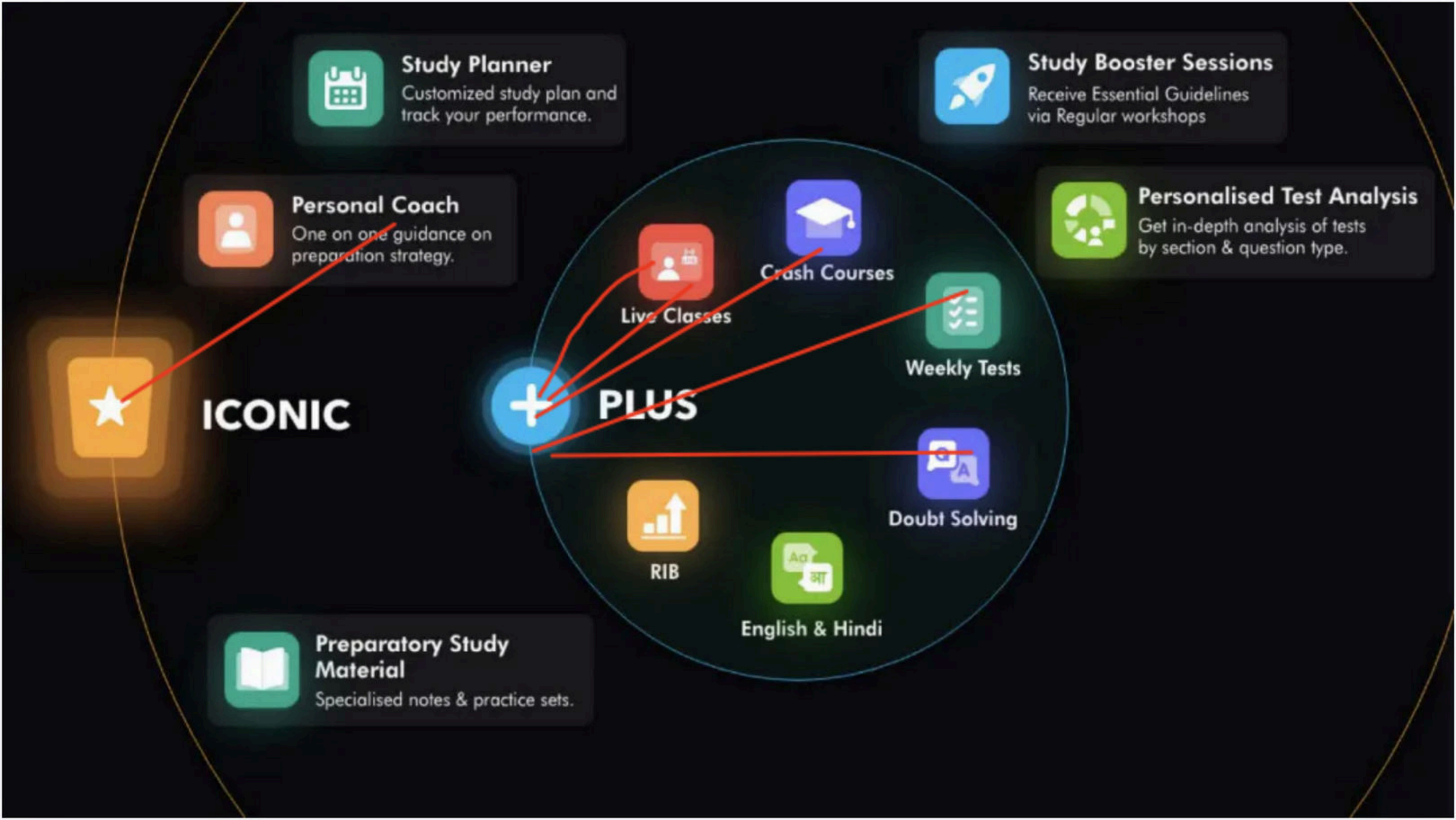
BE (Information Technology) in 2012

GATE/ESE:

- 8+ Years of Teaching Experience
- Ex - ACE ACADEMY Faculty
- Submitted Many Research Paper
- 3+ Years Corparate Research Experience

Subjects Taken:

Discrete maths / DBMS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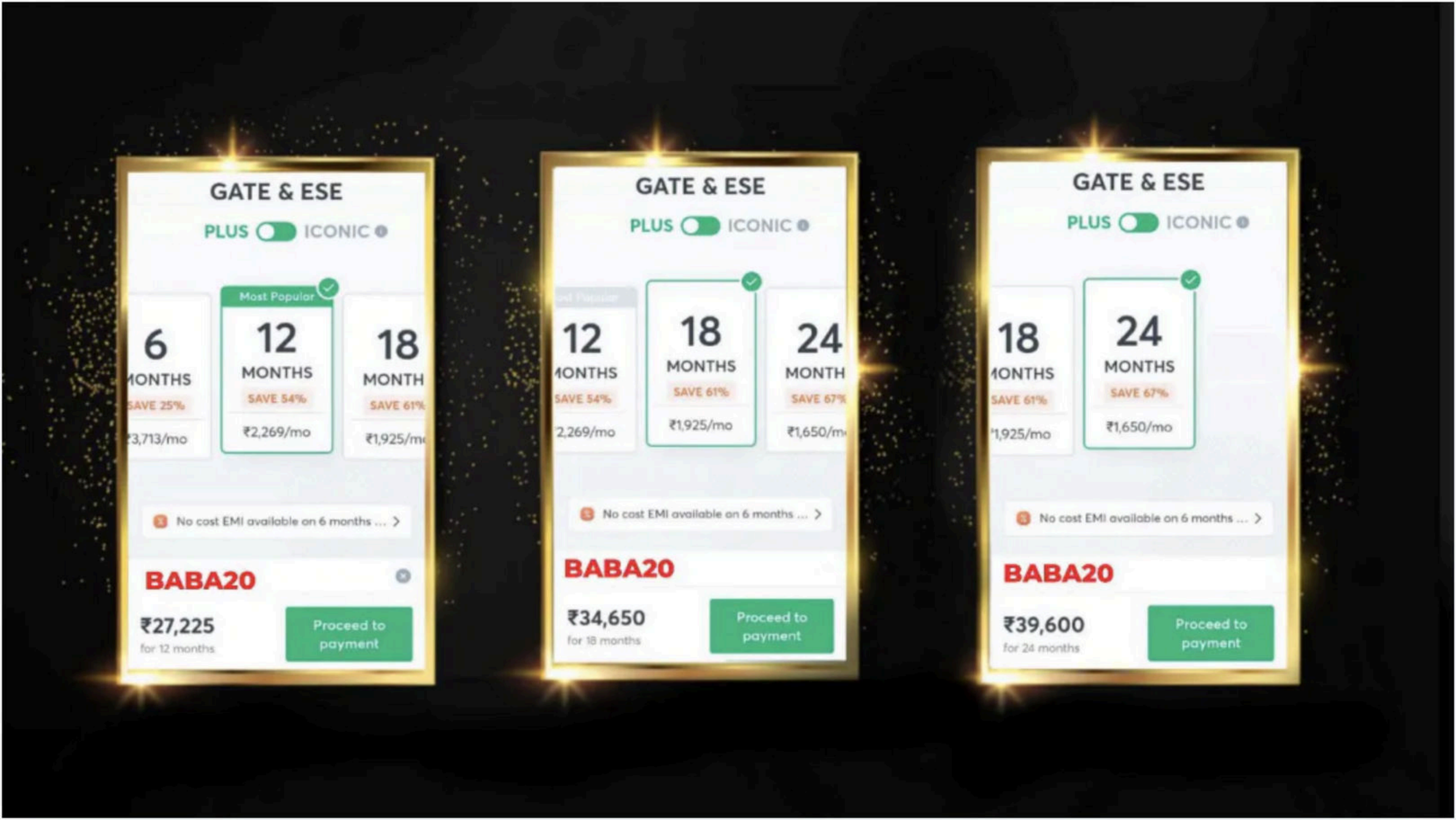
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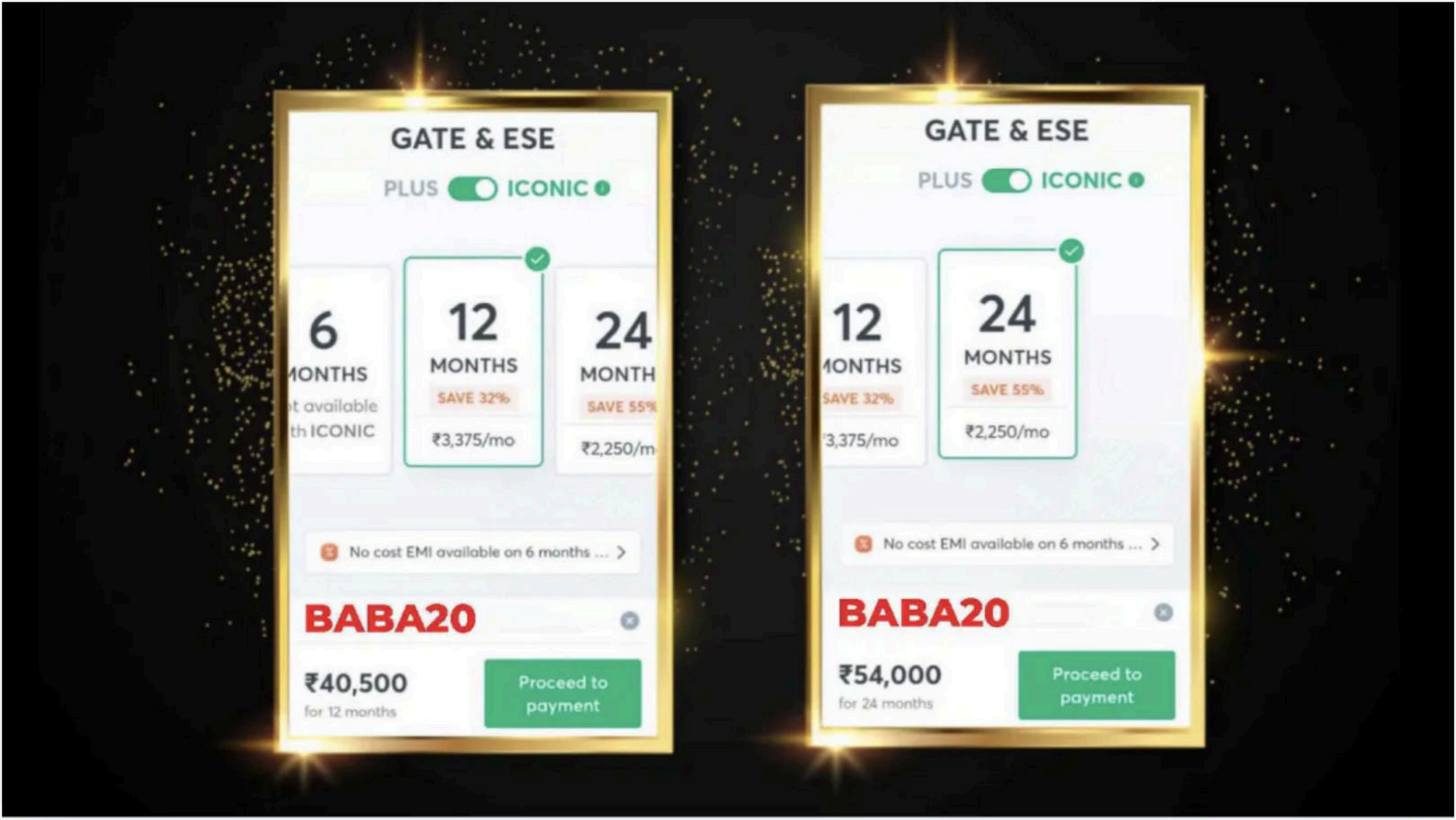
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Satish Yadav

Teaches in GATE & ESE

Researcher Kahlo # 8+ years of experience in teaching# Ex Ace faculty , gateforum, ICE gate , VISION GATE # submitted many research paper

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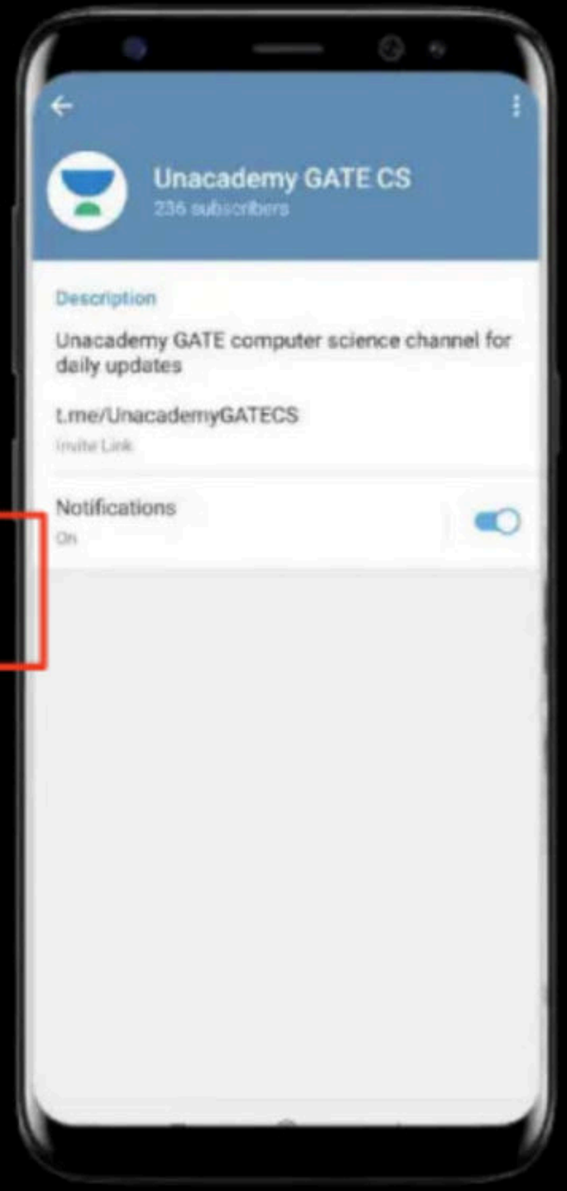
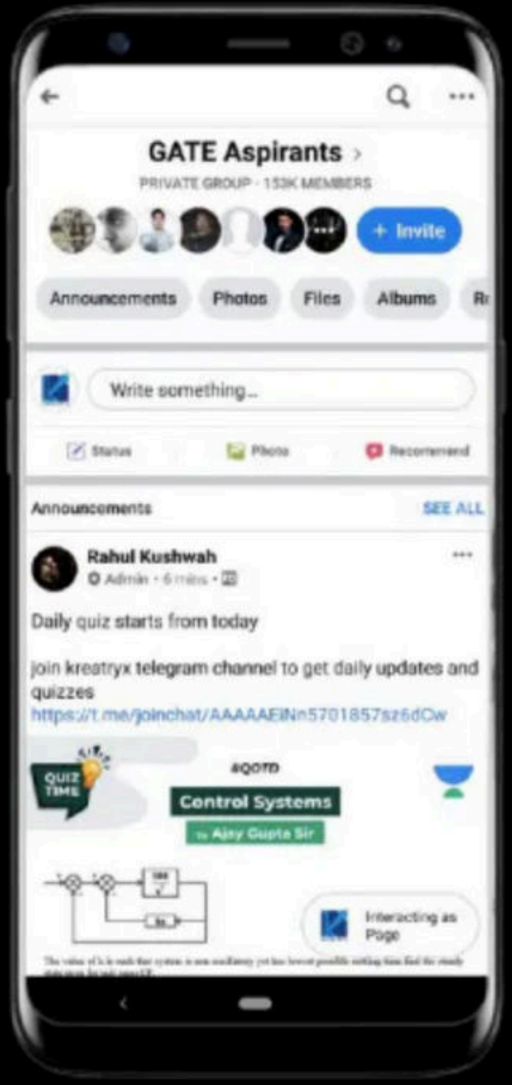


GATE Aspirants

150K+ Members



GATE Aspirants (ME,CE,CSE)

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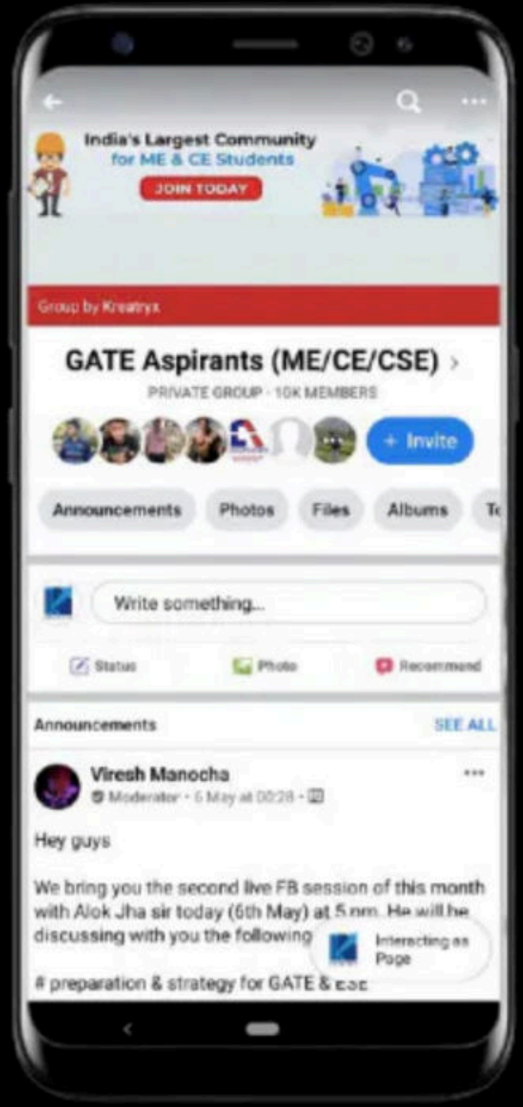

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Satish Yadav

$(\mathbb{Q}^+, *)$

$a * b = \frac{ab}{2}$.

$a * e = a$.

e → Identity element.

→ Identity.
→ Inverse

$a * e = \frac{ae}{2}$

$a * e = a$.

$\frac{ae}{2} = a$

$e = 2$

Inverse :

Identity = 2.

$$a * a^{-1} = e \text{ (Identity)}$$

(a^{-1} ↳ Inverse)

$$a * b = \frac{ab}{2}$$

$$\frac{a * \bar{a}^{1}}{2} = 2.$$

$$a^{-1} = \frac{4}{a}.$$

$$a * e. = a.$$

$$a * \bar{a}^{1}. = e.$$

$$a * e = a.$$

$$a * \bar{a}^{1.} = e$$

2 : $(Q, *)$

$a * b = a + b - ab$; $1 * 2 = 1 + 2 - 1 \cdot 2$.

semigroup ?

$a * (b * c)$

$\downarrow$

$a * (b + c - bc)$

$1 \quad 2$

$a + (b + c - bc) - a(b + c - bc)$

$1 + 2 - 1 \cdot 2$.

$\begin{cases} a \in Q \quad b \in Q. \\ a * b \in Q. \\ a + b - a \times b. \in Q. \end{cases}$

$(R, *)$ Group?

$a * b = a + b - 2$.

Abelian Group?

1) Closed. ✓

2) Associative ✓

3) Identity.

identity element.

$a * e = a$.

$a + e - 2 = a$

$e = 2$.

4) Inverse.:

$a * \bar{a}! = e$.

$a * a^{-1} = e.$

$a * b = a + b - 2$

$a * a^{-1} = 2$

$a + a^{-1} - 2 = 2.$

$$\boxed{a^{-1} = 4 - a.}$$

$a * b = b * a.$

$a + b - 2 = b + a - 2.$

{Abelian Group.}

$a \times \_ = a.$

G be set all the matrix.

$G = \left\{ \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix} \right.$

$\begin{bmatrix} 1 & m \\ 0 & 1 \end{bmatrix}$ $m \in Z$.

$*$ -> multiplication.

$(G, *)$

Group ?:

1) $a \in G \quad b \in G \quad a * b \in G.$

$$\begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix} \quad \begin{bmatrix} 1 & b \\ 0 & 1 \end{bmatrix} \quad \begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix} * \begin{bmatrix} 1 & b \\ 0 & 1 \end{bmatrix}$$

$a \in z \qquad b \in z.$

$$= \begin{bmatrix} 1 & a+b \\ 0 & 1 \end{bmatrix}$$

closed.

$a+b \in z.$

2) Associative : $A(B \cdot C) = (A \cdot B) \cdot C$.

3) $A \times I = A$. Identity element

4) Inverse : $A * A^{-1} = I$.

$|A| = 1 \neq 0$

A^{-1} always exist.

$(R, *)$ $\quad a * b = 2ab$.

$a^2 * b = 2ab$.

1) $a \in R \quad b \in R \quad a * b \in R$.

$= 2ab \in R$.

2) Associative:

$a * (b * c) = (a * b) * c$.

$a * (2bc) = (2ab) * c$.

1 2. $\quad 2(2ab) \cdot c$.

$4abc \quad 2a2bc \quad 4abc$

$a * b = 2ab$

Identity:

$a * e = a$

$2ae = a$

$e = 1/2$

Inverse: $a * a^{-1} = e$

$2aa^{-1} = \frac{1}{2}$

$$2a \cdot a' = \frac{1}{2}$$

$$a' = \frac{1}{4a}.$$

Gate-06

$\{1, 2, 3, 5, 7, 8, 9\}$, under multiplication mod 10.

Given below four possible Reason. which one of them is false? is not a Group.

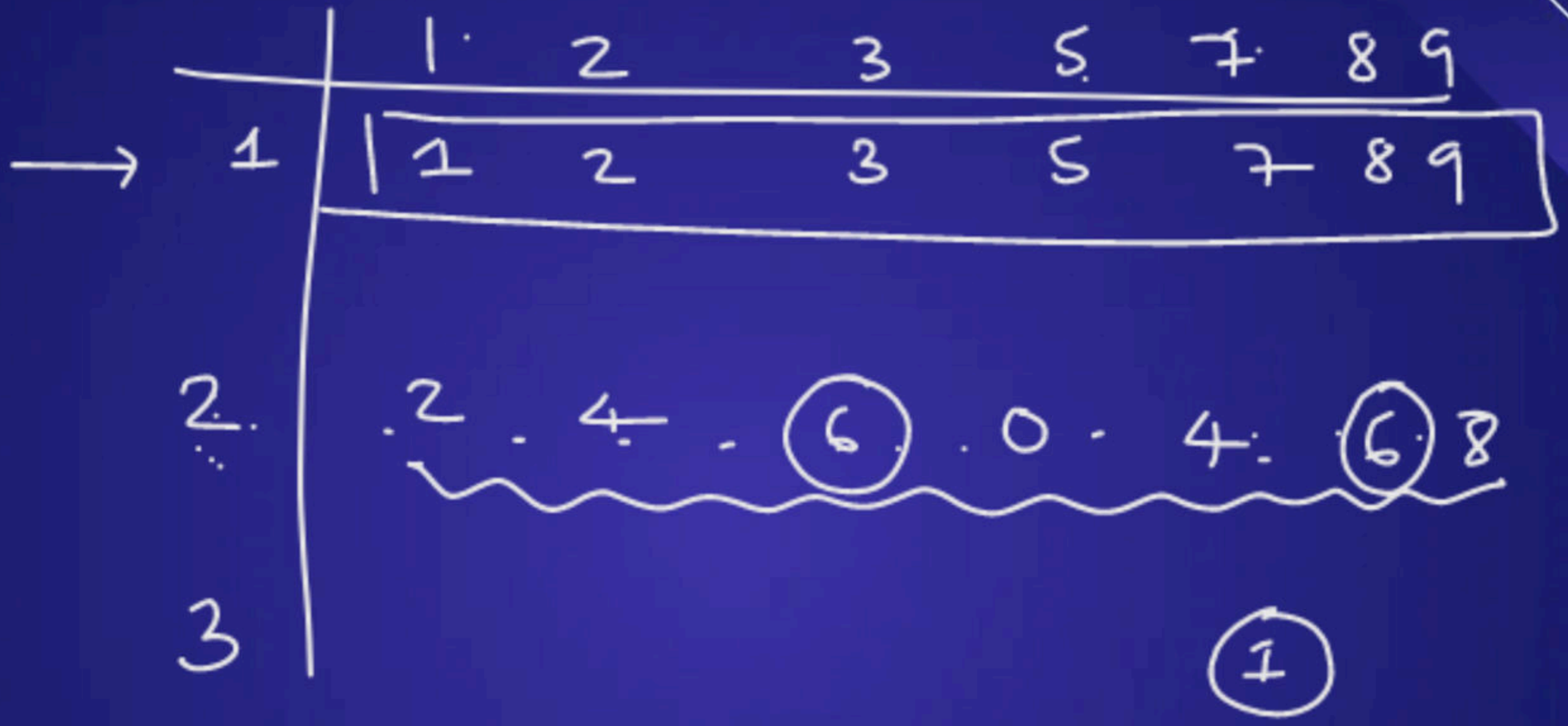
Ans

a) It is not closed → True

b) 2 does not have inverse → True

c) 3 —"— —"— → false

d) 8 —"— —"—



$(3 \times 7) \bmod 10 = 1.$

$\{1, 2, 4, 7, 8, 11, 13, 14\}$

$4x = 1$. is Group under $\otimes_{15}$

$(4 \times \underline{n}) \bmod 15 = 1$. Inverse of 4 & 7.

Identity.

$4 * \underline{1} = 4$

a) 3, & 13

b) 2 & 11

c) 1, 4 & 13

d) 8 & 14.

$4 =$

Thank You