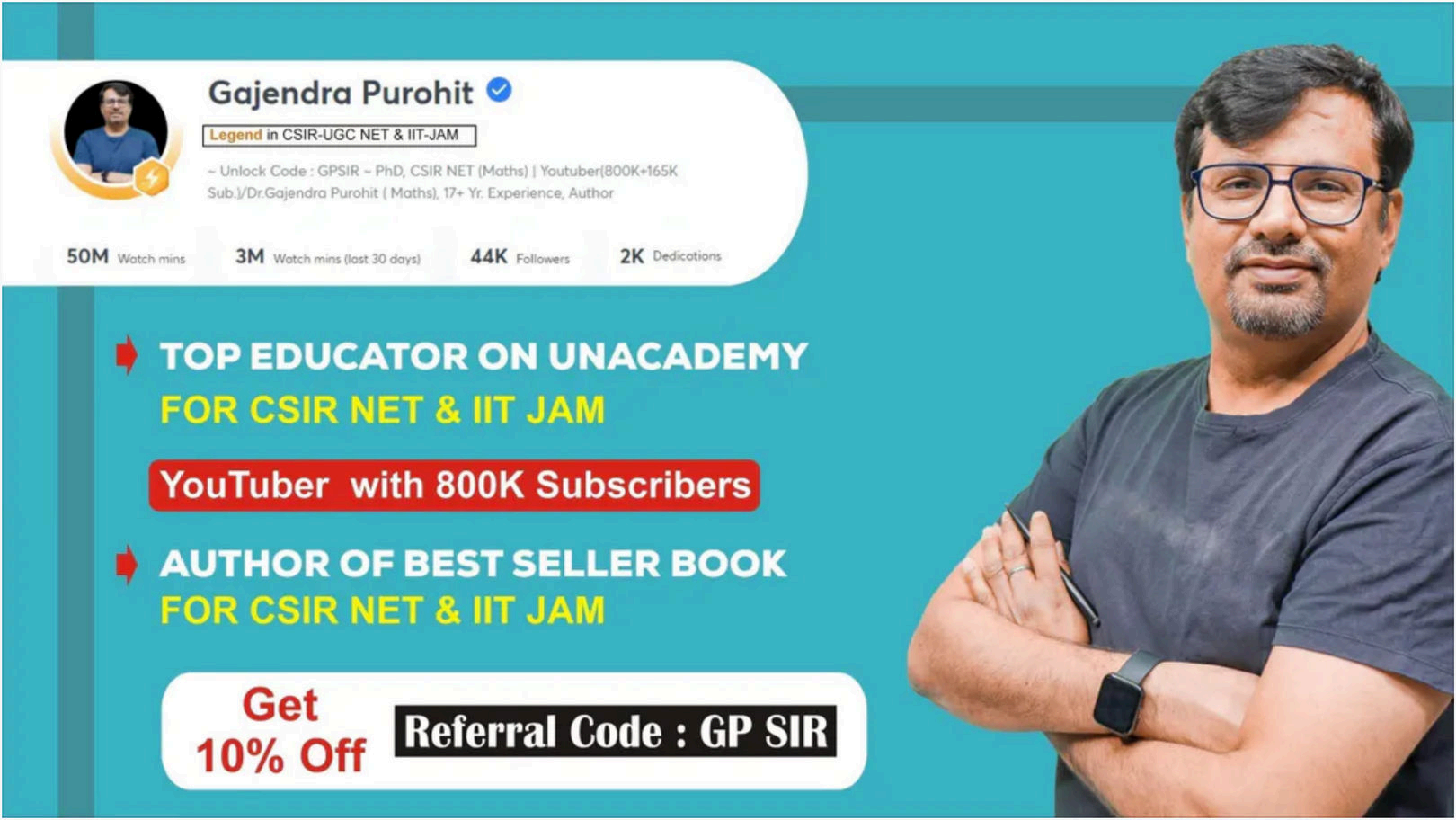
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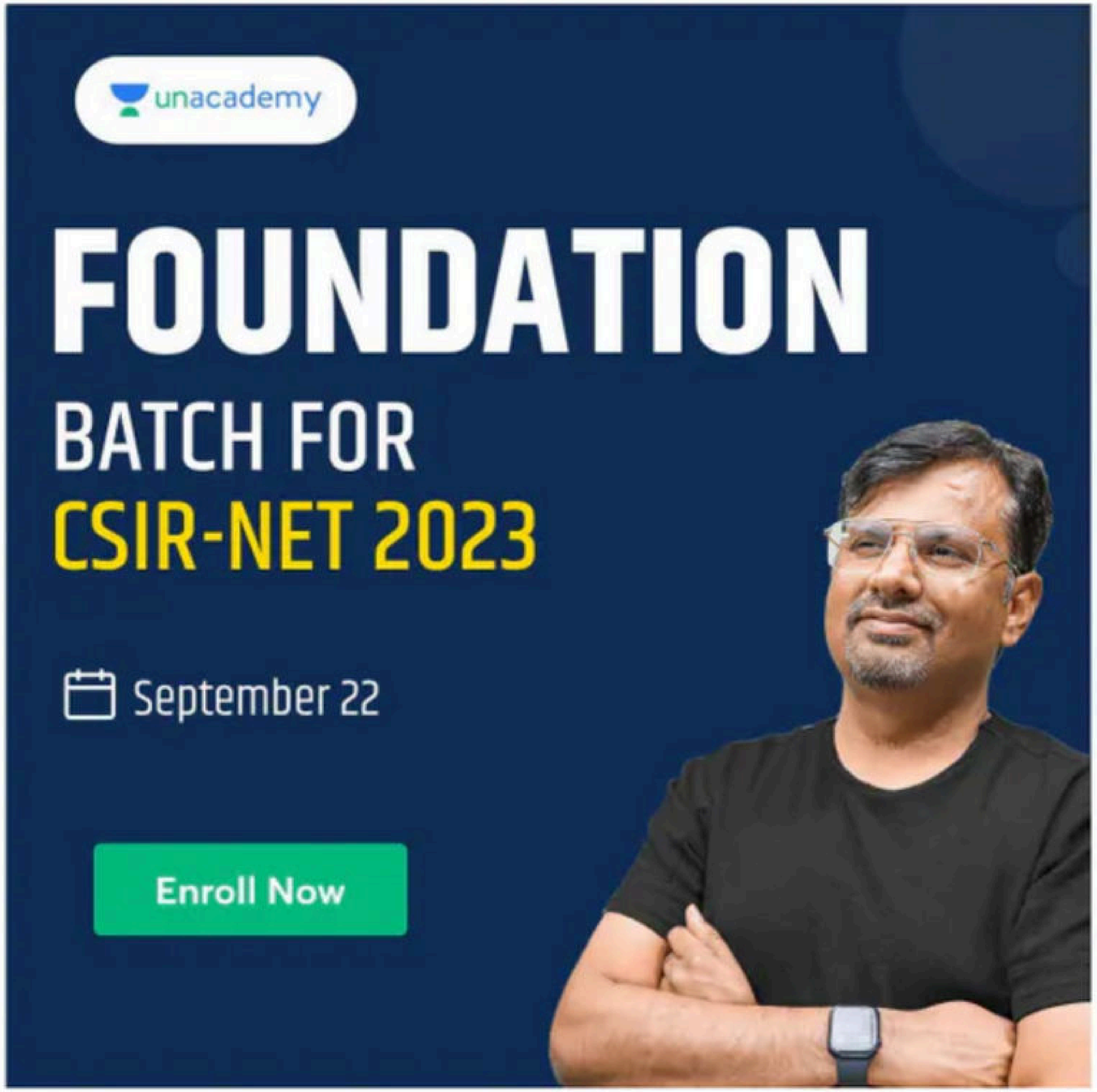

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Result :Let W_1& W_2 are two subspace of V then $\dim(W_1 + W_2) = \dim W_1 + \dim W_2 - \dim(W_1 \cap W_2)$

Result :Let V be a vector space of dimension n and W be a

subspace of V with m Linearly independent condition then $\dim V = n - m$

Q.1 Let $W_1 = \{(u, v, w, x) \in R^4 \mid u + v + w = 0, 2v + x = 0, 2u + 2w - x = 0\}$ & $W_2 = \{(u, v, w, x) \in R^4 \mid u + w + x = 0, u + w - 2x = 0, v - x = 0\}$. Then which among the following is true.

(a) $\dim(W_1) = 1$ (b) $\dim(W_2) = 2$

(c) $\dim(W_1 \cap W_2) = 1$ (d) $\dim(W_1 + W_2) = 3$

Q.2. Consider the subspace $W = \{(x_1, x_2, ..., x_{10}) \in R^{10};$ $x_n = x_{n-1} + x_{n-2}$ for $3 \leq n \leq 10\}$ of the vector space R^{10}.

The dimension of W is

(a) 2 (b) 3

(c) 9 (d) 10

Q.3. Let $W_1 = \{(x, y, z) \in R^3; 3x + y = 0\}$ & $W_2 = \{(x, y, z) \in R^3; z = 0\}$. Then $\dim(W_1 \cap W_2)$ is

(a) 0 (b) 1

(c) 2 (d) 3

Q4. Let V be the vector space of all 2×2 matrices over R.

Consider the subspace $W_1 = \left\{ \begin{bmatrix} a & -a \\ c & d \end{bmatrix}; a, c, d \in R \right\}$ &

$W_2 = \left\{ \begin{bmatrix} a & b \\ -a & d \end{bmatrix}; a, b, d \in R \right\}$.

If $m = \dim(W_1 \cap W_2)$ & $n = \dim(W_1 + W_2)$ then $m + n$ is

(a) 5 (b) 6

(c) 7 (d) 8

Q.5. Let $A = \begin{bmatrix} 1 & 1 & 1 \\ 2 & 2 & 3 \\ x & y & z \end{bmatrix}$ and let $V = \{(x, y, z) \in R^3; \det A = 0\}$.

Then dimension of V equals to

(a) 0 (b) 1

(c) 2 (d) 3

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Linear Transformation

Let V and V` be vector space over F. A mapping $T : V \rightarrow V'$ is a linear transformation if for all $u, v \in V$ & $\alpha, \beta \in F$

$T(\alpha u + \beta v) = \alpha T(u) + \beta T(v)$ & $T(\alpha u) = \alpha T(u)$; for all $\alpha \in F$

Note : Let V & V' be vector space over F & T : V $\rightarrow$ V' be a linear transformation. Then

(a) $T(0) = 0; 0 \in V$

(b) $T(-v) = -T(v)$; for all $u \in V$

Q.1. Which of the following is a linear transformation from R^3 to R^2?

(A) $f\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 4 \\ x+y \end{pmatrix}$

(B) $g\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} xy \\ x+y \end{pmatrix}$

(C) $h\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} z-x \\ x+y \end{pmatrix}$

(a) Only f

(b) Only g

(c) Only h

(d) All of the above

Null space of Linear transformation : Let $T : V(F) \to V'(F)$ be a linear transformation then null space of T is the set of all vectors of V(F) s.t. $T(u) = 0$; (zero vector of V') and it is denoted by ker (T) i.e. $\ker(T) = \{u \in V(F) : T(u) = 0\}$

Note : If V(F) & V'(F) be two vector space & $T : V(F) \to V'(F)$ be linear transformation then ker(T) is subspace of V(F).

Range of linear transformation : Let $V(F)$ & $V'(F)$ be two vector space and $T : V \rightarrow V'$ be a linear transformation. Then the Range of T written as $R(T)$ is the set of all vectors β in V' such that $\beta = T(\alpha)$ for some α in V.

i.e. Range $(T) = \{T(\alpha) \in V' \mid \alpha \in V\}$

Note : Let $T : V(F) \rightarrow V'(F)$ be a linear transformation then Range(T) is subspace of $V'(F)$.

Rank & Nullity of Linear Transformation :

Let $T : V(F) \to V'(F)$ be a linear transformation & Range (T) &

ker(T) are range space of T & null space of T then dim

$\{Range(T)\} = \rho(T)$ = rank of T

& dim $\{ker(T)\} = \eta(T)$ = nullity of T

Sylvester's Law : Let $T : V(F) \to V'(F)$ be linear transformation

then $\rho(T) + \eta(T) = \dim V(F)$

One-One linear transformation : Let $T : V \rightarrow V'$ be a linear transformation with $\eta(T) = 0$ then T is called one-one linear transformation.

Onto linear transformation : Let $T : V \to V'$ be a linear transformation with $\rho(T) = \dim V'$ Then T is called onto linear transformation.


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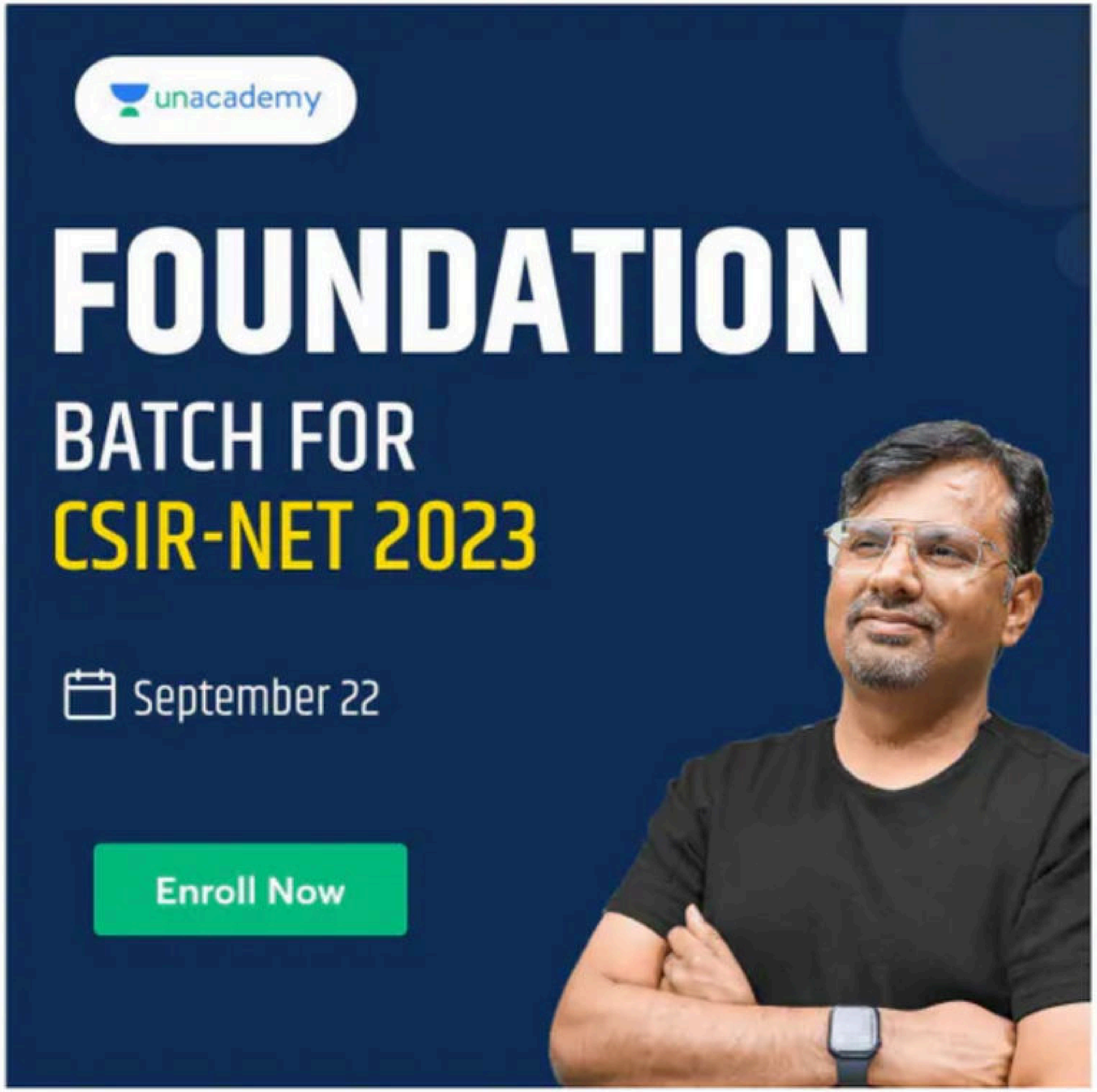
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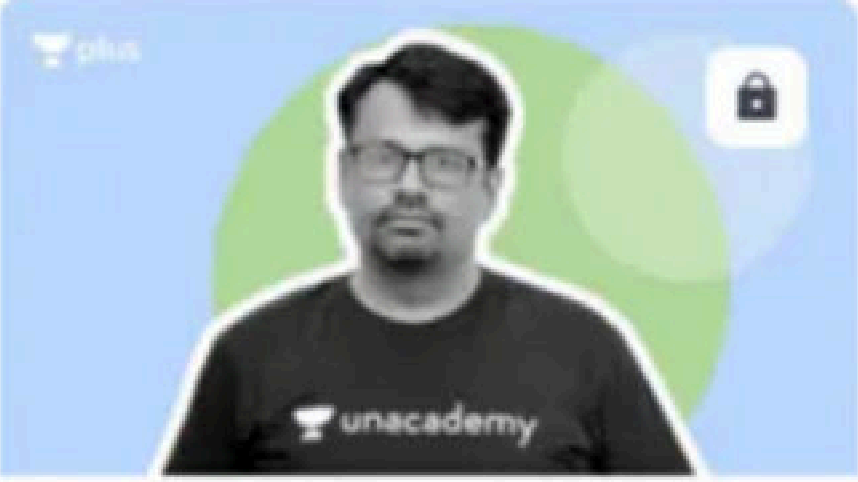

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Educator highlights

- Works at **Pacific Science College**
- Studied at **M.Sc., NET, PhD(Algebra), MBA(Finance), BEd**
- PhD, NET | Plus Educator For CSIR NET | Youtuber (260K+Subs.) | Director Pacific Science College |
- Lives in **Udaipur, Rajasthan, India**
- Unacademy Educator since

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