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BASIS:

Basis of V.S V over the field F, is the subset $B \subseteq V$ if
1. B is L.I. set
2. $\langle B \rangle = V$

DIMENSION of a V.S. V(F).

The cardinality of the basis is known as DIMENSION of V(F), denoted by $\dim(V)$

Eg: Let $V = R(R)$. Then basis of V are/is :-
✗ (A) $B = \{0\}$ L.D. ✗ (B) $B = \{1, 2\}$ L.D. (C) $B = \{1\}$. ✓
(D) $B = \{\{\alpha\}\}$ where α is non-zero elt. ✓

Eg: Let $P_n(R)$. Then basis of V are
✗ $B = \{0, 1, x, \ldots, x^n\}$ L.D.
✗ $B = \{1, x, x^2, \ldots, x^{n-1}\}$ L.I but $\langle B \rangle \neq V$
✓ $B = \{1, x, \ldots, x^n\}$
✗ D = None

Ques: $\dim(P_n(R)) =$ (A) 1 (B) $\cancel{n}$ (C) $n-1$ (D) $n+1$ ✓

Eg: Let $V(R) = \{\langle a_n \rangle : a_n \in R\}$. Then what is a basis of V?
✗ (A) $\{e_1, e_2, \ldots, e_n\}$ L.I but $\langle A \rangle \neq \dim V$ (B) $\{\langle 1, \frac{1}{2}, \frac{1}{3}, \ldots \rangle\}$ ✗ $\dim(V) \neq \langle B \rangle$
(C) $\{\langle 1, 1, \ldots, \rangle\}$ (D) $\{\{e_1, e_2, \ldots\}\}$
$e_i = (0, 0, \ldots, 1, \ldots 0)$