

## Determinants

### ISC Previous Years Board Questions with Solutions (2020 to 2023)

1. Without expanding at any stage, find the value of the determinant: (ISC 2020)

$$\Delta = \begin{vmatrix} 20 & a & b+c \\ 20 & b & a+c \\ 20 & c & a+b \end{vmatrix}$$

**Solution:**

$$\text{Given } \Delta = \begin{vmatrix} 20 & a & b+c \\ 20 & b & a+c \\ 20 & c & a+b \end{vmatrix}$$

$$= 20 \begin{vmatrix} 1 & a & b+c \\ 1 & b & a+c \\ 1 & c & a+b \end{vmatrix}$$

(Taking common 20 from  $C_1$ )

$$= 20 \begin{vmatrix} 1 & a+b+c & b+c \\ 1 & a+b+c & a+c \\ 1 & a+b+c & a+b \end{vmatrix} \quad (C_2 \rightarrow C_2 + C_3)$$

$$= 20(a+b+c) \begin{vmatrix} 1 & 1 & b+c \\ 1 & 1 & a+c \\ 1 & 1 & a+b \end{vmatrix}$$

(Taking common  $(a+b+c)$  from  $C_2$ )

$$= 20(a+b+c) \times 0 \quad (\because C_1 \text{ and } C_2 \text{ are identical})$$

$$= 0 \quad \text{Answer}$$

2. Using properties of determinants, show that (ISC 2020)

$$\begin{vmatrix} x & p & q \\ p & x & q \\ q & q & x \end{vmatrix} = (x-p)(x^2 + px - 2q^2)$$

**Solution:**

$$\text{L. H. S.} = \begin{vmatrix} x & p & q \\ p & x & q \\ q & q & x \end{vmatrix}$$

$$= \begin{vmatrix} x & p-x & q \\ p & x-p & q \\ q & 0 & x \end{vmatrix} \quad (\text{operating } C_2 \rightarrow C_2 - C_1)$$