<u>Objective Questions</u>

**Question 1.**
Mark the tick against the correct answer in the following:

$$\begin{vmatrix} \cos 70^\circ & \sin 20^\circ \\ \sin 70^\circ & \cos 20^\circ \end{vmatrix} = ?$$

A. 1

B. 0

C. cos 50$^o$

D. sin 50$^o$

**Answer:**
To find: Value of $\begin{vmatrix} \cos 70^\circ & \sin 20^\circ \\ \sin 70^\circ & \cos 20^\circ \end{vmatrix}$

Formula used: (i) $\cos\theta = \sin(90 - \theta)$

We have, $\begin{vmatrix} \cos 70^\circ & \sin 20^\circ \\ \sin 70^\circ & \cos 20^\circ \end{vmatrix}$

On expanding the above,

⇒ {cos 70°} {cos 20°} – {sin 70°} {sin 20°}

On applying formula $\cos\theta = \sin(90 - \theta)$

⇒ {sin (90 – 70)} {sin (90 – 20)} - {sin 70°} {sin 20°}

⇒ {sin 20°} {sin 70°} - {sin 70°} {sin 20°}

= 0

**Question 2.**

Mark the tick against the correct answer in the following:

$$\begin{vmatrix} \cos 15^\circ & \sin 15^\circ \\ \sin 15^\circ & \cos 15^\circ \end{vmatrix} = ?$$

A. 1

B. $\frac{1}{2}$

C. $\frac{\sqrt{3}}{2}$

D. none of these

**Answer:**

To find: Value of $\begin{vmatrix} \cos 15^\circ & \sin 15^\circ \\ \sin 15^\circ & \cos 15^\circ \end{vmatrix}$

Formula used: (i) $\cos(A + B) = \cos A \cos B - \sin A \sin B$

We have, $\begin{vmatrix} \cos 15^\circ & \sin 15^\circ \\ \sin 15^\circ & \cos 15^\circ \end{vmatrix}$

On expanding the above,

⇒ {cos 15°} {cos 15°} – {sin 15°} {sin 15°}

On applying formula $\cos(A + B) = \cos A \cos B - \sin A \sin B$

= cos (15 + 15)

= cos (30°)

$= \frac{\sqrt{3}}{2}$

**Question 3.**

Mark the tick against the correct answer in the following:

$$\begin{vmatrix} \sin 23^\circ & -\sin 7^\circ \\ \cos 23^\circ & \cos 7^\circ \end{vmatrix} = ?$$

A. $\frac{\sqrt{3}}{2}$

B. $\frac{1}{2}$

C. $\sin 16^\circ$

D. $\cos 16^\circ$

**Answer:**

To find: Value of $\begin{vmatrix} \sin 23^\circ & -\sin 7^\circ \\ \cos 23^\circ & \cos 7^\circ \end{vmatrix}$

Formula used: (i) $\sin(A+B) = \sin A \cos B + \cos A \sin B$

We have, $\begin{vmatrix} \sin 23^\circ & -\sin 7^\circ \\ \cos 23^\circ & \cos 7^\circ \end{vmatrix}$

On expanding the above,

$\Rightarrow (\sin 23^\circ)(\cos 7^\circ) - (\cos 23^\circ)(-\sin 7^\circ)$

$\Rightarrow (\sin 23^\circ)(\cos 7^\circ) + (\cos 23^\circ)(\sin 7^\circ)$

On applying formula $\sin(A+B) = \sin A \cos B + \cos A \sin B$

$= \sin(23 + 7)$

$= \sin(30^\circ)$

$= \frac{1}{2}$

**Question 4.**

Mark the tick against the correct answer in the following:

$$\begin{vmatrix} a+ib & c+id \\ -c+id & a-id \end{vmatrix} = ?$$

A. $(a^2 + b^2 – c^2 – d^2)$

B. $(a^2 – b^2 + c^2 – d^2)$

C. $(a^2 + b^2 + c^2 + d^2)$

D. none of these

**Answer:**

To find: Value of $\begin{vmatrix} a+ib & c+id \\ -c+id & a-ib \end{vmatrix}$

Formula used: $i^2 = -1$

We have, $\begin{vmatrix} a+ib & c+id \\ -c+id & a-ib \end{vmatrix}$

On expanding the above,

$\Rightarrow (a + ib)\,(a – ib) – (-c + id)\,(c + id)$

$\Rightarrow (a^2 – iab + iba – i^2b^2) - (-c^2 – icd + icd + i^2d^2)$

$\Rightarrow \{a^2 – iab + iba – (-1)b^2\} – \{-c^2 – icd + icd + (-1)d^2\}$

$\Rightarrow \{a^2 – iab + iba + 1b^2\} – \{-c^2 – icd + icd - 1d^2\}$

$\Rightarrow a^2 + b^2 + c^2 + d^2$

**Question 5.**

Mark the tick against the correct answer in the following:

If ω is a complex root of unity then $\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{vmatrix} = ?$

A. 1

B. -1

C. 0

D. none of these

**Answer:**

To find: Value of $\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{vmatrix}$

Formula used: $\omega^3 = 1$

We have, $\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{vmatrix}$

On expanding the above along 1st column

$\Rightarrow 1 \begin{vmatrix} \omega^2 & 1 \\ 1 & \omega \end{vmatrix} - \omega \begin{vmatrix} \omega & \omega^2 \\ 1 & \omega \end{vmatrix} + \omega^2 \begin{vmatrix} \omega & \omega^2 \\ \omega^2 & 1 \end{vmatrix}$

$\Rightarrow [1\{(\omega^2)(\omega)-(1)(1)\}] - [\omega\{(\omega)(\omega)-(\omega^2)(1)\}] + [\omega^2\{(\omega)(1)-(\omega^2)(\omega^2)\}]$

$\Rightarrow [1\{\omega^3-1\}]-[\omega\{\omega^2-\omega^2\}]+[\omega^2\{\omega-\omega^4\}]$ ... (i)

As $\omega^3 = 1$,

$\Rightarrow \omega^3.\omega=1.\ \omega$

$\Rightarrow \omega^4= \omega$

Using the above obtained value of $\omega^4$ in eqn. (i)

$\Rightarrow [1\{\omega^3-1\}] - [\omega\{\omega^2-\omega^2\}] + [\omega^2\{\omega-\omega\}]$

$\Rightarrow 1\{\omega^3-1\}$

$\Rightarrow \omega^3 - 1$

$\Rightarrow 1 - 1 = 0$

**Question 6.**
Mark the tick against the correct answer in the following:

If ω is a complex cube root of unity then the value of $\begin{vmatrix} 1 & \omega & 1+\omega \\ 1+\omega & 1 & \omega \\ \omega & 1+\omega & 1 \end{vmatrix}$ is

A. 2

B. 4

C. 0

D. -3

**Answer:**

To find: Value of $\begin{vmatrix} 1 & \omega & 1+\omega \\ 1+\omega & 1 & \omega \\ \omega & 1+\omega & 1 \end{vmatrix}$

Formula used: (i) $\omega^3 = 1$

(ii) $1+\omega+\omega^2 = 0$

We have, $\begin{vmatrix} 1 & \omega & 1+\omega \\ 1+\omega & 1 & \omega \\ \omega & 1+\omega & 1 \end{vmatrix}$

On expanding the above along 1st column

$\Rightarrow 1\begin{vmatrix} \omega^2 & 1 \\ 1 & \omega \end{vmatrix} - \omega \begin{vmatrix} \omega & \omega^2 \\ 1 & \omega \end{vmatrix} + \omega^2 \begin{vmatrix} \omega & \omega^2 \\ \omega^2 & 1 \end{vmatrix}$

$\Rightarrow [1\{(\omega^2)(\omega)-(1)(1)\}]-[\omega\{(\omega)(\omega)-(\omega^2)(1)\}]+[\omega^2\{(\omega)1-(\omega^2)(\omega^2)\}]$

$\Rightarrow [1\{\omega^3-1\}]-[\omega\{\omega^2-\omega^2\}]+[\omega^2\{\omega-\omega^4\}]$ ... (i)

As $\omega^3 = 1$,

$\Rightarrow \omega^3.\omega = 1.\ \omega$

$\Rightarrow \omega^4 = \omega$

Using the above obtained value of $\omega^4$ in eqn. (i)

$\Rightarrow [1\{\omega^3 - 1\}] - [\omega\{\omega^2 - \omega^2\}] + [\omega^2\{\omega - \omega\}]$

$\Rightarrow 1\{\omega^3 - 1\}$

$\Rightarrow \omega^3 - 1$

$\Rightarrow 1 - 1 = 0$

**Question 7.**
Mark the tick against the correct answer in the following:

$$\begin{vmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{vmatrix} = ?$$

A. 8

B. -8

C. 16

D. 142

**Answer:**

To find: Value of $\begin{vmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{vmatrix}$

We have, $\begin{vmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{vmatrix}$

$$\Rightarrow \begin{vmatrix} 1 & 4 & 9 \\ 4 & 9 & 16 \\ 9 & 16 & 25 \end{vmatrix}$$

Applying $R_1 \longrightarrow R_3 - R_1$

$$\Rightarrow \begin{vmatrix} 8 & 12 & 16 \\ 4 & 9 & 16 \\ 9 & 16 & 25 \end{vmatrix}$$

Applying $R_2 \longrightarrow R_1 - R_2$

$$\Rightarrow \begin{vmatrix} 8 & 12 & 16 \\ 4 & 3 & 0 \\ 9 & 16 & 25 \end{vmatrix}$$

Taking 4 common from $R_1$

$$\Rightarrow 4 \begin{vmatrix} 2 & 3 & 4 \\ 4 & 3 & 0 \\ 9 & 16 & 25 \end{vmatrix}$$

Applying $R_1 \longrightarrow R_1 - R_2$

$$\Rightarrow 4 \begin{vmatrix} -2 & 0 & 4 \\ 4 & 3 & 0 \\ 9 & 16 & 25 \end{vmatrix}$$

Taking -2 common from $R_1$

$$\Rightarrow (4)\,(-2) \begin{vmatrix} 1 & 0 & -2 \\ 4 & 3 & 0 \\ 9 & 16 & 25 \end{vmatrix}$$

Applying $R_1 \longrightarrow 9R_1$

$$\Rightarrow \frac{-8}{9} \begin{vmatrix} 9 & 0 & -18 \\ 4 & 3 & 0 \\ 9 & 16 & 25 \end{vmatrix}$$

Applying $R_3 \longrightarrow R_3 - R_1$

$$\Rightarrow \frac{-8}{9}\begin{vmatrix} 9 & 0 & -18 \\ 4 & 3 & 0 \\ 0 & 16 & 43 \end{vmatrix}$$

Taking 9 common from $R_1$

$$\Rightarrow -8\begin{vmatrix} 1 & 0 & -2 \\ 4 & 3 & 0 \\ 0 & 16 & 43 \end{vmatrix}$$

Expanding along $R_1$

⇒ -8 [1[(3)(43)-(16)(0)] – 0 [(4)(43)-(0)(0)] - 2 [(4)(16)-(3)(0)]]

⇒ -8 [[(129)-(0)] - 2 [(64)-(0)]]

⇒ -8 [129 – 128]

⇒ -8

**Question 8.**
Mark the tick against the correct answer in the following:

$$\begin{vmatrix} 1! & 2! & 3! \\ 2! & 3! & 4! \\ 3! & 4! & 5! \end{vmatrix} = ?$$

A. 2

B. 6

C. 24

D. 120

**Answer:**

To find: Value of $\begin{vmatrix} 1! & 2! & 3! \\ 2! & 3! & 4! \\ 3! & 4! & 5! \end{vmatrix}$

We have, $\left|\begin{vmatrix} 1! & 2! & 3! \\ 2! & 3! & 4! \\ 3! & 4! & 5! \end{vmatrix}\right|$

$\Rightarrow \begin{vmatrix} 1 & 2 & 6 \\ 2 & 6 & 24 \\ 6 & 24 & 120 \end{vmatrix}$

Taking 2 common from $R_2$

$\Rightarrow 2 \begin{vmatrix} 1 & 2 & 6 \\ 1 & 3 & 12 \\ 6 & 24 & 120 \end{vmatrix}$

Taking 6 common from $R_3$

$\Rightarrow 2\times6 \begin{vmatrix} 1 & 2 & 6 \\ 1 & 3 & 12 \\ 1 & 4 & 20 \end{vmatrix}$

Applying $R_2 \to R_2 - R_1$

$\Rightarrow 12 \begin{vmatrix} 1 & 2 & 6 \\ 0 & 1 & 6 \\ 1 & 4 & 20 \end{vmatrix}$

Applying $R_3 \to R_3 - R_1$

$\Rightarrow 12 \begin{vmatrix} 1 & 2 & 6 \\ 0 & 1 & 6 \\ 0 & 2 & 14 \end{vmatrix}$

Expanding column 1

$\Rightarrow$ 12 [1{(1)(14)-(6)(2)}]

$\Rightarrow$ 12 [1{(14)-(12)}]

$\Rightarrow$ 12[2]

$\Rightarrow$ 24

**Question 9.**
Mark the tick against the correct answer in the following:

$$\begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix} = ?$$

A. (a + b + c)

B. 3(a + b + c)

C. 3abc

D. 0

**Answer:**

To find: Value of $\begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix}$

We have, $\begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix}$

Applying $R_1 \rightarrow R_1 + R_2$

$$\Rightarrow \begin{vmatrix} a-b+b-c & b-c+c-a & c-a+a-b \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix}$$

$$\Rightarrow \begin{vmatrix} a-c & b-a & c-b \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix}$$

Applying $R_1 \rightarrow R_1 + R_3$

$$\Rightarrow \begin{vmatrix} a-c+c-a & b-a+a-b & c-b+b-c \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix}$$

$$\Rightarrow \begin{vmatrix} 0 & 0 & 0 \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix}$$

If every element of a row is 0 then the value of the determinant will be 0

**Question 10.**
Mark the tick against the correct answer in the following:

$$\begin{vmatrix} 1 & 1+p & 1+p+q \\ 2 & 3+2p & 1+3p+2q \\ 3 & 6+3p & 1+6p+3q \end{vmatrix} = ?$$

A. 0

B. 1

C. -1

D. none of these

**Answer:**
To find: Value of $\begin{vmatrix} 1 & 1+p & 1+p+q \\ 2 & 3+2p & 1+3p+2q \\ 3 & 6+3p & 1+6p+3q \end{vmatrix}$

We have, $\begin{vmatrix} 1 & 1+p & 1+p+q \\ 2 & 3+2p & 1+3p+2q \\ 3 & 6+3p & 1+6p+3q \end{vmatrix}$

Applying $R_2 \rightarrow R_2 - 2R_1$

$$\Rightarrow \begin{vmatrix} 1 & 1+p & 1+p+q \\ 0 & 1 & p-2 \\ 3 & 6+3p & 1+6p+3q \end{vmatrix}$$

Applying $R_3 \rightarrow R_3 - 3R_1$

$$\Rightarrow \begin{vmatrix} 1 & 1+p & 1+p+q \\ 0 & 1 & p-2 \\ 0 & 3 & 3p-2 \end{vmatrix}$$

Expanding along $C_1$

$\Rightarrow$ [1{(1)(3p-2)-(3)(p-2)}]

$\Rightarrow 1$

**Question 11.**
Mark the tick against the correct answer in the following:

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^3 & b^3 & c^3 \end{vmatrix} = ?$$

A. (a – b) (b – c) (c – a)

B. -(a – b) (b – c) (c – a)

C. (a – b) (b – c) (c – a) (a + b + c)

D. abc (a – b)(b – c) (c – a)

**Answer:**

To find: Value of $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^3 & b^3 & c^3 \end{vmatrix}$

We have, $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^3 & b^3 & c^3 \end{vmatrix}$

Applying $C_2 \rightarrow C_2 - C_1$

$$\Rightarrow \begin{vmatrix} 1 & 0 & 1 \\ a & b-a & c \\ a^3 & b^3-a^3 & c^3 \end{vmatrix}$$

Applying $C_3 \rightarrow C_3 - C_1$

$$\Rightarrow \begin{vmatrix} 1 & 0 & 0 \\ a & b-a & c-a \\ a^3 & b^3-a^3 & c^3-a^3 \end{vmatrix}$$

We know, $x^3 - y^3 = (x - y)(x^2+xy+y^2)$

$$\Rightarrow \begin{vmatrix} 1 & 0 & 0 \\ a & b-a & c-a \\ a^3 & (b-a)(b^2+ab+a^2) & (c-a)(c^2+ca+a^2) \end{vmatrix}$$

Taking (b-a) common from $C_2$

$$\Rightarrow (b-a) \begin{vmatrix} 1 & 0 & 0 \\ a & 1 & c-a \\ a^3 & (b^2+ab+a^2) & (c-a)(c^2+ca+a^2) \end{vmatrix}$$

Taking (c-a) common from $C_2$

$$\Rightarrow (b-a)(c-a) \begin{vmatrix} 1 & 0 & 0 \\ a & 1 & 1 \\ a^3 & (b^2+ab+a^2) & (c^2+ca+a^2) \end{vmatrix}$$

Expanding along $C_1$

$\Rightarrow (b - a)\ (c - a)[1\{(1)(c^2 + ca + a^2) - (b^2 + ab + a^2)(1)\}]$

$\Rightarrow (b - a)\ (c - a)[c^2 + ca + a^2 - b^2 - ab - a^2]$

$\Rightarrow (b - a)\ (c - a)[c^2 - b^2 + ca - ab]$

$\Rightarrow (b - a)\ (c - a)[(c - b)\ (c + b) + a(c - b)]$

$\Rightarrow (b - a)\ (c - a)[(a + b + c)(c - b)]$

$\Rightarrow (a - b)\ (b - c)\ (c - a)\ (a + b + c)$

**Question 12.**

Mark the tick against the correct answer in the following:

$$\begin{vmatrix} \sin\alpha & \cos\alpha & \sin(\alpha+\delta) \\ \sin\beta & \cos\beta & \sin(\beta+\delta) \\ \sin\gamma & \cos\gamma & \sin(\gamma+\delta) \end{vmatrix} = ?$$

A. 0

B. 1

C. sin (α + δ) + sin (β + δ)+ sin (γ + δ)

D. none of these

**Answer:**

To find: Value of $\begin{vmatrix} \sin\alpha & \cos\alpha & \sin(\alpha+\delta) \\ \sin\beta & \cos\beta & \sin(\beta+\delta) \\ \sin\gamma & \cos\gamma & \sin(\gamma+\delta) \end{vmatrix}$

Formula Used: sin(A+B) = sinAcosB+cosAsinB

We have, $\begin{vmatrix} \sin\alpha & \cos\alpha & \sin(\alpha+\delta) \\ \sin\beta & \cos\beta & \sin(\beta+\delta) \\ \sin\gamma & \cos\gamma & \sin(\gamma+\delta) \end{vmatrix}$

Applying $C_1 \rightarrow \cos(\delta)C_1$

$$\Rightarrow \begin{vmatrix} \sin\alpha\cos\delta & \cos\alpha & \sin(\alpha+\delta) \\ \sin\beta\cos\delta & \cos\beta & \sin(\beta+\delta) \\ \sin\gamma\cos\delta & \cos\gamma & \sin(\gamma+\delta) \end{vmatrix}$$

Applying $C_2 \rightarrow \sin(\delta)C_2$

$$\Rightarrow \begin{vmatrix} \sin\alpha\cos\delta & \cos\alpha\sin\delta & \sin(\alpha+\delta) \\ \sin\beta\cos\delta & \cos\beta\sin\delta & \sin(\beta+\delta) \\ \sin\gamma\cos\delta & \cos\gamma\sin\delta & \sin(\gamma+\delta) \end{vmatrix}$$

We know, sin(A+B) = sinAcosB+cosAsinB

$$\Rightarrow \begin{vmatrix} \sin\alpha\cos\delta & \cos\alpha\sin\delta & \sin\alpha\cos\delta + \cos\alpha\sin\delta \\ \sin\beta\cos\delta & \cos\beta\sin\delta & \sin\beta\cos\delta + \cos\beta\sin\delta \\ \sin\gamma\cos\delta & \cos\gamma\sin\delta & \sin\gamma\cos\delta + \cos\gamma\sin\delta \end{vmatrix}$$

Applying $C_3 \rightarrow C_3 - C_1$

$$\Rightarrow \begin{vmatrix} \sin\alpha\cos\delta & \cos\alpha\sin\delta & \sin\alpha\cos\delta + \cos\alpha\sin\delta - \sin\alpha\cos\delta \\ \sin\beta\cos\delta & \cos\beta\sin\delta & \sin\beta\cos\delta + \cos\beta\sin\delta - \sin\beta\cos\delta \\ \sin\gamma\cos\delta & \cos\gamma\sin\delta & \sin\gamma\cos\delta + \cos\gamma\sin\delta - \sin\gamma\cos\delta \end{vmatrix}$$

$$\Rightarrow \begin{vmatrix} \sin\alpha\cos\delta & \cos\alpha\sin\delta & \cos\alpha\sin\delta \\ \sin\beta\cos\delta & \cos\beta\sin\delta & \cos\beta\sin\delta \\ \sin\gamma\cos\delta & \cos\gamma\sin\delta & \cos\gamma\sin\delta \end{vmatrix}$$

= 0

When two columns are identical then the value of determinant is 0

**Question 13.**
Mark the tick against the correct answer in the following:

If a, b, c be distinct positive real numbers then the value of $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ is

A. positive

B. negative

C. a perfect square

D. 0

**Answer:**

To find: Nature of $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$

We have, $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$

Applying $C_1 \to C_1 + C_2 + C_3$

$$\Rightarrow \begin{vmatrix} a+b+c & b+c+a & c+a+b \\ b & c & a \\ c & a & b \end{vmatrix}$$

Taking (a+b+c) common from $R_1$

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

Expanding along $R_1$

$\Rightarrow (a+b+c)[1\{(b)(c)-(a)(a)\} – 1\{(b)(b)-(c)(a)\} + 1\{(a)(b)-(c)(c)\}]$

$\Rightarrow (a+b+c)[1\{bc-a^2\} – 1\{b^2-ca\} + 1\{ba - c^2\}]$

$\Rightarrow (a+b+c)[bc - a^2 –b^2 + ca + ab - c^2]$

$\Rightarrow -(a+b+c)[ c^2 + a^2 + b^2 - ca - bc – ba ]$

$\Rightarrow -\frac{1}{2}(a+b+c)\ 2[ c^2 + a^2 + b^2 - ca - bc – ba ]$

$\Rightarrow -\frac{1}{2}(a+b+c)\ [2c^2 + 2a^2 + 2b^2 - 2ca - 2bc – 2ba]$

$\Rightarrow -\frac{1}{2}(a+b+c)\ [c^2 + a^2 - 2ca + c^2 + b^2 - 2bc + a^2 + b^2 - 2ba]$

$\Rightarrow -\frac{1}{2}(a+b+c)\ [(c-a)^2 +(c-b)^2 +(a-b)^2]$

Clearly, we can see that the answer is negative

**Question 14.**
Mark the tick against the correct answer in the following:

$$\begin{vmatrix} x+y & x & x \\ 5x+4y & 4x & 2x \\ 10x+8y & 8x & 3x \end{vmatrix} = ?$$

A. 0

B. $x^3$

C. $y^3$

D. none of these

**Answer:**

To find: Value of $\begin{vmatrix} x+y & x & x \\ 5x+4y & 4x & 2x \\ 10x+8y & 8x & 3x \end{vmatrix}$

We have, $\begin{vmatrix} x+y & x & x \\ 5x+4y & 4x & 2x \\ 10x+8y & 8x & 3x \end{vmatrix}$

Applying $R_2 \to 2R_2$

$$\Rightarrow \frac{1}{2}\begin{vmatrix} x+y & x & x \\ 10x+8y & 8x & 4x \\ 10x+8y & 8x & 3x \end{vmatrix}$$

Applying $R_2 \to R_2 - R_3$

$$\Rightarrow \frac{1}{2}\begin{vmatrix} x+y & x & x \\ 0 & 0 & x \\ 10x+8y & 8x & 3x \end{vmatrix}$$

Applying $R_1 \to 8R_1$

$$\Rightarrow \frac{1}{2\times 8}\begin{vmatrix} 8x+8y & 8x & 8x \\ 0 & 0 & x \\ 10x+8y & 8x & 3x \end{vmatrix}$$

Applying $R_3 \to R_3 - R_1$

$$\Rightarrow \frac{1}{16}\begin{vmatrix} 8x+8y & 8x & 8x \\ 0 & 0 & x \\ 2x & 0 & -5x \end{vmatrix}$$

Expanding along $R_2$

$$\Rightarrow \frac{1}{16}[x\{(2x)(8x) - (8x+8y)(0)\}]$$

$$\Rightarrow \frac{1}{16}[x\{16x^2\}]$$

$\Rightarrow x^3$

**Question 15.**

Mark the tick against the correct answer in the following:

$$\begin{vmatrix} a^2+2a & 2a+1 & 1 \\ 2a+1 & a+2 & 1 \\ 3 & 3 & 1 \end{vmatrix} = ?$$

A. (a – 1)

B. $(a-1)^2$

C. $(a-1)^3$

D. none of these

**Answer:**

To find: Value of $\begin{vmatrix} a^2+2a & 2a+1 & 1 \\ 2a+1 & a+2 & 1 \\ 3 & 3 & 1 \end{vmatrix}$

We have, $\begin{vmatrix} a^2+2a & 2a+1 & 1 \\ 2a+1 & a+2 & 1 \\ 3 & 3 & 1 \end{vmatrix}$

Applying $R_1 \rightarrow R_1 - R_2$

$$\Rightarrow \begin{vmatrix} a^2-1 & a-1 & 0 \\ 2a+1 & a+2 & 1 \\ 3 & 3 & 1 \end{vmatrix}$$

Applying $R_2 \rightarrow R_2 - R_3$

$$\Rightarrow \begin{vmatrix} a^2-1 & a-1 & 0 \\ 2a-2 & a-1 & 0 \\ 3 & 3 & 1 \end{vmatrix}$$

Expanding along $C_3$

$\Rightarrow [1\{(a^2-1)(a-1) - (a-1)(2a-2)\}]$

$\Rightarrow [1\{(a-1)(a+1)(a-1) - (a-1)2(a-1)\}]$

$\Rightarrow [\{(a+1)(a-1)^2 - 2(a-1)^2\}]$

$\Rightarrow [\{(a-1)^2 (a+1-2)\}]$

$\Rightarrow [\{(a-1)^2 (a-1)\}]$

$\Rightarrow (a-1)^3$

**Question 16.**
Mark the tick against the correct answer in the following:

$$\begin{vmatrix} a & a+2b & a+2b+3c \\ 3a & 4a+6b & 5a+7b+9c \\ 6a & 9a+12b & 11a+15b+18c \end{vmatrix} = ?$$

A. $a^3$

B. $-a^3$

C. 0

D. none of these

**Answer:**

To find: Value of $\begin{vmatrix} a & a+2b & a+2b+3c \\ 3a & 4a+6b & 5a+7b+9c \\ 6a & 9a+12b & 11a+15b+18c \end{vmatrix}$

We have, $\begin{vmatrix} a & a+2b & a+2b+3c \\ 3a & 4a+6b & 5a+7b+9c \\ 6a & 9a+12b & 11a+15b+18c \end{vmatrix}$

Applying $R_3 \rightarrow R_3 - 2R_2$

$\Rightarrow \begin{vmatrix} a & a+2b & a+2b+3c \\ 3a & 4a+6b & 5a+7b+9c \\ 0 & a & a+b \end{vmatrix}$

Applying $R_2 \rightarrow R_2 - 3R_1$

$$\Rightarrow \begin{vmatrix} a & a+2b & a+2b+3c \\ 0 & a & 2a+b \\ 0 & a & a+b \end{vmatrix}$$

Expanding along $C_1$

$\Rightarrow$ [a{(a) (a+b) – (a)(2a+b)}]

$\Rightarrow$ [a{($a^2$ + ab) – ($2a^2$+ab)}]

$\Rightarrow$ [a{$a^2$ + ab – $2a^2$ - ab}]

$\Rightarrow$ [a{–$a^2$}]

$\Rightarrow$ $-a^3$

**Question 17.**
Mark the tick against the correct answer in the following:

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

A. (a + b + c) (a – c)

B. (a + b + c) (b – c)

C. (a + b + c) $(a - c)^2$

D. (a + b + c) $(b - c)^2$

**Answer:**
To find: Value of $\begin{vmatrix} b+c & a & b \\ c+a & c & a \\ a+b & b & c \end{vmatrix}$

We have, $\begin{vmatrix} b+c & a & b \\ c+a & c & a \\ a+b & b & c \end{vmatrix}$

Applying $R_1 \rightarrow R_1 + R_2 + R_3$

$$\Rightarrow \begin{vmatrix} b+c+c+a+a+b & a+c+b & b+a+c \\ c+a & c & a \\ a+b & b & c \end{vmatrix}$$

$$\Rightarrow \begin{vmatrix} 2(a+b+c) & a+b+c & a+b+c \\ c+a & c & a \\ a+b & b & c \end{vmatrix}$$

$$\Rightarrow (a+b+c)\begin{vmatrix} 2 & 1 & 1 \\ c+a & c & a \\ a+b & b & c \end{vmatrix}$$

Expanding along $R_1$

$\Rightarrow$ (a+b+c)[2{(c) (c) – (b) (a)} -1{(c+a)(c)-(a+b)(a)} + 1{(c+a)(b)-(a+b)(c)}]

$\Rightarrow$ (a+b+c)[2{$c^2$ – ab} -1{$c^2$+ac-$a^2$-ab} + 1{bc+ba-ac-bc}]

$\Rightarrow$ (a+b+c)[2$c^2$ – 2ab - $c^2$ – ac + $a^2$ + ab + ba - ac]

$\Rightarrow$ (a+b+c)[$c^2$ + $a^2$ - 2ac]

$\Rightarrow$ (a+b+c)$(c – a)^2$

**Question 18.**
Mark the tick against the correct answer in the following:

$$\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix} = ?$$

A. (x + y)

B. (x – y)

C. xy

D. none of these

**Answer:**

To find: Value of $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$

We have, $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$

Applying $R_1 \rightarrow R_2 - R_1$

$\Rightarrow \begin{vmatrix} 0 & -x & 0 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$

Expanding along $R_1$

$\Rightarrow [x\{(1)(1+y)-(1)(1)\}]$

$\Rightarrow [x\{1+y-1\}]$

$\Rightarrow xy$

**Question 19.**
Mark the tick against the correct answer in the following:

$$\begin{vmatrix} bc & b+c & 1 \\ ca & c+a & 1 \\ ab & a+b & 1 \end{vmatrix} = ?$$

A. (a – b) (b – c) (c – a)

B. -(a – b) (b – c) (c – a)

C. (a + b) (b + c) (c + a)

D. None of these

**Answer:**

To find: Value of $\begin{vmatrix} bc & b+c & 1 \\ ca & a+c & 1 \\ ab & a+b & 1 \end{vmatrix}$

We have, $\begin{vmatrix} bc & b+c & 1 \\ ca & a+c & 1 \\ ab & a+b & 1 \end{vmatrix}$

Applying $R_1 \rightarrow R_2 - R_1$

$$\Rightarrow \begin{vmatrix} bc-ca & b-a & 0 \\ ca & a+c & 1 \\ ab & a+b & 1 \end{vmatrix}$$

$$\Rightarrow \begin{vmatrix} c(b-a) & b-a & 0 \\ ca & a+c & 1 \\ ab & a+b & 1 \end{vmatrix}$$

Taking (b – a) common

$$\Rightarrow (b-a) \begin{vmatrix} c & 1 & 0 \\ ca & a+c & 1 \\ ab & a+b & 1 \end{vmatrix}$$

Applying $R_2 \rightarrow R_2 - R_3$

$$\Rightarrow (b-a) \begin{vmatrix} c & 1 & 0 \\ ca-ab & c-b & 0 \\ ab & a+b & 1 \end{vmatrix}$$

$$\Rightarrow (b-a) \begin{vmatrix} c & 1 & 0 \\ a(c-b) & c-b & 0 \\ ab & a+b & 1 \end{vmatrix}$$

Taking (c - b) common

$$\Rightarrow (b-a)\,(c-b) \begin{vmatrix} c & 1 & 0 \\ a & 1 & 0 \\ ab & a+b & 1 \end{vmatrix}$$

Expanding along $C_3$

$\Rightarrow$ (b – a) (c – b) [1{(c) (1) – (a) (1)}]

$\Rightarrow$ (b – a) (c – b) (c – a)

$\Rightarrow$ (a – b) (b – c) (c – a)

**Question 20.**
Mark the tick against the correct answer in the following:

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

A. 4abc

B. 2(a + b + c)

C. (ab + bc + ca)

D. none of these

**Answer:**
To find: Value of $\begin{vmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{vmatrix}$

We have, $\begin{vmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{vmatrix}$

Applying $R_1 \rightarrow R_1 + R_2 + R_3$

$$\Rightarrow \begin{vmatrix} b+c+b+c & a+c+a+c & a+b+a+b \\ b & c+a & b \\ c & c & a+b \end{vmatrix}$$

Taking 2 common

$$\Rightarrow 2\begin{vmatrix} b+c & a+c & a+b \\ b & c+a & b \\ c & c & a+b \end{vmatrix}$$

Applying $R_1 \rightarrow R_1 - R_2$

$$\Rightarrow 2\begin{vmatrix} c & 0 & a \\ b & c+a & b \\ c & c & a+b \end{vmatrix}$$

Expanding along $R_1$

$\Rightarrow 2\ [c\{(c + a)\ (a + b) - (b)\ (c)\} + a\{(b)(c) - (c)\ (c + a)\}]$

$\Rightarrow 2\ [c\{(ac + cb + a^2 + ab - bc\} + a\{(bc - c^2 - ac)\}]$

$\Rightarrow 2\ [c\{(ac + a^2 + ab)\} + a\{(bc - c^2 - ac)\}]$

$\Rightarrow 2\ [ac^2 + ca^2 + abc + abc - ac^2 - a^2c]$

$\Rightarrow 2\ [2abc]$

$\Rightarrow 4abc$

**Question 21.**
Mark the tick against the correct answer in the following:

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

A. a + b+ c

B. 2(a + b + c)

C. 4abc

D. $a^2b^2c^2$

**Answer:**

To find: Value of $\begin{vmatrix} a & 1 & b+c \\ b & 1 & c+a \\ c & 1 & a+b \end{vmatrix}$

We have, $\begin{vmatrix} a & 1 & b+c \\ b & 1 & c+a \\ c & 1 & a+b \end{vmatrix}$

Applying $R_2 \rightarrow R_2 - R_1$

$$\Rightarrow \begin{vmatrix} a & 1 & b+c \\ b-a & 0 & a-b \\ c & 1 & a+b \end{vmatrix}$$

Taking (a - b) common

$$\Rightarrow (a-b)\begin{vmatrix} a & 1 & b+c \\ -1 & 0 & a-b \\ c & 1 & a+b \end{vmatrix}$$

Applying $R_3 \rightarrow R_3 - R_1$

$$\Rightarrow (a-b)\begin{vmatrix} a & 1 & b+c \\ -1 & 0 & a-b \\ c-a & 0 & a-c \end{vmatrix}$$

Taking (c-a) common

$$\Rightarrow (b-a)(c-a)\begin{vmatrix} a & 1 & b+c \\ -1 & 0 & a-b \\ 1 & 0 & -1 \end{vmatrix}$$

Expanding along $R_1$

$= (b - a)(c - a)[0 - 1(1 - (a - b)) + (b + c)(0)]$

$= (b - a)(c - a)(-1 + a - b)$

$= (b - a)(c - a)(a - b - 1)$

$= (b - a)(ac - bc - c - a^2 + ab + a)$

$= (abc - b^2c - bc - a^2b + ab^2 + ab - a^2c + abc + ac + a^3 + a^2b + a^2)$

$= 4abc$

**Question 22.**

Mark the tick against the correct answer in the following:

$$\begin{vmatrix} x+1 & x+2 & x+4 \\ x+3 & x+5 & x+8 \\ x+7 & x+10 & x+14 \end{vmatrix} = ?$$

A. -2

B. 2

C. $x^2 - 2$

D. $x^2 + 2$

**Answer:**

To find: Value of $\begin{vmatrix} x+1 & x+2 & x+4 \\ x+3 & x+5 & x+8 \\ x+7 & x+10 & x+14 \end{vmatrix}$

We have, $\begin{vmatrix} x+1 & x+2 & x+4 \\ x+3 & x+5 & x+8 \\ x+7 & x+10 & x+14 \end{vmatrix}$

Applying $R_1 \rightarrow R_2 - R_1$

$\Rightarrow \begin{vmatrix} 2 & 3 & 4 \\ x+3 & x+5 & x+8 \\ x+7 & x+10 & x+14 \end{vmatrix}$

Applying $R_2 \rightarrow R_3 - R_2$

$\Rightarrow \begin{vmatrix} 2 & 3 & 4 \\ 4 & 5 & 6 \\ x+7 & x+10 & x+14 \end{vmatrix}$

Expanding along $R_1$

$\Rightarrow [2\{(5)(x+14) – (6)(x+10)\} – 3\{(4)(x+14) – (6)(x+7)\} + 4 \{(4)(x+10) – (5)(x+7)\}]$

$\Rightarrow [2\{5x + 70 – 6x – 60\} – 3\{4x + 56 -6x - 42\} + 4 \{4x + 40 – 5x - 35\}]$

$\Rightarrow [2\{10 - x\} – 3\{14 -2x\} + 4 \{5 - x\}]$

$\Rightarrow$ [20 – 2x – 42 + 6x + 20 - 4x]

$\Rightarrow$ -2

**Question 23.**
Mark the tick against the correct answer in the following:

If $\begin{vmatrix} 5 & 3 & -1 \\ -7 & x & 2 \\ 9 & 6 & -2 \end{vmatrix} = 0$ then x = ?

A. 0

B. 6

C. -6

D. 9

**Answer:**
To find: Value of x

We have, $\begin{vmatrix} 5 & 3 & -1 \\ -7 & x & 2 \\ 9 & 6 & -2 \end{vmatrix} = 0$

Applying $R_1 \rightarrow 2R_1$

$\Rightarrow \begin{vmatrix} 10 & 6 & -2 \\ -7 & x & 2 \\ 9 & 6 & -2 \end{vmatrix} = 0$

Applying $R_1 \rightarrow R_1 - R_3$

$\Rightarrow \begin{vmatrix} 1 & 0 & 0 \\ -7 & x & 2 \\ 9 & 6 & -2 \end{vmatrix} = 0$

Expanding along $R_1$

$\Rightarrow$ [1{(x)(-2) – (6)(2)}] = 0

$\Rightarrow$ [1{-2x – 12}] = 0

$\Rightarrow$ -2x-12 = 0

$\Rightarrow$ -2x = 12

$\Rightarrow$ x = -6

**Question 24.**
Mark the tick against the correct answer in the following:

The solution set of the equation $\begin{vmatrix} x & 3 & 7 \\ 2 & x & 2 \\ 7 & 6 & x \end{vmatrix} = 0$ is

A. {2, -3. 7}

B. {2, 7. -9}

C. [-2, 3, -7}

D. none of these

**Answer:**
To find: Value of x

We have, $\begin{vmatrix} x & 3 & 7 \\ 2 & x & 2 \\ 7 & 6 & x \end{vmatrix} = 0$

Applying $R_1 \rightarrow 2R_1$

$\Rightarrow \begin{vmatrix} 2x & 6 & 14 \\ 2 & x & 2 \\ 7 & 6 & x \end{vmatrix} = 0$

Applying $R_1 \rightarrow R_1 - R_3$

$\Rightarrow \begin{vmatrix} 2x-7 & 0 & 14-x \\ 2 & x & 2 \\ 7 & 6 & x \end{vmatrix} = 0$

Expanding along $R_1$

$\Rightarrow [(2x-7)\{(x)(x) - (6)(2)\} + (14-x)\{(2)(6) - (x)(7)] = 0$

$\Rightarrow [(2x-7)\{x^2 - 12\} + (14-x)\{12 - 7x\}] = 0$

$\Rightarrow [2x^3 - 24x - 7x^2 + 84 + 168 - 98x - 12x + 7x^2] = 0$

$\Rightarrow [2x^3 - 134x + 252] = 0$

$\Rightarrow [x^3 - 67x + 126] = 0$

By Hit and trial x = -2, 3, -7

**Question 25.**
Mark the tick against the correct answer in the following:

The solution set of the equation $\begin{vmatrix} x-2 & 2x-3 & 3x-4 \\ x-4 & 2x-9 & 3x-16 \\ x-8 & 2x-27 & 2x-64 \end{vmatrix} = 0$ is

A. {4}

B. {2, 4}

C. {2, 8}

D. {4, 8}

**Answer:**
To find: Value of x

We have, $\begin{vmatrix} x-2 & 2x-3 & 3x-4 \\ x-4 & 2x-9 & 3x-16 \\ x-8 & 2x-27 & 3x-64 \end{vmatrix} = 0$

Applying $C_2 \rightarrow C_2 - 2C_1$

$\Rightarrow \begin{vmatrix} x-2 & 1 & 3x-4 \\ x-4 & -1 & 3x-16 \\ x-8 & -11 & 3x-64 \end{vmatrix} = 0$

Applying $C_3 \rightarrow C_3 - 3C_1$

$$\Rightarrow \begin{vmatrix} x-2 & 1 & 2 \\ x-4 & -1 & -4 \\ x-8 & -11 & -40 \end{vmatrix} = 0$$

Expanding along $R_1$

$\Rightarrow$ [x-2{(-1)(-40) – (-4)(-11)} -1 {(x-4)(-40) – (-4)(x-8)} + 2 {(x-4)(-11) – (-1)(x-8)] = 0

$\Rightarrow$ [(x-2){40-44} -1 {(-40x + 160 + 4x – 32} + 2 {-11x + 44 + x - 8}] = 0

$\Rightarrow$ [(x-2){-4} -1 {(- 36x + 128} + 2 {-10x+36}] = 0

$\Rightarrow$ [-4x + 8 + 36x - 128 - 20x + 72] = 0

$\Rightarrow$ 12x – 48 = 0

$\Rightarrow$ x = 4

**Question 26.**
Mark the tick against the correct answer in the following:

The solution set of the equation $\begin{vmatrix} a+x & a-x & a-x \\ a-x & a+x & a-x \\ a-x & a-x & a+x \end{vmatrix} = 0$ is

A. {a, 0}

B. {3a, 0}

C. {a, 3a}

D. None of these

**Answer:**
To find: Value of x

We have, $\begin{vmatrix} a+x & a-x & a-x \\ a-x & a+x & a-x \\ a-x & a-x & a+x \end{vmatrix} = 0$

Applying $R_1 \to R_1 - R_2$

$$\Rightarrow \begin{vmatrix} 2x & -2x & 0 \\ a-x & a+x & a-x \\ a-x & a-x & a+x \end{vmatrix} = 0$$

Applying $R_2 \to R_2 - R_3$

$$\Rightarrow \begin{vmatrix} 2x & -2x & 0 \\ 0 & 2x & -2x \\ a-x & a-x & a+x \end{vmatrix} = 0$$

Taking 2 common from $R_1$

$$\Rightarrow 2\begin{vmatrix} x & -x & 0 \\ 0 & 2x & -2x \\ a-x & a-x & a+x \end{vmatrix} = 0$$

Taking 2 common from $R_2$

$$\Rightarrow 2 \times 2\begin{vmatrix} x & -x & 0 \\ 0 & x & -x \\ a-x & a-x & a+x \end{vmatrix} = 0$$

Applying $R_3 \to R_1 + R_3$

$$\Rightarrow 4\begin{vmatrix} x & -x & 0 \\ 0 & x & -x \\ a & a-2x & a+x \end{vmatrix} = 0$$

Expanding along $R_1$

$\Rightarrow 4[x\{(x)(a+x) - (-x)(a-2x)\}] - (-x)\{(0)(a+x) - (-x)(a)\}] = 0$

$\Rightarrow 4[x\{ax + x^2 + ax - 2x^2\}] - (-x)\{ax\}] = 0$

$\Rightarrow 4[x\{2ax - x^2\}] + ax^2] = 0$

$\Rightarrow 4[2ax^2 - x^3 + ax^2] = 0$

$\Rightarrow - x^2 + 3ax = 0$

$\Rightarrow -x(x - 3a) = 0$

$\Rightarrow x = 0$ , or $x = 3a$

**Question 27.**
Mark the tick against the correct answer in the following:

The solution set of the equation $\begin{vmatrix} 3x-8 & 3 & 3 \\ 3 & 3x-8 & 3 \\ 3 & 3 & 3x-8 \end{vmatrix} = 0$ is

A. $\left\{\frac{2}{3}, \frac{8}{3}\right\}$

B. $\left\{\frac{2}{3}, \frac{11}{3}\right\}$

C. $\left\{\frac{3}{2}, \frac{8}{3}\right\}$

D. None of these

**Answer:**
To find: Value of x

We have, $\begin{vmatrix} 3x-8 & 3 & 3 \\ 3 & 3x-8 & 3 \\ 3 & 3 & 3x-8 \end{vmatrix} = 0$

Applying $R_1 \to R_1 - R_2$

$\Rightarrow \begin{vmatrix} 3x-11 & 11-3x & 0 \\ 3 & 3x-8 & 3 \\ 3 & 3 & 3x-8 \end{vmatrix} = 0$

Applying $R_2 \to R_2 - R_3$

$$\Rightarrow \begin{vmatrix} 3x-11 & 11-3x & 0 \\ 0 & 3x-11 & 11-3x \\ 3 & 3 & 3x-8 \end{vmatrix} = 0$$

Expanding along $R_1$

⇒ (3x-11){(3x-11)(3x-8) – (3)(11-3x)} – (11-3x){(0)((3x-8) – (11-3x)(3)} = 0

⇒ (3x-11){(3x-11)(3x-8+3)} – (11-3x){–(11-3x)(3)} = 0

⇒ $(3x-11)^2(3x-5)\} + (3x-11)\{(3x-11)(3)\} = 0$

⇒ $(3x-11)^2(3x-5)\} + (3x-11)^2(3)\} = 0$

⇒ $(3x-11)^2(3x-5+3) = 0$

⇒ $(3x-11)^2(3x-2) = 0$

$\Rightarrow x = \frac{11}{3}$, Or, $x = \frac{2}{3}$

**Question 28.**
Mark the tick against the correct answer in the following:

The vertices of a a ABC are A(-2, 4), B(2, -6) and C(5, 4). The area of a ABC is

A. 17.5 sq units

B. 35 sq units

C. 32 sq units

D. 28 sq units

**Answer:**
To find: Area of ABC

Given: A(-2,4), B(2,-6) and C(5,4)

Formula used: $\Delta = \frac{1}{2}\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}$

We have, A(-2,4), B(2,6) and C(5,4)

$$\Delta = \frac{1}{2}\begin{vmatrix} -2 & 4 & 1 \\ 2 & -6 & 1 \\ 5 & 4 & 1 \end{vmatrix}$$

Expanding along $R_1$

$\Rightarrow \frac{1}{2}$ [-2{(-6)(1)-(4)(1)-4 {(2)(1)-(5)(1)}+1 {(2)(4)-(5)(-6)}]

$\Rightarrow \frac{1}{2}$ [-2{-6-4} -4 {2-5}+1 {8+30}]

$\Rightarrow \frac{1}{2}$ [-2{-10} - 4{-3}+1 {38}]

$\Rightarrow \frac{1}{2}$ [20 + 12 + 38]

$\Rightarrow \frac{1}{2}$ [70]

$\Rightarrow$ 35 sq. units

**Question 29.**
Mark the tick against the correct answer in the following:

If the points A(3, -2), B(k, 2) and C(8, 8) are collinear then the value of k is

A. 2

B. -3

C. 5

D. -4

**Answer:**
To find: Area of ABC

Given: A(3,-2), B(k,2) and C(8,8)

The formula used: $\Delta = \frac{1}{2}\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = 0$

We have, A(3,-2), B(k,2) and C(8,8)

$$\Delta = \frac{1}{2}\begin{vmatrix} 3 & -2 & 1 \\ k & 2 & 1 \\ 8 & 8 & 1 \end{vmatrix}$$

Expanding along $R_1$

$\Rightarrow \frac{1}{2}$ [3{(2)(1)-(8)(1)} - (-2){(k)(1)-(8)(1)}+ 1{(k)(8)-(2)(8)}] = 0

$\Rightarrow \frac{1}{2}$ [3{2-8} + 2{k-8}+ 1{8k-16}]=0

⇒ -18 +2k - 16 + 8k -16 = 0

⇒ 10k -50 = 0

⇒ k = 5