# Matrices - Class XII

## Related Questions with Solutions

## Questions

### Quetion: 01

If the system of linear equations :
$x+ay+z=3$
$x+2y+2z=6$
$x+5y+3z=b$
has no solution, then

A. $a=-1, b=9$
B. $a\neq -1, b=9$
C. $a=1, b\neq 9$
D. $a=-1, b\neq 9$

### Quetion: 02

The number of values of $k$ , for which the system of equations $(k+1)x+8y=4k, kx+(k+3)y=3k-1$ has no solution, is

A. 1
B. 2
C. 3
D. infinite

### Quetion: 03

Consider the system of linear equations
$x_1+2x_2+x_3=3$
$2x_1+3x_2+x_3=3$
$3x_1+5x_2+2x_3=1$
The system has

A. infinite number of solutions
B. exactly 3 solutions
C. a unique solution
D. no solution

### Quetion: 04

The system of equations $\alpha x+y+z=\alpha-1, x+\alpha y+z=\alpha-1, x+y+\alpha z=\alpha-1$ has no solutions, if $\alpha$ is

A. either –2 or 1
B. -2
C. 1
D. not -2

### Quetion: 05

The values of $k$ for which the system $(k+1)x+8y=0; kx+(k+3)y=0$ has unique solution, are

A. 3, 1
B. –3, 1
C. 3, –1
D. –3, –1

### Quetion: 06

The number of real values of $\lambda$ for which the system of linear equations $2x+4y-\lambda z=0, 4x+\lambda y+2z=0, \lambda x+2y+2z=0$ has infinitely many solutions, is

A. 0

B. 1
C. 2
D. 3

## Solutions

### Solution: 01

The given system of equations has no solution.

$$\therefore \begin{vmatrix} 1 & a & 1 \\ 1 & 2 & 2 \\ 1 & 5 & 3 \end{vmatrix} = 0$$

Applying $R_1 \to R_1 - R_2$ and then $R_2 \to R_2 - R_3$, we get

$$\begin{vmatrix} 0 & a-2 & -1 \\ 0 & -3 & -1 \\ 1 & 5 & 3 \end{vmatrix} = 0 \Rightarrow a = -1$$

Also in addition to above $(\text{adj } A)B \neq O \Rightarrow$ no solution

Here, $\text{adj}(A) = \begin{bmatrix} -4 & 8 & -4 \\ -1 & 2 & -1 \\ 3 & -6 & 3 \end{bmatrix}$

$$\Rightarrow \quad (\text{adj } A)(B) = \begin{bmatrix} -4 & 8 & -4 \\ -1 & 2 & -1 \\ 3 & -6 & 3 \end{bmatrix} \begin{bmatrix} 3 \\ 6 \\ b \end{bmatrix} \neq O$$

$\Rightarrow -12 + 48 - 4b \neq 0 \Rightarrow b \neq 9$

### Solution: 02

The matrix equation is $\begin{bmatrix} k+1 & 8 \\ k & k+3 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4k \\ 3k-1 \end{bmatrix}$

For no solution of $AX = B$ a necessary condition is det $A = 0$.

$$\Rightarrow \begin{vmatrix} k+1 & 8 \\ k & k+3 \end{vmatrix} = 0$$

$\Rightarrow (k+1)(k+3) - 8k = 0 \Rightarrow k^2 + 4k + 3 - 8k = 0$

$\Rightarrow k^2 - 4k + 3 = 0 \Rightarrow (k-1)(k-3) = 0 \therefore k = 1, 3$

For $k = 1$, the equation becomes

$2x + 8y = 4$, $x + 4y = 2$

which is just a single equation in two variables, *i.e.*, $x + 4y = 2$ and it has infinite solutions.

For $k = 3$, the equation becomes

$4x + 8y = 12$, $3x + 6y = 8$

which are parallel lines. So no solution in this case

### Solution: 03

Given system of equations is

$x_1 + 2x_2 + x_3 = 3$

$2x_1 + 3x_2 + x_3 = 3$

$3x_1 + 5x_2 + 2x_3 = 1$

It can be observed that the sum of first two equations yields

$(x_1 + 2x_2 + x_3) + (2x_1 + 3x_2 + x_3) = 3 + 3$

$\Rightarrow \quad 3x_1 + 5x_2 + 2x_3 = 6$

But this contradicts the third equation, *i.e.*,

$3x_1 + 5x_2 + 2x_3 = 1$

So, the system is inconsistent and hence it has no solution.

### Solution: 04

The given system of equations can be written as $AX = B$

For no solution $|A| = 0$ and $(\text{adj } A)(B) \neq O$

Now, $|A| = 0$

$\Rightarrow \alpha^3 - 3\alpha + 2 = 0 \Rightarrow (\alpha - 1)^2(\alpha + 2) = 0$

$\Rightarrow \alpha = 1, -2$

But for $\alpha = 1, |A| = 0$ and $(\text{adj } A)(B) = O$
Also each equation becomes $x + y + z = 0$
$\Rightarrow$ for $\alpha = 1$ there exist infinitely many solution.
Again for $\alpha = -2$
$|A| = 0$ but $(\text{adj } A)(B) \neq O \Rightarrow \exists$ no solution

## Solution: 05

The given system of equations is
$(k+1)x + 8y = 0, kx + (k+3)y = 0$
Coefficient matrix, $A = \begin{bmatrix} k+1 & 8 \\ k & k+3 \end{bmatrix}$
Now, $|A| = \begin{vmatrix} k+1 & 8 \\ k & k+3 \end{vmatrix} = (k+1)(k+3) - 8k$
$= k^2 + 4k + 3 - 8k = k^2 - 4k + 3 = (k-1)(k-3)$
For unique solution $|A| \neq 0$ i.e., $k$ must not be equal to $1$ or $3$.

## Solution: 06

Let $A = \begin{bmatrix} 2 & 4 & -\lambda \\ 4 & \lambda & 2 \\ \lambda & 2 & 2 \end{bmatrix}$
For infinitely many solutions,
$|A| = 0$
$\Rightarrow \begin{vmatrix} 2 & 4 & -\lambda \\ 4 & \lambda & 2 \\ \lambda & 2 & 2 \end{vmatrix} = 0$
$\Rightarrow 2(2\lambda - 4) - 4(8 - 2\lambda) - \lambda\left(8 - \lambda^2\right) = 0$
$\Rightarrow \quad \lambda^3 + 4\lambda - 40 = 0$
$\therefore$ Number of values of $\lambda = 1 \quad (\because \quad \lambda(3) \cdot \lambda(4) < 0)$

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## Correct Options

**Answer:01**
**Correct Options: D**
**Answer:02**
**Correct Options: A**
**Answer:03**
**Correct Options: D**
**Answer:04**
**Correct Options: B**
**Answer:05**
**Correct Options: D**
**Answer:06**
**Correct Options: B**