1. Write the position vector of the point which divides the join of points with position vectors $\overrightarrow{3a} - \overrightarrow{2b}$ and $\overrightarrow{2a} + \overrightarrow{3b}$ in the ratio 2 : 1.

2. Write the number of vectors of unit length perpendicular to both the vectors:18
$\mathbf{a} = 2\hat{i} + \hat{j} + 2\hat{k}$ and $\mathbf{b} = \hat{j} + \hat{k}$

3. Find the vector equation of the plane with intercepts 3, −4, and 2 on the x, y, and z-axis, respectively.

4. If $x \epsilon N$ and $\begin{bmatrix} x+3 & -2 \\ -3x & 2x \end{bmatrix} = 8$,then find the value of $x\cdot$.

5. Use elementary column operation $c_2 \rightarrow c_2 + 2c_1$ in the following matrix equation:
$\begin{bmatrix} 2 & 1 \\ 2 & 0 \end{bmatrix} = \begin{bmatrix} 3 & 1 \\ 2 & 0 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ -1 & 1 \end{bmatrix}$

6. Write the number of all possible matrices of order 2×2 with each entry 1,2 or 3.

7. Evaluate the integral :

$$\int_0^{\frac{\pi}{2}} \frac{\sin^2 x}{\sin x + \cos x} \, dx$$

8. Evaluate the integral:

$$\int_0^{\frac{3}{2}} \left| x \cos(\pi x) \right| \, dx$$

9. In a game a man wins ₹5 for getting a number greater than 4 and loses ₹1 otherwise, when a fair die is thrown. The man decided to thrown the die thrice but to quit as and when he gets a number greater than 4. Find the expected value of the amount he wins/loses.

10. A bag contains 4 balls. Two balls are drawn at random (*withoutreplacement*) and are found to be white. What is the probability that all balls in the bag are white?

11. Evaluate the integral:

$$\int \frac{x^2}{x^4 + x^2 - 2}\, dx$$

12. If $x = a \sin 2t(1 + \cos 2t)$ and $y = b \cos 2t(1 - \cos 2t)$, Find $\frac{dy}{dx}$ at $t = \frac{\pi}{4}$.

13. Find the coordinates of the point where the line through the points $A(3, 4, 1)$ and $B(5, 1, 6)$ crosses the xz plan e. Also find the angle which this line make with the xz plane.

14. Find

$$\int (3x + 1)\sqrt{4 - 3x - 2x^2}\, dx$$