1. Yes, the data is organized in rows and columns.

2. True

3. No

$$(2 \times 3) \cdot (2 \times 3)$$

Not equal – therefore no product can be found

4. $$I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

(2×2)

5. Systems can be solved using:

   a) Inverse Matrices

   b) Cramer's Rule

6. $\begin{bmatrix} 13 & -2 \\ 6 & 1 \end{bmatrix}$

$$2\begin{bmatrix} 3 & 0 \\ 1 & 5 \end{bmatrix} + \begin{bmatrix} 7 & -2 \\ 4 & -9 \end{bmatrix} =$$

$$\begin{bmatrix} 6 & 0 \\ 2 & 10 \end{bmatrix} + \begin{bmatrix} 7 & -2 \\ 4 & -9 \end{bmatrix} =$$

$$\begin{bmatrix} 13 & -2 \\ 6 & 1 \end{bmatrix}$$

7. $\begin{bmatrix} 5 & 17 \\ 2 & -12 \end{bmatrix}$

$$\begin{bmatrix} 6 & -2 \\ 2 & 11 \end{bmatrix} - \begin{bmatrix} 1 & -19 \\ 0 & 23 \end{bmatrix} =$$

$$\begin{bmatrix} 6 & -2 \\ 2 & 11 \end{bmatrix} + \begin{bmatrix} -1 & 19 \\ 0 & -23 \end{bmatrix} =$$

$$\begin{bmatrix} 5 & 17 \\ 2 & -12 \end{bmatrix}$$

8. $\begin{bmatrix} 87 & 30 \\ 11 & 2 \end{bmatrix}$

$$\begin{bmatrix} 5 & 9 \\ 1 & 1 \end{bmatrix} \times \begin{bmatrix} 3 & -3 \\ 8 & 5 \end{bmatrix} =$$

$$\begin{bmatrix} 15 + 72 & -15 + 45 \\ 3 + 8 & -3 + 5 \end{bmatrix} =$$

$$\begin{bmatrix} 87 & 30 \\ 11 & 2 \end{bmatrix}$$

9. $\begin{bmatrix} 8 & -8 \\ -3 & -7 \end{bmatrix}$

$$\begin{bmatrix} 4 & 0 \\ -4 & 5 \end{bmatrix} \times \begin{bmatrix} 2 & -2 \\ 1 & -3 \end{bmatrix} =$$

$$\begin{bmatrix} 8 + 0 & -8 + 0 \\ -8 + 5 & 8 + -15 \end{bmatrix} =$$

$$\begin{bmatrix} 8 & -8 \\ -3 & -7 \end{bmatrix}$$

10. $\begin{bmatrix} -1 & 2 \\ 30 & 9 \end{bmatrix}$

$$\begin{bmatrix} 2 & -1 & 0 \\ 4 & 7 & 1 \end{bmatrix} \times \begin{bmatrix} 1 & 1 \\ 3 & 0 \\ 5 & 5 \end{bmatrix}$$

(2×3) (3×2)

can find product

product will be 2×2

$$\begin{bmatrix} 2 & -1 & 0 \\ 4 & 7 & 1 \end{bmatrix} \times \begin{bmatrix} 1 & 1 \\ 3 & 0 \\ 5 & 5 \end{bmatrix} =$$

$$\begin{bmatrix} 2 + -3 + 0 & 2 + 0 + 0 \\ 4 + 21 + 5 & 4 + 0 + 5 \end{bmatrix} =$$

$$\begin{bmatrix} -1 & 2 \\ 30 & 9 \end{bmatrix}$$

11. (28)

$$\begin{bmatrix} 7 & 7 \\ 1 & 5 \end{bmatrix} \rightarrow \begin{vmatrix} 7 & 7 \\ 1 & 5 \end{vmatrix} = 35 - 7 = 28$$

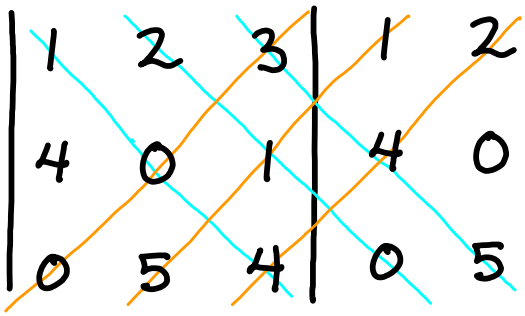
12. (21)

$$\begin{bmatrix} 3 & -2 \\ 6 & 3 \end{bmatrix} \rightarrow \begin{vmatrix} 3 & -2 \\ 6 & 3 \end{vmatrix} = 9 - (-12) = 9 + 12 = 21$$

13. (28)

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 0 & 1 \\ 0 & 5 & 4 \end{bmatrix} \rightarrow \begin{vmatrix} 1 & 2 & 3 \\ 4 & 0 & 1 \\ 0 & 5 & 4 \end{vmatrix} =$$

$$\begin{vmatrix} 1 & 2 & 3 \\ 4 & 0 & 1 \\ 0 & 5 & 4 \end{vmatrix} \begin{matrix} 1 & 2 \\ 4 & 0 \\ 0 & 5 \end{matrix} =$$



$(0 + 0 + 60) - (0 + 5 + 32) = 60 - 37 = (23)$

14. No, because the product of the matrices does not equal the identity matrix I

$$I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} -3 & 3 \\ 3 & -3 \end{bmatrix}\begin{bmatrix} 3 & -3 \\ -3 & 3 \end{bmatrix} \neq \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

15. $A^{-1} = \begin{bmatrix} 1/6 & 1/3 \\ 1/6 & -2/3 \end{bmatrix}$

$$A = \begin{bmatrix} 4 & 2 \\ 1 & -1 \end{bmatrix}$$

$$A^{-1} = \frac{1}{\begin{vmatrix} 4 & 2 \\ 1 & -1 \end{vmatrix}}\begin{bmatrix} -1 & -2 \\ -1 & 4 \end{bmatrix} = \frac{1}{-6}\begin{bmatrix} -1 & -2 \\ -1 & 4 \end{bmatrix}$$

$$A^{-1} = \begin{bmatrix} 1/6 & 1/3 \\ 1/6 & -2/3 \end{bmatrix}$$

16. $x=3,\ y=-3\ \ (3,-3)$

$$\begin{cases} -x+y=-6 \\ 2x+2y=0 \end{cases}$$

$$\underbrace{\begin{bmatrix} -1 & 1 \\ 2 & 2 \end{bmatrix}}_{\text{find inverse}}\begin{bmatrix} x \\ y \end{bmatrix}=\begin{bmatrix} -6 \\ 0 \end{bmatrix}$$

$$\frac{1}{\begin{vmatrix} -1 & 1 \\ 2 & 2 \end{vmatrix}}\begin{bmatrix} 2 & -1 \\ -2 & -1 \end{bmatrix}=\frac{1}{-4}\begin{bmatrix} 2 & -1 \\ -2 & -1 \end{bmatrix}=\underbrace{\begin{bmatrix} -1/2 & 1/4 \\ 1/2 & 1/4 \end{bmatrix}}_{\text{inverse}}$$

$$\begin{bmatrix} -1/2 & 1/4 \\ 1/2 & 1/4 \end{bmatrix}\begin{bmatrix} -6 \\ 0 \end{bmatrix}=\begin{bmatrix} 3+0 \\ -3+0 \end{bmatrix}=\begin{bmatrix} 3 \\ -3 \end{bmatrix}=\begin{matrix} x=3 \\ y=-3 \end{matrix}$$

$(2\times 2)\ (2\times 1)$

$(3,-3)$

17. $x=-4,\ y=-15 \quad (-4,-15)$

$$\begin{cases} -3x + y = -3 \\ 5x - 2y = 10 \end{cases}$$

$$x = \frac{\begin{vmatrix} -3 & 1 \\ 10 & -2 \end{vmatrix}}{\begin{vmatrix} -3 & 1 \\ 5 & -2 \end{vmatrix}} = \frac{6-10}{1} = -4 \qquad x=-4$$

$$y = \frac{\begin{vmatrix} -3 & -3 \\ 5 & 10 \end{vmatrix}}{\begin{vmatrix} -3 & 1 \\ 5 & -2 \end{vmatrix}} = \frac{-30-(-15)}{1} = -15 \qquad y=-15$$