

Albert Town High School  
Mathematics worksheet  
Matrices and simultaneous equations

Answer all questions

1. If  $A = \begin{pmatrix} 3 & 2 \\ 2 & -3 \end{pmatrix}$

- a. Evaluate the determinant of  $A$
- b. Determine  $A^{-1}$
- c. Using  $A^{-1}$  solve the simultaneous equations 
$$\begin{aligned} 3x + 2y &= 1 \\ 2x - 3y &= 5 \end{aligned}$$

2. Given the equations 
$$\begin{aligned} x - y &= -5 \\ 3x + 2y &= -5 \end{aligned}$$

- a. Write the equations in matrix form
- b. Determine the inverse of the matrix
- c. Hence solve the equations

3. Write down the inverse of the matrix

a.  $\begin{pmatrix} 1 & 4 \\ 2 & 1 \end{pmatrix}$

- b. Hence or otherwise determine the value of  $a, b, c$  and  $d$  for

$$\begin{pmatrix} 1 & 4 \\ 2 & 1 \end{pmatrix} \begin{pmatrix} a & b \\ c & d \end{pmatrix} = \begin{pmatrix} 4 & 13 \\ 8 & 5 \end{pmatrix}$$

4. Given that  $P = \begin{pmatrix} 2 & 1 \\ 5 & -3 \end{pmatrix}$

- a. Evaluate  $P^{-1}$
- b. Use a matrix method to solve  $x \begin{pmatrix} 2 \\ 5 \end{pmatrix} + y \begin{pmatrix} 1 \\ -3 \end{pmatrix} = \begin{pmatrix} 7 \\ 1 \end{pmatrix}$

5. Given That  $M = \begin{pmatrix} 2 & 5 \\ 7 & 15 \end{pmatrix}$

- a. Show that  $M$  is a non-singular matrix
- b. Write down the inverse of  $M$
- c. Write down the 2x2 matrix which is equal to the product of  $M \times M^{-1}$
- d. Pre multiply both sides of the following equation by  $M^{-1}$  
$$\begin{pmatrix} 2 & 5 \\ 7 & 15 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -3 \\ 17 \end{pmatrix}$$
- e. Hence solve for  $x$  and  $y$

6. Given the linear equations 
$$\begin{aligned} 2x + 5y &= 6 \\ 3x + 4y &= 8 \end{aligned}$$

- a. Write the equations in the form  $AX = B$ , where  $A$ ,  $X$  and  $B$  are matrices
- b. Calculate the determinant of Matrix  $A$

c. Show that  $A^{-1} = \begin{pmatrix} \frac{-4}{7} & \frac{5}{7} \\ \frac{3}{7} & \frac{-2}{7} \end{pmatrix}$

- d. Using  $A^{-1}$  solve for  $x$  and  $y$