

For these problems, use the animation “Matrix Multiplication”.

1) Have a play with the animation for a few minutes, getting to understand the controls and displays. Note down five things that you have found out.

2) You are given the following three matrices:

$$D = \begin{pmatrix} 1 & 4 \\ 2 & 5 \\ 3 & 6 \end{pmatrix}, E = \begin{pmatrix} 2 & 1 \\ -1 & -2 \end{pmatrix} \text{ and } F = \begin{pmatrix} 1 & 0 \end{pmatrix}.$$

For each of the following, state whether the matrices can be multiplied in this form. If so, write down the size of the resulting matrix and carry out the matrix multiplication.

(a) DE (b) DF (c) ED (d) EF (e) FD (f) FE

3) Given the matrices $I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} b_{11} \\ b_{21} \end{pmatrix}$, calculate IB . Explain why I is called the identity matrix.

4) Given the matrices $X = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ and $B = \begin{pmatrix} b_{11} \\ b_{21} \end{pmatrix}$, calculate XB . What is the action of X on B ?

5) Given $X = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$, calculate X^2 and X^3 . Interpret your result.

6) Given $X = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ and $Z = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$, calculate $XZ - ZX$. What does the result tell you about the product of two matrices?