

MATHEMATICS: TERM 2 QUESTIONS 2

MATRICES

1. Add the following pairs of matrices where possible:

$$\begin{array}{ll} \text{(a)} \quad \begin{pmatrix} 1 & 0 \\ 3 & -2 \end{pmatrix} + \begin{pmatrix} 2 & -1 \\ 1 & 2 \end{pmatrix} & \text{(b)} \quad \begin{pmatrix} 1 & 2 & 1 \\ 0 & 3 & -2 \end{pmatrix} + \begin{pmatrix} 2 & 0 & 1 \\ 9 & -3 & 2 \end{pmatrix} \\ \text{(c)} \quad \begin{pmatrix} 1 & 0 & -1 \\ 3 & -2 & 0 \end{pmatrix} + \begin{pmatrix} 2 & -1 \\ 5 & -2 \\ -1 & -1 \end{pmatrix} & \text{(d)} \quad \begin{pmatrix} 1 & 0 & 3 \\ -2 & 0 & 2 \\ 0 & 2 & 1 \end{pmatrix} + \begin{pmatrix} 2 & -2 & 1 \\ -1 & 0 & 2 \\ 1 & 1 & 0 \end{pmatrix} \end{array}$$

2. Multiply the following pairs of matrices where possible:

$$\begin{array}{ll} \text{(a)} \quad \begin{pmatrix} 1 & 0 \\ 3 & -2 \end{pmatrix} \times \begin{pmatrix} 2 & -1 \\ 1 & 2 \end{pmatrix} & \text{(b)} \quad \begin{pmatrix} 1 & 2 & 1 \\ 0 & 3 & -2 \end{pmatrix} \times \begin{pmatrix} 2 & 0 & 1 \\ 9 & -3 & 2 \end{pmatrix} \\ \text{(c)} \quad \begin{pmatrix} 1 & 0 & -1 \\ 3 & -2 & 0 \end{pmatrix} \times \begin{pmatrix} 2 & -1 \\ 5 & -2 \\ -1 & -1 \end{pmatrix} & \text{(d)} \quad \begin{pmatrix} 1 & 0 & 3 \\ -2 & 0 & 2 \\ 0 & 2 & 1 \end{pmatrix} \times \begin{pmatrix} 2 & -2 & 1 \\ -1 & 0 & 2 \\ 1 & 1 & 0 \end{pmatrix} \end{array}$$

3. Where possible, repeat the multiplications in question 2 with the order of the matrices reversed.

4. Find the determinants of the following matrices:

$$\begin{array}{ll} \text{(a)} \quad \begin{pmatrix} 1 & 0 \\ 3 & -2 \end{pmatrix} & \text{(b)} \quad \begin{pmatrix} 1 & 2 \\ 3 & 6 \end{pmatrix} \\ \text{(c)} \quad \begin{pmatrix} 1 & 0 & -1 \\ 3 & -2 & 0 \\ 1 & 1 & 1 \end{pmatrix} & \text{(d)} \quad \begin{pmatrix} 1 & 2 & -1 \\ -2 & 6 & 2 \\ 1 & 2 & -1 \end{pmatrix} \end{array}$$

5. Find, where they exist, the inverses of the matrices in question 4. In each case check that when you multiply the original matrix by its inverse *in either order* that you obtain the identity matrix.
6. Evaluate the determinants to your answers to 2(a) and 3(a) and also 2(d) and 3(d), checking that they are the same.

Solutions

1.

(a) $\begin{pmatrix} 3 & -1 \\ 4 & 0 \end{pmatrix}$

(b) $\begin{pmatrix} 3 & 2 & 2 \\ 9 & 0 & 0 \end{pmatrix}$

(c) Addition not possible

(d) $\begin{pmatrix} 3 & -2 & 4 \\ -3 & 0 & 4 \\ 1 & 3 & 1 \end{pmatrix}$

2.

(a) $\begin{pmatrix} 2 & -1 \\ 4 & -7 \end{pmatrix}$

(b) Multiplication not possible

(c) $\begin{pmatrix} 3 & 0 \\ -4 & 1 \end{pmatrix}$

(d) $\begin{pmatrix} 5 & 1 & 1 \\ -2 & 6 & -2 \\ -1 & 1 & 4 \end{pmatrix}$

3.

(a) $\begin{pmatrix} -1 & 2 \\ 7 & -4 \end{pmatrix}$

(b) Multiplication not possible

(c) $\begin{pmatrix} -1 & 2 & -2 \\ -1 & 4 & -5 \\ -4 & 2 & 1 \end{pmatrix}$

(d) $\begin{pmatrix} 6 & 2 & 3 \\ -1 & 4 & -1 \\ -1 & 0 & 5 \end{pmatrix}$

4.

(a) -2

(b) 0

(c) -7

(d) 0

5.

(a) $\begin{pmatrix} 1 & 0 \\ 3/2 & -1/2 \end{pmatrix}$

(b) No inverse

(c) $\begin{pmatrix} 2/7 & 1/7 & 2/7 \\ 3/7 & -2/7 & 3/7 \\ -5/7 & 1/7 & 2/7 \end{pmatrix}$

(d) No inverse

6. Determinants are (a) -10 and (d) 144 .