

Matrix Multiplication

For AQA Level 2 Certificate in Further Mathematics (8365)

Name _____

Total marks: **24**

Answer **all** questions in the spaces provided. Show your working: marks are given for correct method. You may use a calculator.

- 1 Work out $\begin{pmatrix} 2 & -3 \\ 4 & 1 \end{pmatrix} \begin{pmatrix} 5 \\ 2 \end{pmatrix}$
Circle your answer.

[1 mark]

$$\begin{pmatrix} 4 \\ 22 \end{pmatrix}$$

$$\begin{pmatrix} 18 \\ -13 \end{pmatrix}$$

$$\begin{pmatrix} -4 \\ 22 \end{pmatrix}$$

$$\begin{pmatrix} 10 & -6 \\ 20 & 2 \end{pmatrix}$$

- 2 $\mathbf{A} = \begin{pmatrix} 3 & 1 \\ -2 & 4 \end{pmatrix}$ $\mathbf{B} = \begin{pmatrix} 0 & -1 \\ 5 & 2 \end{pmatrix}$

(a) Work out **AB**

[2 marks]

Answer $\begin{pmatrix} & \\ & \end{pmatrix}$

(b) Work out **BA**

[2 marks]

Answer $\begin{pmatrix} & \\ & \end{pmatrix}$

3 $\mathbf{C} = \begin{pmatrix} 1 & -2 \\ 3 & 0 \end{pmatrix}$
Work out $3\mathbf{C}^2$

[2 marks]

Answer $\begin{pmatrix} & \\ & \end{pmatrix}$

4 $\mathbf{P}$ is a 2×2 matrix such that
 $\begin{pmatrix} 6 & -1 \\ 2 & 5 \end{pmatrix} \mathbf{P} = \begin{pmatrix} 6 & -1 \\ 2 & 5 \end{pmatrix}$
Circle matrix $\mathbf{P}$.

[1 mark]

$$\begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 6 & -1 \\ 2 & 5 \end{pmatrix}$$

5 $\mathbf{A} = \begin{pmatrix} 5 & 2 \\ -3 & 1 \end{pmatrix}$ $\mathbf{B} = \begin{pmatrix} 1 & -2 \\ 3 & 5 \end{pmatrix}$
Show that $\mathbf{AB} = k\mathbf{I}$, where $\mathbf{I}$ is the identity matrix and k is an integer.
State the value of k .

[2 marks]

$$k = \underline{\hspace{2cm}}$$

- 6 $\begin{pmatrix} p & q \\ 2q & -p \end{pmatrix} \begin{pmatrix} 3 \\ 2 \end{pmatrix} = 11 \begin{pmatrix} 1 \\ -2 \end{pmatrix}$
Work out the values of p and q .

[3 marks]

Answer $p =$ _____ $q =$ _____

- 7 The matrix $\mathbf{T} = \begin{pmatrix} 2 & 3 \\ -1 & 4 \end{pmatrix}$ maps the point Q to the point $(-1, -16)$
Work out the coordinates of Q .
You must show your working.

[3 marks]

Answer (_____ , _____)

- 8 $\mathbf{A} = \begin{pmatrix} 4 & -2 \\ b & 3 \end{pmatrix}$ $\mathbf{B} = \begin{pmatrix} 3 & a \\ 1 & 4 \end{pmatrix}$
 $\mathbf{AB} = k\mathbf{I}$, where $\mathbf{I}$ is the identity matrix and k is a constant.
Work out the values of a , b and k .

[4 marks]

Answer $a =$ _____ $b =$ _____ $k =$ _____

9 $\mathbf{A} = \begin{pmatrix} a & 2 \\ 3 & -a \end{pmatrix}$

(a) Show that $\mathbf{A}^2 = k\mathbf{I}$, where k is an expression in terms of a .

[2 marks]

(b) $\mathbf{A}^2 \begin{pmatrix} 2 \\ -1 \end{pmatrix} = \begin{pmatrix} 20 \\ -10 \end{pmatrix}$

Work out the two possible values of a .

[2 marks]

Answer $a = \underline{\hspace{2cm}}$ or $a = \underline{\hspace{2cm}}$