## *Y1 Matrices – Operations, Determinants and Inverses Exam Questions (Edexcel)*

**Q1.**

$$\begin{pmatrix} x & 9 \\ y & z \end{pmatrix} - 3\begin{pmatrix} z & y \\ z & y \end{pmatrix} = k\mathbf{I}$$

where $x$, $y$, $z$ and $k$ are constants.

Determine the value of $x$, the value of $y$ and the value of $z$.

**(Total for question = 4 marks)**

**(Q01 8FM0/01, June 2023)**

**Q2.**

$$\mathbf{A} = \begin{pmatrix} p & 2 \\ 3 & p \end{pmatrix}, \quad \mathbf{B} = \begin{pmatrix} -5 & 4 \\ 6 & -5 \end{pmatrix}$$

where $p$ is a constant.

(a) Find, in terms of $p$, the matrix **AB**

(2)

Given that

$$\mathbf{AB} + 2\mathbf{A} = k\mathbf{I}$$

where $k$ is a constant and **I** is the $2 \times 2$ identity matrix,

(b) find the value of $p$ and the value of $k$.

(4)

**(Total for question = 6 marks)**

**(Q05 6667/01, June 2017)**

**Q3.**

Given that $k$ is a real number and that

$$\mathbf{A} = \begin{pmatrix} 1+k & k \\ k & 1-k \end{pmatrix}$$

find the exact values of $k$ for which **A** is a singular matrix. Give your answers in their simplest form.

(3)

**(Total for question = 3 marks)**

**(Q03 6667/01, June 2016)**

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**Q4.**

$$\mathbf{A} = \begin{pmatrix} 2 & 1 \\ -1 & 0 \end{pmatrix} \text{ and } \mathbf{B} = \begin{pmatrix} -1 & 1 \\ 0 & 1 \end{pmatrix}$$

Given that $\mathbf{M} = (\mathbf{A} + \mathbf{B})(2\mathbf{A} - \mathbf{B})$,

(a) calculate the matrix **M**,

(6)

(b) find the matrix **C** such that **MC** = **A**.

(4)

**(Total 10 marks)**

**(Q06 6667/01/R, June 2014)**

**Q5.**

(i) Given that

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

(a) find **AB**.

(b) Explain why $\mathbf{AB} \neq \mathbf{BA}$.

(4)

(ii) Given that

$$\mathbf{C} = \begin{pmatrix} 2k & -2 \\ 3 & k \end{pmatrix}, \text{ where } k \text{ is a real number}$$

find $\mathbf{C}^{-1}$, giving your answer in terms of $k$.

(3)

**(Total 7 marks)**

**(Q04 6667/01, June 2014)**

**Q6.**

(i)

$$\mathbf{A} = \begin{pmatrix} 2k+1 & k \\ -3 & -5 \end{pmatrix}, \text{ where } k \text{ is a constant}$$

Given that

$$\mathbf{B} = \mathbf{A} + 3\mathbf{I}$$

where **I** is the 2 × 2 identity matrix, find

(a) **B** in terms of $k$,

(2)

(b) the value of $k$ for which **B** is singular.

(2)

(ii) Given that

$$\mathbf{C} = \begin{pmatrix} 2 \\ -3 \\ 4 \end{pmatrix}, \quad \mathbf{D} = \begin{pmatrix} 2 & -1 & 5 \end{pmatrix}$$

and

$$\mathbf{E} = \mathbf{CD}$$

find **E**.

(2)

**(Total 6 marks)**

**(Q03 6667/01/R, June 2013)**

**Q7.**

$$\mathbf{M} = \begin{pmatrix} x & x-2 \\ 3x-6 & 4x-11 \end{pmatrix}$$

Given that the matrix **M** is singular, find the possible values of $x$.

(4)

**(Total 4 marks)**

**(Q02 6667/01, June 2013)**

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**Q8.**

$\mathbf{X} = \begin{pmatrix} 1 & a \\ 3 & 2 \end{pmatrix}$, where $a$ is a constant

(a) Find the value of $a$ for which the matrix **X** is singular.

**(2)**

$$\mathbf{Y} = \begin{pmatrix} 1 & -1 \\ 3 & 2 \end{pmatrix}\text{, where } a \text{ is a constant}$$

(b) Find $\mathbf{Y}^{-1}$ .

**(2)**

The transformation represented by **Y** maps the point $A$ onto the point $B$.

Given that $B$ has coordinates $(1 - \lambda, 7\lambda - 2)$, where is a constant,

(c) find, in terms of $\lambda$, the coordinates of point $A$.

**(4)**

**(Total 8 marks)**

**(Q06 6667/01, Jan 2013)**

**Q9.**

(a) Given that

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

find **AB**.

(2)

(b) Given that

$$\mathbf{C} = \begin{pmatrix} 3 & 2 \\ 8 & 6 \end{pmatrix}, \quad \mathbf{D} = \begin{pmatrix} 5 & 2k \\ 4 & k \end{pmatrix}, \text{ where } k \text{ is a constant}$$

and

$$\mathbf{E} = \mathbf{C} + \mathbf{D}$$

find the value of $k$ for which **E** has no inverse.

(4)

**(Total 6 marks)**

**(Q03 6667/01, June 2012)**

**Q10.**

$$\mathbf{A} = \begin{pmatrix} 0 & 1 \\ 2 & 3 \end{pmatrix}$$

(a) Show that **A** is non-singular.

(2)

(b) Find **B** such that $\mathbf{BA}^2 = \mathbf{A}$.

(4)

**(Total 6 marks)**

**(Q06 6667/01, Jan 2012)**

**Q11.**

$$\mathbf{A} = \begin{pmatrix} 6 & -2 \\ -4 & 1 \end{pmatrix}$$

and **I** is the 2 × 2 identity matrix.

(a) Prove that

$$\mathbf{A}^2 = 7\mathbf{A} + 2\mathbf{I}$$

(2)

(b) Hence show that

$$\mathbf{A}^{-1} = \frac{1}{2}(\mathbf{A} - 7\mathbf{I})$$

(2)

The transformation represented by **A** maps the point $P$ onto the point $Q$.

Given that $Q$ has coordinates $(2k + 8, -2k - 5)$, where $k$ is a constant,

(c) find, in terms of $k$, the coordinates of $P$.

(4)

**(Total 8 marks)**

**(Q06 6667/01, June 2013)**

**Q12.**

Given that $\mathbf{X} = \begin{pmatrix} 2 & a \\ -1 & -1 \end{pmatrix}$, where $a$ is a constant, and $a \neq 2$,

(a) find $\mathbf{X}^{-1}$ in terms of $a$.

**(3)**

Given that $\mathbf{X} + \mathbf{X}^{-1} = \mathbf{I}$, where **I** is the 2×2 identity matrix,

(b) find the value of $a$.

**(3)**

**(Total 6 marks)**

**(Q06 6674/01, Jan 2009)**

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