Vectors and transformations – 2024 O Level Math D 4024

1. June/2024/Paper_ 4024/11/No.20

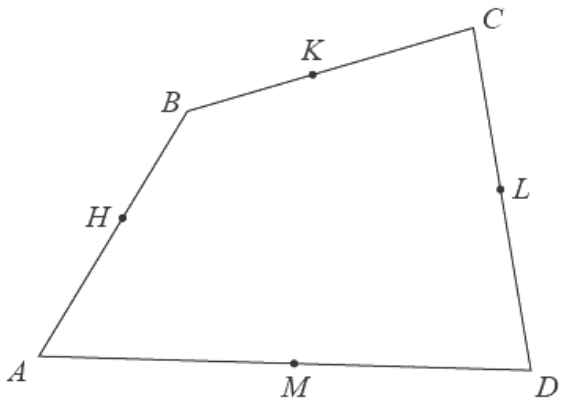
The matrix **N** satisfies the equation

$$3\mathbf{N} = \mathbf{N} + 5\begin{pmatrix} 4 & 0 \\ 6 & -2 \end{pmatrix}.$$

Find **N**.

$\mathbf{N} = \begin{pmatrix} & \\ & \end{pmatrix}$ [2]

2. June/2024/Paper_ 4024/11/No.24



NOT TO SCALE

$ABCD$ is a quadrilateral.
H, K, L and M are the midpoints of AB, BC, CD and AD respectively.
$\overrightarrow{AB} = 2\mathbf{a}$, $\overrightarrow{BC} = 2\mathbf{b}$ and $\overrightarrow{AD} = 2\mathbf{d}$.

Express, as simply as possible, in terms of **a** and **b** or **a**, **b** and **d**

(a) $\overrightarrow{HK}$

$\overrightarrow{HK} =$ ..... [1]

(b) $\overrightarrow{CD}$

$\overrightarrow{CD} =$ ..... [1]

(c) $\overrightarrow{ML}$.

$\overrightarrow{ML} =$ ..... [2]

3. June/2024/Paper_ 4024/12/No.23

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

(a) Find $\mathbf{A}^{-1}$.

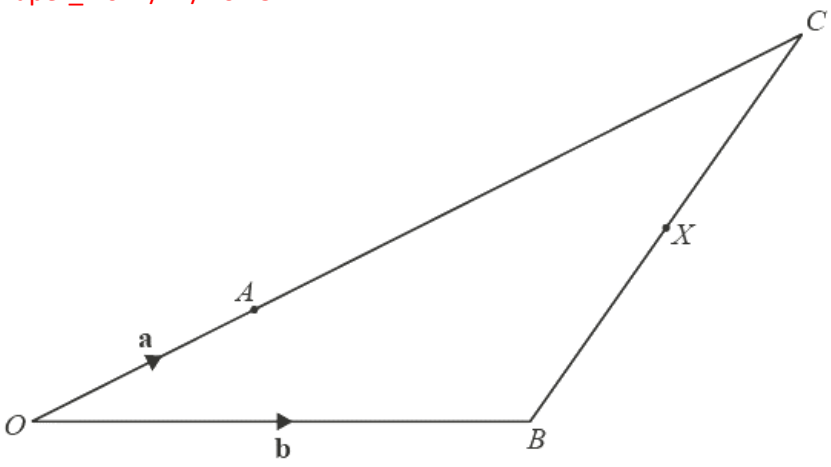
$\mathbf{A}^{-1} =$ ( ) [2]

(b) $\mathbf{AX} = \begin{pmatrix} 7 \\ 4 \end{pmatrix}$

Find $\mathbf{X}$.

$\mathbf{X} =$ [2]

4. June/2024/Paper_ 4024/12/No.25



NOT TO SCALE

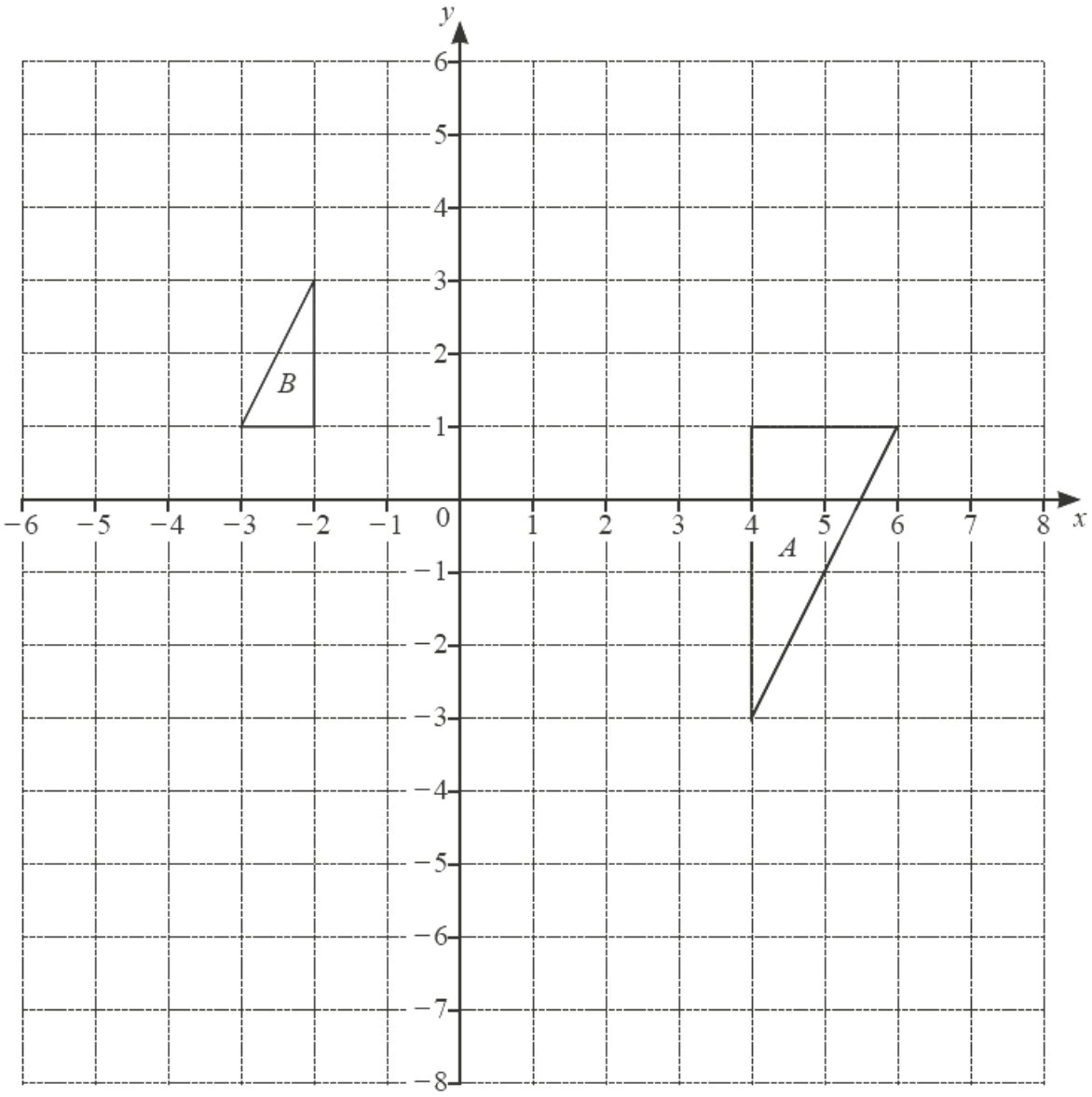
OCB is a triangle.

A is a point on OC such that $OA : AC = 1 : 3$.
X is the midpoint of BC.
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.

Find the position vector of X.
Give your answer as simply as possible in terms of **a** and **b**.

..... [3]

5. June/2024/Paper_ 4024/21/No.6



(a) Triangle A is mapped onto triangle P by a translation of $\begin{pmatrix} 1 \\ -3 \end{pmatrix}$.

Draw triangle P. [2]

(b) Describe fully the **single** transformation that maps triangle A onto triangle B.

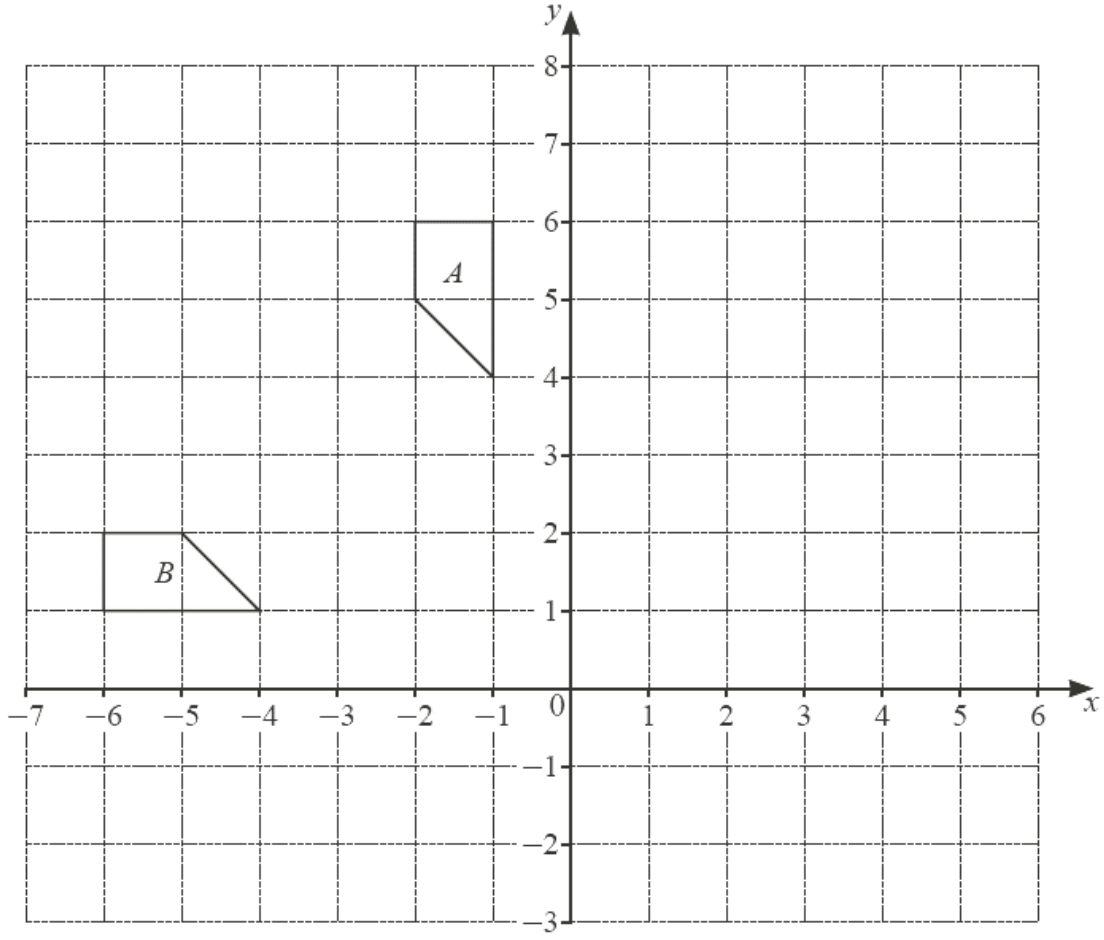
.....

..... [3]

(c) Transformation M is a reflection in the line $y = -1$.
Transformation R is a rotation 90° clockwise about (1, 1).
RM(B) = Q.

Draw triangle Q. [3]

6. June/2024/Paper_ 4024/22/No.5



(a) Describe fully the **single** transformation that maps shape A onto shape B.

.....

..... [2]

(b) Shape A is mapped onto shape C by an enlargement of scale factor 3.
Two of the vertices of shape C are (2, 5) and (5, 2).

(i) Find the coordinates of the centre of the enlargement.

(..... , ...) [2]

(ii) Find the area of shape C.

..... units^2 [2]

(c) Transformation T is represented by the matrix $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$.

Transformation T maps shape A onto shape D.

(i) On the grid, draw shape D.

[2]

(ii) Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$.

.....

..... [3]

7. June/2024/Paper_ 4024/22/No.11(b)

Q is the point $(n, -4)$, R is the point $(-1, 8)$ and S is the point $(3, 2)$.

(b) RST is a straight line and $RS : RT = 2 : 5$.

Find the coordinates of T.

(..... , ...) [2]