Name:

Level 2 Further Maths

Matrix Transformations

Corbettmaths

Ensure you have: Pencil or pen

Guidance

1. Read each question carefully before you begin answering it.
2. Check your answers seem right.
3. Always show your workings

Revision for this topic

www.corbettmaths.com/more/further-maths/

1. Find where the matrix $\begin{pmatrix} 5 & -2 \\ -1 & 3 \end{pmatrix}$ maps the point $(-3, 1)$

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(2)

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2. Find where the matrix $\begin{pmatrix} 0 & 4 \\ 2 & -8 \end{pmatrix}$ maps the point $(2, -1)$

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(2)

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3. The transformation matrix $\begin{pmatrix} b & -2 \\ -1 & 3 \end{pmatrix}$ maps the point $(5, 1)$ onto the point $(16, c)$

$b =$ ..... $c =$ .....

(3)

4. The transformation matrix **M** is $\begin{pmatrix} 1 & a \\ -4 & 1 \end{pmatrix}$

The image of the point $(b,\ 3)$ under **M** is $(14,\ -5)$

$a =$ …….. $b =$ ……..

(3)

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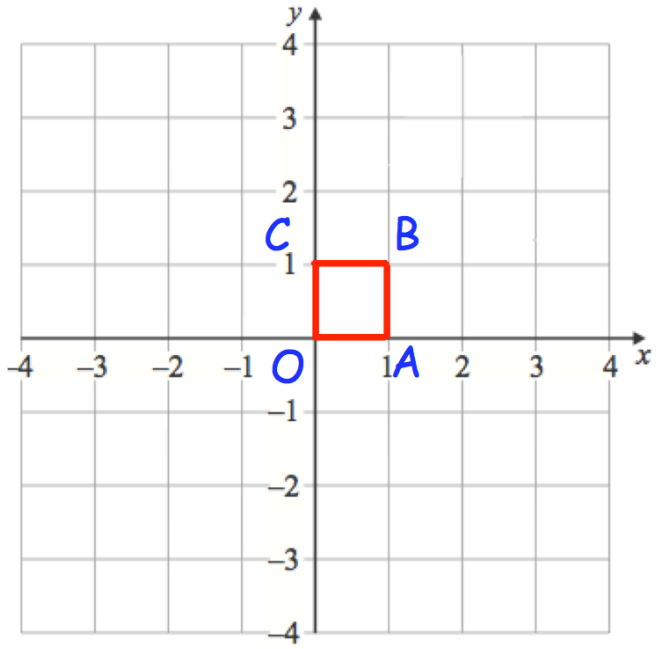
5. The matrix $\begin{pmatrix} 3 & x \\ 6 & -3 \end{pmatrix}$ maps the point $(y,\ 4)$ onto the point $(-14, 24)$

Find the values of *x* and *y*

$x =$ …….. $y =$ ……..

(4)

6. The diagram shows the unit square OABC



OABC is transformed by the matrix $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ to give OA'B'C'

(a) Draw and label OA'B'C'

(2)

(b) Describe the transformation fully.

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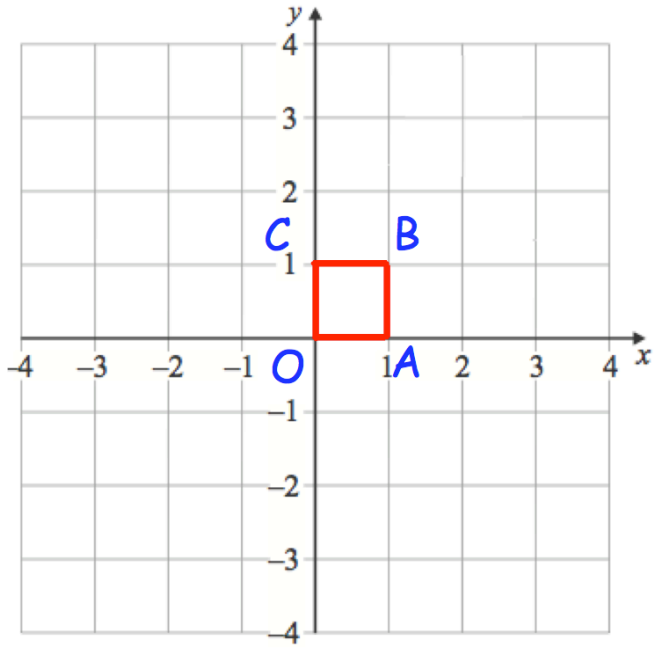
(2)

7. The diagram shows the unit square OABC



OABC is transformed by the matrix $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ to give OA'B'C'

(a) Draw and label OA'B'C'

(2)

(b) Describe the transformation fully.

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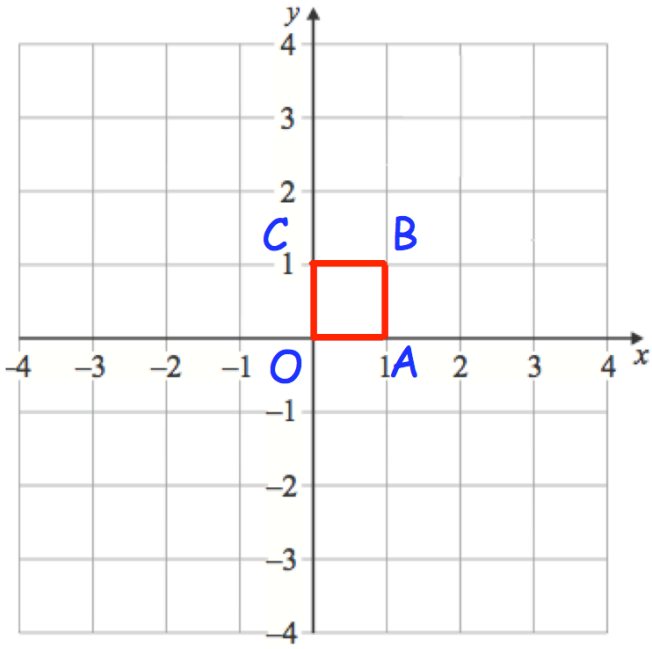
(2)

8. The diagram shows the unit square OABC



OABC is transformed by the matrix $\begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$ to give OA'B'C'

(a) Draw and label OA'B'C'

(2)

(b) Describe the transformation fully.

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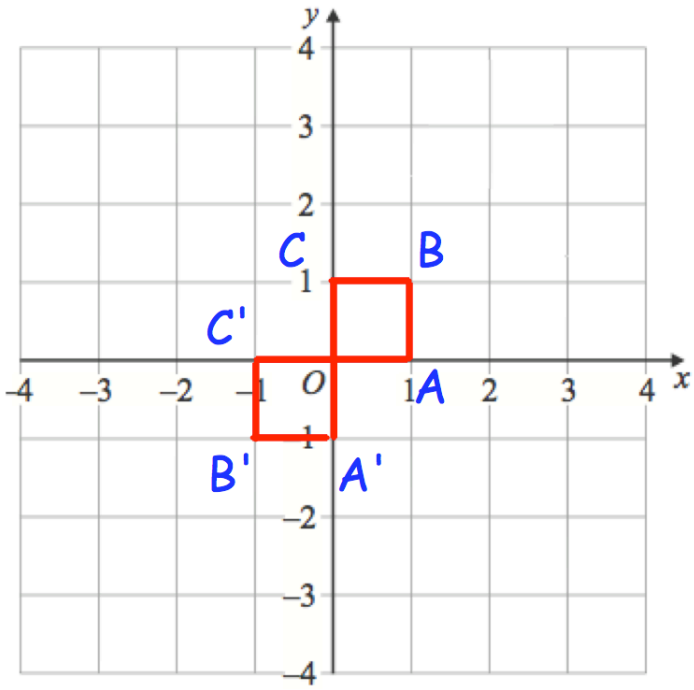
(2)

9. The unit square OABC has vertices

O(0, 0) A(1, 0) B(1, 1) C(0, 1)

OABC is mapped to OA'B'C' under transformation matrix **M**



Work out matrix **M**

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(3)

10. The point $(4, a)$ is invariant when transformed by the matrix $\begin{pmatrix} -5 & -2 \\ 3 & 2 \end{pmatrix}$

Find the value of *a*

$a =$ .....

(4)

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11. The transformation matrix $\begin{pmatrix} a & b \\ -a & 2b \end{pmatrix}$ maps the point $(2, -4)$ onto the point $(10, 40)$

Find the values of *a* and *b*

$a =$ ..... $b =$ .....

(5)

12. The transformation matrix $\begin{pmatrix} 3a & 4b \\ b & a \end{pmatrix}$ maps the point $(1, -2)$ onto the point $(-2, -1)$

Find the values of *a* and *b*

$a =$ …….. $b =$ ……..

(5)

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13. The transformation matrix $\begin{pmatrix} -a & 2b \\ -8b & 3a \end{pmatrix}$ maps the point $(-1, -2)$ onto the point $(-12, 32)$

Find the values of *a* and *b*

$a =$ …….. $b =$ ……..

(5)

14. Work out the matrix that transforms the unit square by a 90° anticlockwise rotation about O

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(2)

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15. Work out the matrix that transforms the unit square by a 180° rotation about O.

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(2)

16. Work out the matrix that transforms the unit square by a reflection in the y-axis.

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(2)

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17. Work out the matrix that transforms the unit square by a reflection in line $y = x$

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(2)

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

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(3)

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19. Describe fully the **single** transformation represented by $\begin{pmatrix} 5 & 0 \\ 0 & 5 \end{pmatrix}$

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(3)

20. The transformation matrix $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$ maps point P to point Q.

The transformation matrix $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$ maps point Q to point R.

Point P is $(-3, 2)$.

Work out the coordinates of point R.

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(3)

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21. The transformation matrix $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ maps point P to point Q.

The transformation matrix $\begin{pmatrix} -3 & 0 \\ 0 & -3 \end{pmatrix}$ maps point Q to point R.

Point R is $(-6, -15)$.

Work out the coordinates of point P.

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(5)

22. The unit square OABC is transformed by a reflection in the y-axis followed by enlargement scale factor 3, centre the origin.

What is the matrix of the combined transformation?

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(4)

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23. Here are two transformation:

A: A rotation of 180°

B: A reflection in the x-axis

Work out the single matrix which represents the combined transformation A followed by B.

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(4)

24. The transformation matrix **M** represents a 270° clockwise rotation about the origin.

(a) Write down matrix **M**

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(2)

(b) Describe fully the **single** transformation represented by $\mathbf{M}^3$

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(2)

(c) Write down the matrix for the **single** transformation represented by $\mathbf{M}^3$

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(2)

25. The unit square is transformed by matrix **Q** followed by matrix **R** followed by the matrix **S**
This is equivalent to transforming the unit square by the identity matrix.

Matrix **R** represents a rotation.
Matrices **Q** and **S** represent reflections.

Write down three possible matrices for **Q**, **R** and **S**

Q = …… **R =** …… **S =** ……

(6)