Your notes

Level 2 Further Maths: revision notes

Matrix transformations

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Transforming the unit square

- A 2 × 2 matrix transforms points: multiply the matrix by the point written as a column vector.
- The columns of the matrix show where the **unit vectors** go: the first column is the **image** of [1; 0] and the second is the **image** of [0; 1]. Use this to find any transformation matrix.
- The **unit square** has vertices (0, 0), (1, 0), (1, 1) and (0, 1). Its **image** shows the effect of the transformation.

Standard matrices

- Reflection in the x-axis: [1 0; 0 –1]. Reflection in the y-axis: [–1 0; 0 1].
- Reflection in y = x: [0 1; 1 0]. Reflection in y = –x: [0 –1; –1 0].
- Rotation 90° anticlockwise about the origin: [0 –1; 1 0]. Rotation 180°: [–1 0; 0 –1]. Rotation 90° clockwise (270° anticlockwise): [0 1; –1 0].
- Enlargement, scale factor k, centre the origin: [k 0; 0 k].

Combining transformations

- Transformation A followed by transformation B is the single matrix BA. The first transformation goes on the right.
- Example: reflection in the x-axis, A = [1 0; 0 –1], followed by rotation 90° anticlockwise, B = [0 –1; 1 0]. BA = [0 1; 1 0], which is a reflection in y = x.
- The **image** of (3, 2) under [0 –1; 1 0] is (–2, 3).

Key terms

Transformation matrix	A matrix that moves points in a particular way.
Unit square	The square with vertices (0, 0), (1, 0), (1, 1) and (0, 1).
Image	The result of a transformation.

Unit vector	A vector of length 1, such as [1; 0] or [0; 1].
Combined transformation	One transformation followed by another.

Your notes

Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

1. Which matrix reflects in the x-axis?
2. Which matrix rotates 90° anticlockwise about the origin?
3. What is the image of (3, 2) under a rotation of 90° anticlockwise about the origin?
4. What does [0 1; 1 0] represent?
5. What does [3 0; 0 3] represent?
6. What does [–1 0; 0 –1] represent?
7. Transformation A is followed by transformation B. Which single matrix represents this?
8. What do the columns of a transformation matrix show?

Answers

1. [1 0; 0 –1]
2. [0 –1; 1 0]
3. (–2, 3)
4. Reflection in y = x
5. Enlargement, scale factor 3, centre the origin
6. Rotation 180° about the origin
7. BA
8. The images of [1; 0] and [0; 1]

What to do next

Practise 10 questions on this topic

Try 3 exam questions, with mark schemes

Read the lesson, one step at a time

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