HIGHER

2.3 Matrices and Matrix Transformations: 1-hour Pack

Total Marks

EDEXCEL 4MA1 · Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Allow 60 minutes.

1 A shape has area 6 cm². It is transformed by the matrix [[-3, 5], [3, 0]].
Work out the area of the image.

(Total for Question 1 is 3 marks)

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2 The matrix P represents: reflection in the line y = x.
The matrix Q represents: rotation of 180 degrees about the origin.
P = [[0, 1], [1, 0]] and Q = [[-1, 0], [0, -1]].
Work out the single matrix that represents the transformation P followed by the transformation Q.

(Total for Question 2 is 3 marks)

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3 Write down the matrix that represents: rotation of 90 degrees anticlockwise about the origin.

(Total for Question 3 is 2 marks)

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4 The matrix M = [[x, 2], [3, 4]] has determinant -10.
Find the value of x.

(Total for Question 4 is 3 marks)

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5 Triangle ABC has vertices A(2, 1), B(-3, -2), C(-3, 5).
The matrix [[1, 3], [2, 3]] transforms triangle ABC onto triangle A'B'C'.
Find the coordinates of A', B' and C'.

(Total for Question 5 is 3 marks)

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6 A = [[5, 3], [2, 5]] and B = [[2, 1], [3, -4]]
Work out AB.

(Total for Question 6 is 3 marks)

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7 A shape is transformed by the matrix [[-2, -2], [2, -1]]. The area of the image is 24 cm².
Work out the area of the original shape.

(Total for Question 7 is 3 marks)

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8 The matrix P represents: reflection in the x-axis.
The matrix Q represents: rotation of 180 degrees about the origin.
P = [[1, 0], [0, -1]] and Q = [[-1, 0], [0, -1]].
Work out the single matrix that represents the transformation P followed by the transformation Q.

(Total for Question 8 is 3 marks)

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9 Write down the matrix that represents: rotation of 180 degrees about the origin.

(Total for Question 9 is 2 marks)

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10 The matrix M = [[4x, 2], [3, 3]] has determinant 18.
Find the value of x.

(Total for Question 10 is 3 marks)

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11 Triangle ABC has vertices A(5, -3), B(-4, -1), C(3, 0).
The matrix [[4, 2], [2, 4]] transforms triangle ABC onto triangle A'B'C'.
Find the coordinates of A', B' and C'.

(Total for Question 11 is 3 marks)

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12 A transformation is represented by a 2 x 2 matrix M. It maps the point (1, 0) to (2, 1) and the point (0, 1) to (2, -5).
Write down M.

(Total for Question 12 is 2 marks)

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13 A shape is transformed by the matrix [[4, -3], [4, -1]]. The area of the image is 24 cm^2.
Work out the area of the original shape.

(Total for Question 13 is 3 marks)

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14 The matrix P represents: rotation of 180 degrees about the origin.
The matrix Q represents: rotation of 90 degrees clockwise about the origin.
P = [[-1, 0], [0, -1]] and Q = [[0, 1], [-1, 0]].
Work out the single matrix that represents the transformation P followed by the transformation Q.

(Total for Question 14 is 3 marks)

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15 In matrix transformations, calculate the product of 2x2 matrices C = [[1, 2], [3, 0]] and D = [[-1, 4], [2, 1]] to combine two linear maps.

(Total for Question 15 is 2 marks)

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Mark scheme · 2.3 Matrices and Matrix Transformations: 1-hour Pack

Question 1

determinant = (-3)(0) - (5)(3) = -15	**M1**
area scale factor = |-15| = 15	**M1**
90 cm²	**A1**

Answer: 90 cm^2

Question 2

recognises the matrix for P followed by Q is QP (not PQ)	**M1**
multiplies Q by P correctly (at least two entries correct)	**M1**
[[0, -1], [-1, 0]]	**A1**

Answer: [[0, -1], [-1, 0]]

Question 3

uses the images of (1, 0) and (0, 1) as the columns of the matrix	**M1**
[[0, -1], [1, 0]]	**A1**

Answer: [[0, -1], [1, 0]]

Question 4

det M = x x 4 - 2 x 3	**M1**
sets 4x - 6 = -10	**M1**
x = -1	**A1**

Answer: x = -1

Question 5

multiplies the matrix by the column vector of one vertex	**M1**
two image points correct, e.g. A' = (5, 7)	**A1**
A'(5, 7), B'(-9, -12), C'(12, 9)	**A1**

Answer: A'(5, 7), B'(-9, -12), C'(12, 9)

Question 6

multiplies rows of the first matrix by columns of the second (at least two entries attempted)	**M1**
at least two entries correct	**A1**
[[19, -7], [19, -18]]	**A1**

Answer: [[19, -7], [19, -18]]

Question 7

determinant = 6, so the area scale factor is 6	**M1**
original area = 24 / 6	**M1**
4 cm²	**A1**

Answer: 4 cm^2

Question 8

recognises the matrix for P followed by Q is QP (not PQ)	**M1**
multiplies Q by P correctly (at least two entries correct)	**M1**
[[-1, 0], [0, 1]]	**A1**

Answer: [[-1, 0], [0, 1]]

Question 9

uses the images of (1, 0) and (0, 1) as the columns of the matrix	**M1**
[[-1, 0], [0, -1]]	**A1**

Answer: [[-1, 0], [0, -1]]

Question 10

det M = 4x x 3 - 2 x 3	**M1**
sets 12x - 6 = 18	**M1**
x = 2	**A1**

Answer: x = 2

Question 11

multiplies the matrix by the column vector of one vertex	**M1**
two image points correct, e.g. A' = (14, -2)	**A1**
A'(14, -2), B'(-18, -12), C'(12, 6)	**A1**

Answer: A'(14, -2), B'(-18, -12), C'(12, 6)

Question 12

the images of (1, 0) and (0, 1) are the first and second columns of M	**M1**
M = [[2, 2], [1, -5]]	**A1**

Answer: [[2, 2], [1, -5]]

Question 13

determinant = 8, so the area scale factor is 8	**M1**
original area = 24 / 8	**M1**
3 cm²	**A1**

Answer: 3 cm^2

Question 14

recognises the matrix for P followed by Q is QP (not PQ)	**M1**
multiplies Q by P correctly (at least two entries correct)	**M1**
[[0, -1], [1, 0]]	**A1**

Answer: [[0, -1], [1, 0]]

Question 15

multiplies rows of C by columns of D to form product entries	**M1**
CD = [[3, 6], [-3, 12]] cao	**A1**

Answer: [[3, 6], [-3, 12]]

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