HIGHER

2.8 Matrices: Solving Simultaneous Equations With the Inverse Matrix: 1-hour Pack

EDEXCEL 4MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Solve the simultaneous equations

$-3x + 2y = 2$

$-2x + y = 1$

by writing them as a matrix equation and using the inverse of a matrix. You must show your working.

(Total for Question 1 is 5 marks)

2 Write the simultaneous equations

$4x + 5y = 34$

$2x + 5y = 32$

in the form M [x; y] = c, where M is a 2 x 2 matrix and c is a column vector.

(Total for Question 2 is 2 marks)

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3 M = [[x, 1], [4, x]]
Find the values of x for which M has no inverse.

(Total for Question 3 is 4 marks)

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4 Solve the simultaneous equations
$-3x + 2y = -23$
$x - y = 8$
by writing them as a matrix equation and using the inverse of a matrix. You must show your working.

(Total for Question 4 is 5 marks)

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5 M = [[5, -3], [-1, 0]]
Find M^{-1}, the inverse of M.

(Total for Question 5 is 3 marks)

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6 The simultaneous equations $4x + 5y = 5$ and $kx + 3y = 7$ do not have a unique solution.
Find the value of k.

(Total for Question 6 is 3 marks)

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7 Solve the simultaneous equations

$-3x + 6y = -27$

$3x - 4y = 21$

by writing them as a matrix equation and using the inverse of a matrix. You must show your working.

(Total for Question 7 is 5 marks)

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8 $M = [[-2, 1], [7, -4]]$

Find M^{-1}, the inverse of M.

(Total for Question 8 is 3 marks)

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9 $M = [[x, -6], [1, 2]]$

Find the value of x for which M has no inverse.

(Total for Question 9 is 3 marks)

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10 Solve the simultaneous equations

$-2x = -14$

$x - 2y = 11$

by writing them as a matrix equation and using the inverse of a matrix. You must show your working.

(Total for Question 10 is 5 marks)

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11 Write the simultaneous equations

$6x + 4y = 48$

$6x - y = 18$

in the form M [x; y] = c, where M is a 2 x 2 matrix and c is a column vector.

(Total for Question 11 is 2 marks)

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12 M = [[5, 7], [2, -3]]

Find M^{-1}, the inverse of M.

(Total for Question 12 is 3 marks)

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Mark scheme · 2.8 Matrices: Solving Simultaneous Equations With the Inverse Matrix: 1-hour Pack

Question 1

writes [[-3, 2], [-2, 1]] [x; y] = [2; 1]	**M1**
finds the inverse [[1, -2], [2, -3]]	**M1**
pre-multiplies both sides by the inverse (inverse first, then the column vector)	**M1**
x = 0	**A1**
y = 1	**A1**

Answer: x = 0, y = 1

Question 2

M = [[4, 5], [2, 5]]	**B1**
c = [34; 32]	**B1**

Answer: [[4, 5], [2, 5]] [x; y] = [34; 32]

Question 3

M has no inverse when its determinant is 0	**M1**
$x^2 - 4 = 0$	**M1**
$x^2 = 4$, so takes both square roots	**M1**
x = 2 or x = -2	**A1**

Answer: x = 2 or x = -2

Question 4

writes [[-3, 2], [1, -1]] [x; y] = [-23; 8]	**M1**
finds the inverse [[-1, -2], [-1, -3]]	**M1**
pre-multiplies both sides by the inverse (inverse first, then the column vector)	**M1**
x = 7	**A1**
y = -1	**A1**

Answer: x = 7, y = -1

Question 5

determinant = (5)(0) - (-3)(-1) = -3	**M1**
swaps the leading diagonal and changes the signs of the other two entries	**M1**
M^{-1} = (1/3)[[0, -3], [-1, -5]]	**A1**

Answer: (1/3)[[0, -3], [-1, -5]]

Question 6

writes the coefficient matrix [[4, 5], [k, 3]]	**M1**
determinant = 12 - 5k = 0	**M1**
k = 12/5	**A1**

Answer: k = 12/5

Question 7

writes [[-3, 6], [3, -4]] [x; y] = [-27; 21]	**M1**
finds the inverse (1/6)[[4, 6], [3, 3]]	**M1**
pre-multiplies both sides by the inverse (inverse first, then the column vector)	**M1**
x = 3	**A1**
y = -3	**A1**

Answer: x = 3, y = -3

Question 8

determinant = (-2)(-4) - (1)(7) = 1	**M1**
swaps the leading diagonal and changes the signs of the other two entries	**M1**
M^{-1} = [[-4, -1], [-7, -2]]	**A1**

Answer: [[-4, -1], [-7, -2]]

Question 9

M has no inverse when its determinant is 0	**M1**
2x + 6 = 0	**M1**
x = -3	**A1**

Answer: x = -3

Question 10

writes [[-2, 0], [1, -2]] [x; y] = [-14; 11]	**M1**
finds the inverse (1/4)[[-2, 0], [-1, -2]]	**M1**
pre-multiplies both sides by the inverse (inverse first, then the column vector)	**M1**
x = 7	**A1**
y = -2	**A1**

Answer: x = 7, y = -2

Question 11

M = [[6, 4], [6, -1]]	**B1**
c = [48; 18]	**B1**

Answer: [[6, 4], [6, -1]] [x; y] = [48; 18]

Question 12

determinant = (5)(-3) - (7)(2) = -29	**M1**
swaps the leading diagonal and changes the signs of the other two entries	**M1**
M^{-1} = (1/29)[[3, 7], [2, -5]]	**A1**

Answer: (1/29)[[3, 7], [2, -5]]

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