4.1 Matrix Operations: Addition, Subtraction and Multiplication: 1-hour Pack

AQA 8365 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A = [[1, 2], [0, 1]] and B = [[5, 4], [1, 3]]. X is a 2 x 2 matrix such that AX = B.

(a) Let X = [[p, q], [r, s]]. Show that AX = [[p + 2r, q + 2s], [r, s]]. **(2)**

(b) Hence find the matrix X. **(4)**

(Total for Question 1 is 6 marks)

2 A = [[4, 6], [5, 5]]. Find the inverse matrix A^{-1}.

(Total for Question 2 is 4 marks)

3 P = [[4, -3, 0], [1, 0, 0]] and Q = [[4, 1], [4, 0], [-1, -1]]. Work out PQ and write down its order.

(Total for Question 3 is 4 marks)

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4 A = [[-3, -3], [-4, 3]] and v = [[-4], [-5]]. Work out Av.

(Total for Question 4 is 3 marks)

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

(Total for Question 5 is 3 marks)

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6 A = [[0, -1], [1, 2]] and AX = [[3, 2], [-7, -1]]. Find the matrix X.

(Total for Question 6 is 4 marks)

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7 The matrix [[7, k], [6, -6]] has no inverse. Find the value of k.

(Total for Question 7 is 3 marks)

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8 A = [[-4, 5], [5, -5]] and B = [[-5, 0], [0, -4]]. Work out 2A + 3B.

(Total for Question 8 is 3 marks)

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9 P = [[1, 5, 5], [-3, 0, 5]] and Q = [[0, 3], [-4, -4], [-3, 5]]. Work out PQ and write down its order.

(Total for Question 9 is 4 marks)

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10 A = [[6, -1], [1, -1]]. Find the inverse matrix A^{-1}.

(Total for Question 10 is 4 marks)

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11 Matrix P = [[4, 2, 7]] gives the prices, in pounds, of tickets, programmes and badges. Matrix Q = [[2], [16], [19]] gives the number of each item bought. Work out PQ and say what the answer represents.

(Total for Question 11 is 4 marks)

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12 A = [[-3, -2], [2, 1]] and AX = [[-9, 6], [6, -3]]. Find the matrix X.

(Total for Question 12 is 4 marks)

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13 A = [[1, 4], [2, 3]] and B = [[-2, 6], [0, 0]]. Work out AB.

(Total for Question 13 is 3 marks)

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14 D = [[4, -1], [0, 3]] and E = [[-2, 5], [1, -4]].

(a) Find 2D. **(1)**

(b) Find 3E. **(1)**

(c) Hence find 2D - 3E. **(2)**

(Total for Question 14 is 4 marks)

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Mark scheme · 4.1 Matrix Operations: Addition, Subtraction and Multiplication: 1-hour Pack

Question 1

(a) multiplies A by X using the general entries p, q, r, s	**M1**
(a) correctly shows AX = [[p+2r, q+2s], [r, s]] (answer printed)	**A1**
(a) Answer: AX = [[p + 2r, q + 2s], [r, s]] (shown)	
(b) compares the bottom row to find r = 1 and s = 3 directly	**M1**
(b) r = 1 and s = 3 cao	**A1**
(b) substitutes r and s into the top row equations, p+2(1)=5 and q+2(3)=4, to find p and q	**M1**
(b) states X = [[3, -2], [1, 3]] cao	**A1**
(b) Answer: X = [[3, -2], [1, 3]]	

Question 2

attempt to find the determinant	**M1**
determinant = -10	**A1**
swaps leading diagonal and changes sign of the other two entries	**M1**
[[-1/2, 3/5], [1/2, -2/5]] oe cao	**A1**
Answer: [[-1/2, 3/5], [1/2, -2/5]]	

Question 3

order 2 x 2	**B1**
row-by-column method	**M1**
at least half the entries correct	**A1**
[[4, 4], [4, 1]] cao	**A1**
Answer: [[4, 4], [4, 1]], order 2 x 2	

Question 4

row-by-column method	**M1**
one entry correct	**A1**
[[27], [1]] cao	**A1**
Answer: [[27], [1]]	

Question 5

row-by-column method with at least two correct entries	**M1**
at least three correct entries	**A1**
[[-18, 34], [14, -28]] cao	**A1**
Answer: [[-18, 34], [14, -28]]	

Question 6

$X = A^{-1}B$ or equivalent method	**M1**
$A^{-1} = [[2, 1], [-1, 0]]$	**M1**
at least two entries of X correct	**A1**
[[-1, 3], [-3, -2]] cao	**A1**
Answer: [[-1, 3], [-3, -2]]	

Question 7

uses determinant = 0	**M1**
7(-6) - k(6) = 0 or equivalent	**M1**
k = -7 cao	**A1**
Answer: k = -7	

Question 8

2A = [[-8, 10], [10, -10]]	**M1**
3B found	**M1**
[[-23, 10], [10, -22]] cao	**A1**
Answer: [[-23, 10], [10, -22]]	

Question 9

order 2 x 2	**B1**
row-by-column method	**M1**
at least half the entries correct	**A1**
[[-35, 8], [-15, 16]] cao	**A1**
Answer: [[-35, 8], [-15, 16]], order 2 x 2	

Question 10

attempt to find the determinant	**M1**
determinant = -5	**A1**
swaps leading diagonal and changes sign of the other two entries	**M1**
[[1/5, -1/5], [1/5, -6/5]] oe cao	**A1**
Answer: [[1/5, -1/5], [1/5, -6/5]]	

Question 11

attempts the multiplication of a 1 x 3 by a 3 x 1 matrix	**M1**
8 + 32 + 133	**A1**
[[173]]	**A1**
the total cost in pounds	**B1**
Answer: [[173]], the total cost in pounds	

Question 12

$X = A^{-1}B$ or equivalent method	**M1**
$A^{-1} = [[1, 2], [-2, -3]]$	**M1**
at least two entries of X correct	**A1**
[[3, 0], [0, -3]] cao	**A1**
Answer: [[3, 0], [0, -3]]	

Question 13

row-by-column method with at least two correct entries	**M1**
at least three correct entries	**A1**
[[-2, 6], [-4, 12]] cao	**A1**
Answer: [[-2, 6], [-4, 12]]	

Question 14

(a) [[8, -2], [0, 6]] cao	**B1**
(a) Answer: [[8, -2], [0, 6]]	
(b) [[-6, 15], [3, -12]] cao	**B1**
(b) Answer: [[-6, 15], [3, -12]]	
(c) subtracts corresponding entries of 3E from 2D using answers to (a) and (b)	**M1**
(c) [[14, -17], [-3, 18]] cao	**A1**
(c) Answer: [[14, -17], [-3, 18]]	

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