4.1 Matrix Operations: Addition, Subtraction and Multiplication: 30-minute Pack

AQA 8365 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Given that [[x, 2y], [3z, -4]] + [[-3, 7], [9, 2]] = [[5, 15], [21, -2]], find the values of x, y and z.

(a) Find the value of x. **(2)**

.....

(b) Find the value of y. **(2)**

.....

(c) Find the value of z. **(2)**

.....

(Total for Question 1 is 6 marks)

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2 F = [[2, -3], [4, 1]] and v = [[5], [-2]]. Calculate the matrix Fv.

(Total for Question 2 is 2 marks)

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3 M = [[3, -2], [5, 4]] and I = [[1, 0], [0, 1]]. Show that MI = M.

(Total for Question 3 is 3 marks)

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4 A = [[1, 2], [0, -1]], B = [[-3, 1], [2, 4]] and C = [[0, 2], [1, -2]].

(a) Find 2A - B. **(2)**

(b) Hence find (2A - B)C. **(3)**

(Total for Question 4 is 5 marks)

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

(Total for Question 5 is 3 marks)

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6 A cafe records the number of coffees, teas and cakes sold in a row matrix each week. In Week 1 the sales were [50, 35, 15] and in Week 2 the sales were [42, 28, 24] (coffees, teas, cakes respectively). The prices, in £, are given by the column matrix [[2.50], [2.00], [3.20]].

(a) Find the total sales matrix for the two weeks combined (Week 1 + Week 2). **(2)**

(b) Hence calculate the total revenue for the two weeks combined, using matrix multiplication. **(3)**

(c) The cafe owner plans to increase cake sales by 20% next week, while coffee and tea sales stay the same as the Week 2 total. Write down the new sales row matrix and find the new predicted revenue. **(4)**

(Total for Question 6 is 9 marks)

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Mark scheme · 4.1 Matrix Operations: Addition, Subtraction and Multiplication: 30-minute Pack

Question 1

(a) forms the equation x + (-3) = 5 from the (1,1) entries oe **M1**

(a) x = 8 cao **A1**

(a) Answer: x = 8

(b) forms the equation 2y + 7 = 15 from the (1,2) entries oe **M1**

(b) y = 4 cao **A1**

(b) Answer: y = 4

(c) forms the equation 3z + 9 = 21 from the (2,1) entries oe **M1**

(c) z = 4 cao **A1**

(c) Answer: z = 4

Question 2

at least one correct entry: 2(5)+(-3)(-2)=16 or 4(5)+1(-2)=18 **M1**

[[16], [18]] cao **A1**

Answer: [[16], [18]]

Question 3

correct method for row 1 of MI: 3(1)+(-2)(0)=3 and 3(0)+(-2)(1)=-2 **M1**

correct method for row 2 of MI: 5(1)+4(0)=5 and 5(0)+4(1)=4 **M1**

concludes MI = [[3, -2], [5, 4]], which is identical to M, as required (answer printed) **A1**

Answer: MI = [[3, -2], [5, 4]] = M (shown)

Question 4

(a) finds 2A = [[2,4],[0,-2]] and subtracts B correctly entry-wise **M1**

(a) [[5, 3], [-2, -6]] cao **A1**

(a) Answer: [[5, 3], [-2, -6]]

(b) correct method for row 1: 5(0)+3(1)=3 and 5(2)+3(-2)=4 **M1**

(b) correct method for row 2: -2(0)+(-6)(1)=-6 and -2(2)+(-6)(-2)=8 **M1**

(b) [[3, 4], [-6, 8]] cao **A1**

(b) Answer: [[3, 4], [-6, 8]]

Question 5

5A = [[30, -5], [15, 25]] **M1**

B found **M1**

[[27, -9], [16, 29]] cao **A1**

Answer: [[27, -9], [16, 29]]

Question 6

(a) adds corresponding entries of the two row matrices **M1**

(a) [92, 63, 39] cao **A1**

(a) Answer: [92, 63, 39]

(b) multiplies the combined sales matrix by the price matrix, forming 92(2.50)+63(2.00)+39(3.20) **M1**

(b) correct method evaluating each product: 230 + 126 + 124.80 **M1**

(b) £480.80 cao **A1**

(b) Answer: £480.80

(c) calculates the new cake figure as 24 x 1.20 = 28.8, keeping coffees at 42 and teas at 28 **M1**

(c) states the new sales matrix as [42, 28, 28.8] **A1**

(c) multiplies the new sales matrix by the price matrix: 42(2.50)+28(2.00)+28.8(3.20) **M1**

(c) £253.16 cao **A1**

(c) Answer: New sales matrix [42, 28, 28.8]; new predicted revenue £253.16

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