HIGHER

3.4 Vectors in Two Dimensions: Notation, Magnitude and Arithmetic: Test Pack

Total Marks

EDEXCEL 4MA1 · Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A displacement is 3 units to the right and 5 units up in a plane. Write down the column vector that represents this displacement, using column-vector notation for vectors in two dimensions.

(Total for Question 1 is 1 mark)

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2 a = [6; -4] and b = [4; -5]
Work out 4a - 2b as a column vector.

(Total for Question 2 is 3 marks)

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3 a = [4; -2], b = [1; -2] and c = [-4; -4].
c = ma + nb, where m and n are numbers. Find the value of m and the value of n.

(Total for Question 3 is 4 marks)

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4 a = [-6; 0] and b = [1; -3]
Work out -a + b as a column vector.

(Total for Question 4 is 3 marks)

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5 The vector v = [7; 0].
Find |v|, the magnitude of v. Give your answer as an integer or as a surd in its simplest form.

(Total for Question 5 is 2 marks)

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6 Given vectors a = [2; -3] and b = [-1; 4], find the vector 3a and give your answer in column-vector form.

(Total for Question 6 is 2 marks)

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7 Are the vectors [-4; 3] and [-7; 6] parallel? Give a reason.

(Total for Question 7 is 3 marks)

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8 The point A has position vector OA = [3; 3] and the point B has position vector OB = [-7; 1], where O is the origin.
Find the length of AB. Give your answer as an integer or as a surd in its simplest form.

(Total for Question 8 is 3 marks)

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9 The point Q(-2, -12) is the image of the point P under the translation [-4; -8]. Write down the coordinates of P.

(Total for Question 9 is 2 marks)

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10 Vector p = [7; 2] and vector q = [3; -5]. Calculate p - q and give your answer in column-vector form.

(Total for Question 10 is 2 marks)

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11 The point A has position vector OA = [0; 4] and the point B has position vector OB = [0; 3], where O is the origin.
Find the vector BA.

(Total for Question 11 is 2 marks)

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12 Let a = [3; 1] and b = [1; 2]. Express the vector 2a - b in column form, and then simplify the components.

(Total for Question 12 is 3 marks)

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13 A translation by vector t = [-3; 5] maps point X with position vector OX = [7; 0] to X'. Find the position vector OX' and give it in column form. Then state the image of the point with position vector [2; -1] under the same translation.

(Total for Question 13 is 3 marks)

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14 Given a = [2; -1] and b = [4; 3], show that 3a + 2b = [14; 3] by calculating and giving working.

(Total for Question 14 is 3 marks)

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15 Vectors a and b satisfy 2a + 3b = [11; 7] and a - b = [1; -1]. Find a and b by solving the pair of vector equations, giving your answers in column-vector form.

(Total for Question 15 is 4 marks)

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Mark scheme · 3.4 Vectors in Two Dimensions: Notation, Magnitude and Arithmetic: Test Pack

Question 1

column vector [3; 5] written in column form, cao **B1**

Answer: [3; 5]

Question 2

finds 4a = [24; -16] or -2b = [-8; 10] **M1**

adds corresponding components **M1**

[16; -6] **A1**

Answer: [16; -6]

Question 3

forms the equations 4m + n = -4 and -2m - 2n = -4 **M1**

eliminates one letter, for example by multiplying to match coefficients and adding or subtracting **M1**

m = -2 **A1**

n = 4 **A1**

Answer: m = -2, n = 4

Question 4

finds -a = [6; 0] or b = [1; -3] **M1**

adds corresponding components **M1**

[7; -3] **A1**

Answer: [7; -3]

Question 5

uses $|v| = \sqrt{(7)^2 + (0)^2} = \sqrt{49}$ **M1**

|v| = 7 **A1**

Answer: |v| = 7

Question 6

multiplies each component of a by 3, e.g. shows 3 x 2 and 3 x (-3) **M1**

3a = [6; -9] cao **A1**

Answer: [6; -9]

Question 7

compares the ratios of corresponding components **M1**

7/4 and 2 **A1**

No, the components are not in the same ratio **A1**

Answer: No, the components are not in the same ratio

Question 8

AB = [-10; -2] **M1**

uses $\sqrt{(-10)^2 + (-2)^2} = \sqrt{104}$ **M1**

$AB = 2\sqrt{26}$ **A1**

Answer: $2\sqrt{26}$

Question 9

subtracts the components of the vector from the coordinates of Q **M1**

P = (2, -4) **A1**

Answer: (2, -4)

Question 10

subtracts corresponding components: 7 - 3 and 2 - (-5) **M1**

p - q = [4; 7] cao **A1**

Answer: [4; 7]

Question 11

uses BA = OA - OB **M1**

BA = [0; 1] **A1**

Answer: [0; 1]

Question 12

shows method: forms 2a and subtracts b, e.g. 2[3;1] - [1;2] **M1**

performs component arithmetic correctly, e.g. [6;2] - [1;2] **M1**

gives final simplified vector [5; 0] cao **A1**

Answer: [5; 0]

Question 13

adds t to OX correctly to find OX', and adds t to [2; -1] for the second image **M1**

computes components correctly for both images **M1**

OX' = [4; 5] and image of [2; -1] is [-1; 4], cao **A1**

Answer: [4; 5] and [-1; 4]

Question 14

forms 3a and 2b correctly, e.g. 3[2; -1] and 2[4;3] **M1**

adds the two resulting vectors componentwise **M1**

correct result 3a + 2b = [14; 3] cao **A1**

Question 15

writes the system of equations for components, or uses vector elimination: from a - b = [1; -1] get a = b + [1; -1] **M1**

substitutes into 2a + 3b = [11;7] and simplifies to an equation in b, for both components **M1**

solves for b correctly, giving b = [9/5; 9/5] (5b = [9; 9]) **M1**

finds a = b + [1; -1] = [14/5; 4/5] cao **A1**

Answer: a = [14/5; 4/5], b = [9/5; 9/5]

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