HIGHER

3.4 Vectors in Two Dimensions: Notation, Magnitude and Arithmetic: 2-hour Pack

Total Marks

EDEXCEL 4MA1 · Calculator allowed · about 120 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 The point P(-1, 4) is translated by the vector [2; -6] to the point Q. Find the distance PQ. Give your answer as an integer or as a surd in its simplest form.

(Total for Question 1 is 3 marks)

2 a = [3; 3] and b = [-7; -7]
Work out 3a - 3b as a column vector.

(Total for Question 2 is 3 marks)

3 The vector v = [2; 1].
Find |v|, the magnitude of v. Give your answer as an integer or as a surd in its simplest form.

(Total for Question 3 is 2 marks)

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4 The point A has position vector OA = [0; -1] and the point B has position vector OB = [-2; -4], where O is the origin.
M is the midpoint of AB. Find the position vector of M.

(Total for Question 4 is 2 marks)

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5 a = [1; -1], b = [0; 5] and c = [-1; -14].
c = ma + nb, where m and n are numbers. Find the value of m and the value of n.

(Total for Question 5 is 4 marks)

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6 The point P(5, 4) is translated by the vector [7; -3] to the point Q. Write down the coordinates of Q.

(Total for Question 6 is 2 marks)

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7 a = [-3; -7] and b = [6; 7]
Work out 3a + b as a column vector.

(Total for Question 7 is 3 marks)

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8 The vector v = [1; 7].
Find |v|, the magnitude of v. Give your answer as an integer or as a surd in its simplest form.

(Total for Question 8 is 2 marks)

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9 Are the vectors [-2; 3] and [4; -6] parallel? Give a reason.

(Total for Question 9 is 3 marks)

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10 a = [-3; 4], b = [2; -3] and c = [7; -9].
c = ma + nb, where m and n are numbers. Find the value of m and the value of n.

(Total for Question 10 is 4 marks)

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11 The point P(-6, 1) is translated by the vector [-6; 7] to the point Q. Write down the coordinates of Q.

(Total for Question 11 is 2 marks)

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12 s = [4; 7] and t = [0; -5]
Work out 2s - 2t as a column vector.

(Total for Question 12 is 3 marks)

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13 The vector v = [6; 8].
Find |v|, the magnitude of v. Give your answer as an integer or as a surd in its simplest form.

(Total for Question 13 is 2 marks)

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14 Are the vectors [-3; -2] and [-8; -6] parallel? Give a reason.

(Total for Question 14 is 3 marks)

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15 The point A has position vector OA = [-5; 7] and the point B has position vector OB = [-2; 5], 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 15 is 3 marks)

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16 a = [3; 1], b = [2; -4] and c = [2; 10].
c = ma + nb, where m and n are numbers. Find the value of m and the value of n.

(Total for Question 16 is 4 marks)

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17 a = [0; 1] and b = [6; -7]
Work out -2a - 3b as a column vector.

(Total for Question 17 is 3 marks)

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18 The vector v = [-4; 0].
Find |v|, the magnitude of v. Give your answer as an integer or as a surd in its simplest form.

(Total for Question 18 is 2 marks)

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19 Are the vectors [3; -2] and [7; -4] parallel? Give a reason.

(Total for Question 19 is 3 marks)

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20 The point A has position vector OA = [-5; -5] and the point B has position vector OB = [4; 7], 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 20 is 3 marks)

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21 a = [-5; -1], b = [3; 4] and c = [-11; 8].
c = ma + nb, where m and n are numbers. Find the value of m and the value of n.

(Total for Question 21 is 4 marks)

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22 Are the vectors [-3; -2] and [-9; -6] parallel? Give a reason.

(Total for Question 22 is 3 marks)

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23 The point P(-3, -3) is translated by the vector [2; 4] to the point Q. Write down the coordinates of Q.

(Total for Question 23 is 2 marks)

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24 p = [0; -2] and q = [-4; -2]
Work out 2p - q as a column vector.

(Total for Question 24 is 3 marks)

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25 The vector v = [1; 1].
Find |v|, the magnitude of v. Give your answer as an integer or as a surd in its simplest form.

(Total for Question 25 is 2 marks)

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26 Are the vectors [-4; 4] and [-5; 6] parallel? Give a reason.

(Total for Question 26 is 3 marks)

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27 The vector v = [-3; 6].
Find |v|, the magnitude of v. Give your answer as an integer or as a surd in its simplest form.

(Total for Question 27 is 2 marks)

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28 The point A has position vector OA = [-7; 2] and the point B has position vector OB = [2; 1], where O is the origin.
P is the point on AB such that AP:PB = 1:3. Find the position vector of P.

(Total for Question 28 is 3 marks)

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29 A triangle has vertices with position vectors from origin O as OA = [1; 2], OB = [4; 1]. Find the vector AB in column form.

(Total for Question 29 is 3 marks)

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30 A translation T maps point P with position vector OP = [2; 5] to point P' with position vector OP' = [6; 2]. Find the translation vector t that describes T, and state t in column-vector form.

(Total for Question 30 is 3 marks)

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Mark scheme · 3.4 Vectors in Two Dimensions: Notation, Magnitude and Arithmetic: 2-hour Pack

Question 1

PQ is the magnitude of the translation vector **M1**

$\sqrt{(2)^2 + (-6)^2} = \sqrt{40}$ **M1**

$PQ = 2\sqrt{10}$ **A1**

Answer: $2\sqrt{10}$

Question 2

finds 3a = [9; 9] or -3b = [21; 21] **M1**

adds corresponding components **M1**

[30; 30] **A1**

Answer: [30; 30]

Question 3

uses $|v| = \sqrt{(2)^2 + (1)^2} = \sqrt{5}$ **M1**

$|v| = \sqrt{5}$ **A1**

Answer: $|v| = \sqrt{5}$

Question 4

uses OM = OA + (1/2)AB or (OA + OB)/2 **M1**

OM = [-1; -5/2] **A1**

Answer: [-1; -5/2]

Question 5

forms the equations m = -1 and -m + 5n = -14 **M1**

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

m = -1 **A1**

n = -3 **A1**

Answer: m = -1, n = -3

Question 6

adds the components of the vector to the coordinates of P **M1**

Q = (12, 1) **A1**

Answer: (12, 1)

Question 7

finds 3a = [-9; -21] or b = [6; 7] **M1**

adds corresponding components **M1**

[-3; -14] **A1**

Answer: [-3; -14]

Question 8

uses $|v| = \sqrt{(1)^2 + (7)^2} = \sqrt{50}$ **M1**

$|v| = 5\sqrt{2}$ **A1**

Answer: $|v| = 5\sqrt{2}$

Question 9

compares the ratios of corresponding components **M1**

-2 and -2 **A1**

Yes, [4; -6] = -2 x [-2; 3] **A1**

Answer: Yes, [4; -6] = -2 x [-2; 3]

Question 10

forms the equations -3m + 2n = 7 and 4m - 3n = -9 **M1**

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

m = -3 **A1**

n = -1 **A1**

Answer: m = -3, n = -1

Question 11

adds the components of the vector to the coordinates of P **M1**

Q = (-12, 8) **A1**

Answer: (-12, 8)

Question 12

finds 2s = [8; 14] or -2t = [0; 10] **M1**

adds corresponding components **M1**

[8; 24] **A1**

Answer: [8; 24]

Question 13

uses $|v| = \sqrt{(6)^2 + (8)^2} = \sqrt{100}$ **M1**

|v| = 10 **A1**

Answer: |v| = 10

Question 14

compares the ratios of corresponding components **M1**

8/3 and 3 **A1**

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

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

Question 15

AB = [3; -2] **M1**

uses $\sqrt{(3)^2 + (-2)^2} = \sqrt{13}$ **M1**

$AB = \sqrt{13}$ **A1**

Answer: $\sqrt{13}$

Question 16

forms the equations 3m + 2n = 2 and m - 4n = 10 **M1**

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

m = 2 **A1**

n = -2 **A1**

Answer: m = 2, n = -2

Question 17

finds -2a = [0; -2] or -3b = [-18; 21] **M1**

adds corresponding components **M1**

[-18; 19] **A1**

Answer: [-18; 19]

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Question 18

uses $|v| = \sqrt{(-4)^2 + (0)^2} = \sqrt{16}$ **M1**

$|v| = 4$ **A1**

Answer: $|v| = 4$

Question 19

compares the ratios of corresponding components **M1**

7/3 and 2 **A1**

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

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

Question 20

AB = [9; 12] **M1**

uses $\sqrt{(9)^2 + (12)^2} = \sqrt{225}$ **M1**

AB = 15 **A1**

Answer: 15

Question 21

forms the equations -5m + 3n = -11 and -m + 4n = 8 **M1**

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

m = 4 **A1**

n = 3 **A1**

Answer: m = 4, n = 3

Question 22

compares the ratios of corresponding components **M1**

3 and 3 **A1**

Yes, [-9; -6] = 3 x [-3; -2] **A1**

Answer: Yes, [-9; -6] = 3 x [-3; -2]

Question 23

adds the components of the vector to the coordinates of P **M1**

Q = (-1, 1) **A1**

Answer: (-1, 1)

Question 24

finds 2p = [0; -4] or -q = [4; 2] **M1**

adds corresponding components **M1**

[4; -2] **A1**

Answer: [4; -2]

Question 25

uses $|v| = \sqrt{(1)^2 + (1)^2} = \sqrt{2}$ **M1**

$|v| = \sqrt{2}$ **A1**

Answer: $|v| = \sqrt{2}$

Question 26

compares the ratios of corresponding components **M1**

5/4 and 3/2 **A1**

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

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

Question 27

uses $|v| = \sqrt{(-3)^2 + (6)^2} = \sqrt{45}$ **M1**

$|v| = 3\sqrt{5}$ **A1**

Answer: $|v| = 3\sqrt{5}$

Question 28

AP = (1/4)AB = [9/4; -1/4] **M1**

OP = OA + AP **M1**

OP = [-19/4; 7/4] **A1**

Answer: [-19/4; 7/4]

Question 29

uses AB = OB - OA or shows subtraction of position vectors **M1**

performs components subtraction: [4 - 1; 1 - 2] **M1**

AB = [3; -1] cao **A1**

Answer: [3; -1]

Question 30

uses t = OP' - OP or equivalent **M1**

computes components 6 - 2 and 2 - 5 correctly **M1**

t = [4; -3] cao **A1**

Answer: [4; -3]

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