1.10 Pure: Vectors: 30-minute Pack

EDEXCEL 9MA0 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 p = 4i + j, q = -i + 5j. Find p - q.

(Total for Question 1 is 1 mark)

2 a = 5i - 12j. Find |a|.

(Total for Question 2 is 1 mark)

3 Find the value of k for which ki + 6j is parallel to 2i + 3j.

(Total for Question 3 is 1 mark)

4 State whether the vectors 4i - 6j and -2i + 3j are parallel, giving a brief reason.

(Total for Question 4 is 1 mark)

5 Two survey points D and E have position vectors, relative to a fixed origin and measured in metres, OD = 2i - j + 4k and OE = 6i + 3j - 2k.

(a) Find the vector DE, and hence find |DE|, giving your answer in metres to 3 significant figures. **(4)**

(b) The point F lies on DE such that DF : FE = 3 : 1. Find the position vector of F. **(2)**

(c) State, with a reason, whether F lies closer to D or to E. **(1)**

(Total for Question 5 is 7 marks)

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6 Two forces acting on a particle are F1 = (3i - 2j) N and F2 = (-7i + 9j) N. Find the resultant force, and its magnitude, giving your answer in newtons to 3 significant figures.

(Total for Question 6 is 3 marks)

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7 The quadrilateral OABC has position vectors, relative to O, of 0, a, a + c and c respectively, where a and c are non-zero, non-parallel vectors.

(a) Show that OABC is a parallelogram. **(3)**

(b) M is the midpoint of the diagonal OB and N is the midpoint of the diagonal AC. Show that M and N are the same point. **(4)**

(c) Given that a = 4i - j and c = i + 3j, find the coordinates of the point where the diagonals of OABC intersect. **(3)**

(Total for Question 7 is 10 marks)

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Mark scheme · 1.10 Pure: Vectors: 30-minute Pack

Question 1

5i - 4j cao	**B1**

Answer: 5i - 4j

Question 2

|a| = 13 cao	**B1**

Answer: 13

Question 3

k = 4 cao	**B1**

Answer: k = 4

Question 4

parallel, since 4i-6j = -2(-2i+3j), a scalar multiple	**B1**

Answer: Parallel

Question 5

(a) OE - OD	**M1**
(a) DE = 4i + 4j - 6k	**A1**
(a) $\sqrt{4^2+4^2+(-6)^2}$	**M1**
(a) awrt 8.25 m	**A1**

(a) Answer: DE = 4i+4j-6k; |DE| = awrt 8.25 m

(b) F = D + (3/4)DE (ft from (a))	**M1**
(b) F = 5i + 2j - 0.5k oe	**A1**

(b) Answer: OF = 5i + 2j - 0.5k

(c) F is closer to E, since DF:FE = 3:1 means FE is only 1 part of the 4 compared to DF's 3 parts	**B1**

(c) Answer: F is closer to E

Question 6

add corresponding components	**M1**
resultant = -4i + 7j (N) cao	**A1**
magnitude = $\sqrt{16+49}$ = awrt 8.06 N	**A1**

Answer: Resultant = -4i + 7j (N), magnitude awrt 8.06 N

Question 7

(a) find AB = OB - OA	**M1**
(a) AB = c, so AB = OC	**A1**
(a) cso: one pair of opposite sides (AB, OC) equal and parallel, so OABC is a parallelogram	**A1**

(a) Answer: AB = OC = c, so OABC is a parallelogram

(b) OM = (1/2)(a+c)	**M1**
(b) correct OM	**A1**
(b) ON = OA + (1/2)AC = a + (1/2)(c-a)	**M1**
(b) cso: ON simplifies to (1/2)(a+c) = OM, so M and N coincide	**A1**

(b) Answer: OM = ON = (1/2)(a+c), so M and N are the same point

(c) substitute a, c into (1/2)(a+c)	**M1**
(c) (1/2)(5i+2j)	**M1**
(c) coordinates (2.5, 1) cao	**A1**

(c) Answer: (2.5, 1)

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