Pearson Edexcel A Level Mathematics 9MA0

Unit Test 12 Vectors

Time allowed: 50 **minutes**

School: www.CasperYC.club

Name:

Teacher:

How I can achieve better:

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Question	Points	Score
1	6	
2	6	
3	3	
4	10	
5	6	
6	9	
7	10	
Total:	50	

1. (a) The coordinates of A and B are $(-1, 7, k)$ and $(4, 1, 10)$ respectively. [3]

   Given that the distance from A to B is $5\sqrt{5}$ units, find the possible values of the constant k.

   (b) For the larger value of k, find the unit vector in the direction of $\overrightarrow{OA}$. [3]

Total: 6

2. A triangle has vertices $A(-2, 0, -4)$, $B(-2, 4, -6)$ and $C(3, 4, 4)$. By considering the side lengths of the triangle, show that the triangle is a right-angled triangle. [6]

3. Find the angle that the vector $\mathbf{a} = 4\mathbf{i} - \mathbf{j} + 3\mathbf{k}$ makes with the positive y-axis. [3]

4. (a) Show that in $\triangle KLM$ with $\overrightarrow{KL} = 3\mathbf{i} + 0\mathbf{j} - 6\mathbf{k}$ and $\overrightarrow{LM} = 2\mathbf{i} + 5\mathbf{j} + 4\mathbf{k}$, $\angle KLM = 66.4°$ to one decimal place. [7]

(b) Hence find $\angle LKM$ and $\angle LMK$. [3]

Total: 10

5. Given that [6]

$$(b-a)\mathbf{i} - 2abc\mathbf{j} + 2\mathbf{k} = 10\mathbf{i} - 96\mathbf{j} + (7a+5b)\mathbf{k},$$

find the values of a, b and c.

6. A particle of mass 3 kg is acted on by three forces, $F_1 = (2\mathbf{i} + 6\mathbf{j} - 3\mathbf{k})$N, $F_2 = (7\mathbf{i} + 8\mathbf{k})$N and $F_3 = (-3\mathbf{i} - 3\mathbf{j} - 2\mathbf{k})$N.

   (a) Find the resultant force R acting on the particle. [2]

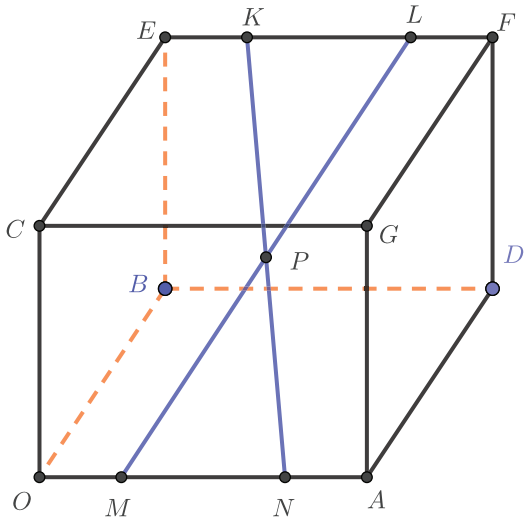
   (b) Find the acceleration of the particle, giving your answer in the form $(p\mathbf{i} + q\mathbf{j} + r\mathbf{k})$ ms^{-2}. [2]

   (c) Find the magnitude of the acceleration. [2]

   (d) Given that the particle starts at rest, find the exact distance travelled by the particle in the first 10s. [3]

Total: 9

7. The diagram shows a cuboid whose vertices are O, A, B, C, D, E, F and G. $\mathbf{a}, \mathbf{b}$ and $\mathbf{c}$ are the vectors $\overrightarrow{OA}, \overrightarrow{OB}$ and $\overrightarrow{OC}$ respectively. The points M and N lie on OA such that $OM : MN : NA = 1 : 2 : 1$. The points K and L lie on EF such that $EK : KL : LF = 1 : 2 : 1$. [10]



Prove that the diagonals KN and ML bisect each other at P.