

Write your name here

Surname

Other names

In the style of:

**Edexcel GCSE**

Centre Number

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Candidate Number

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# Mathematics A

## Vectors

**Higher Tier**

Past Paper Style Questions  
Arranged by Topic

Paper Reference

**1MA0/1H**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*
- **Calculators must not be used.**



### Information

- The total mark for this paper is 100
- The marks for **each** question are shown in brackets  
– *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (\*) are ones where the quality of your written communication will be assessed.

### Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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1.

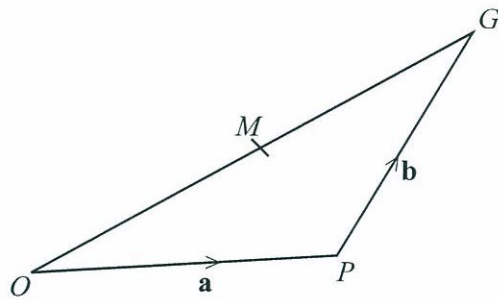


Diagram **NOT**  
accurately drawn

$OGP$  is a triangle.

$M$  is the midpoint of  $OG$ .

$$\vec{OP} = \mathbf{a}$$

$$\vec{PG} = \mathbf{b}$$

(a) Express  $\vec{OM}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .

$$\vec{OM} = \frac{1}{2} (\vec{OG}) = \frac{1}{2} (\mathbf{a} + \mathbf{b})$$

$$\vec{OM} = \frac{\frac{1}{2} (\mathbf{a} + \mathbf{b})}{(2)}$$

(b) Express  $\vec{PM}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$   
Give your answer in its simplest form.

$$\begin{aligned} \vec{PM} &= \vec{PO} + \vec{OM} \\ &= -\mathbf{a} + \frac{1}{2} (\mathbf{a} + \mathbf{b}) \\ &= \frac{1}{2} \mathbf{b} - \frac{1}{2} \mathbf{a} \\ &= \frac{1}{2} (\mathbf{b} - \mathbf{a}) \end{aligned}$$

N.B.:  $\vec{PO} = -\vec{OP}$

$$\vec{PM} = \frac{\frac{1}{2} (\mathbf{b} - \mathbf{a})}{(2)}$$

(Total 4 marks)



2.

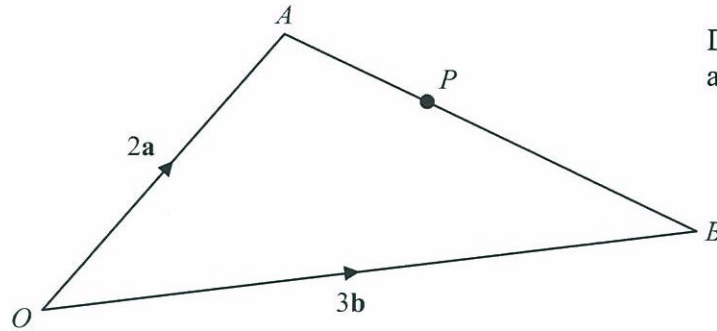


Diagram NOT accurately drawn

$OAB$  is a triangle.

$$\vec{OA} = 2\mathbf{a}$$

$$\vec{OB} = 3\mathbf{b}$$

(a) Find  $\vec{AB}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .

$$\begin{aligned}\vec{AB} &= \vec{AO} + \vec{OB} \\ &= -2\mathbf{a} + 3\mathbf{b}\end{aligned}$$

$$\vec{AB} = \frac{3\mathbf{b} - 2\mathbf{a}}{\dots\dots\dots} \quad (1)$$

$P$  is the point on  $AB$  such that  $AP : PB = 2 : 3$

(b) Show that  $\vec{OP}$  is parallel to the vector  $\mathbf{a} + \mathbf{b}$ .

$$\begin{aligned}\vec{OP} &= \vec{OA} + \vec{AP} \\ &= 2\mathbf{a} + \frac{2}{5}(\vec{AB}) \\ &= 2\mathbf{a} + \frac{2}{5}(3\mathbf{b} - 2\mathbf{a}) \\ &= 2\mathbf{a} + \frac{6}{5}\mathbf{b} - \frac{4}{5}\mathbf{a} \\ &= \frac{6}{5}\mathbf{a} + \frac{6}{5}\mathbf{b} \\ &= \frac{6}{5}(\mathbf{a} + \mathbf{b}), \text{ which is a scalar multiple of the vector } \mathbf{a} + \mathbf{b}\end{aligned}$$

(3)

Note: Two vectors are parallel if one is just a scalar multiple of the other. (Total 4 marks)



3.

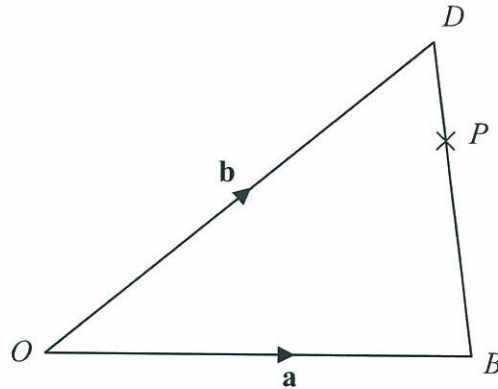


Diagram NOT accurately drawn

$ODB$  is a triangle.

$$\vec{OB} = \mathbf{a}$$

$$\vec{OD} = \mathbf{b}$$

(a) Find  $\vec{BD}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .

$$\vec{BD} = \vec{BO} + \vec{OD} = -\mathbf{a} + \mathbf{b}$$

$$\underline{\mathbf{b} - \mathbf{a}}$$

(1)

$P$  is the point on  $DB$  such that  $DP : PB = 1 : 3$

(b) Find  $\vec{OP}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .

Give your answer in its simplest form.

$$\begin{aligned} \vec{OP} &= \vec{OB} + \vec{BP} \\ &= \vec{OB} + \frac{3}{4}(\vec{BD}) \\ &= \mathbf{a} + \frac{3}{4}(\mathbf{b} - \mathbf{a}) \\ &= \mathbf{a} + \frac{3}{4}\mathbf{b} - \frac{3}{4}\mathbf{a} \\ &= \frac{1}{4}\mathbf{a} + \frac{3}{4}\mathbf{b} \\ &= \frac{1}{4}(\mathbf{a} + 3\mathbf{b}) \end{aligned}$$

$$\underline{\frac{1}{4}(\mathbf{a} + 3\mathbf{b})}$$

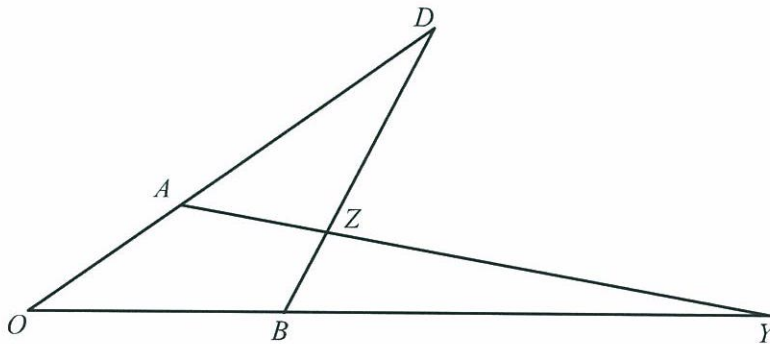
(3)

(Total 4 marks)



4.

Diagram NOT  
accurately drawn



In the diagram,

$$\vec{OA} = 4\mathbf{a} \quad \text{and} \quad \vec{OB} = 4\mathbf{b}$$

$OAD$ ,  $OBY$  and  $BZD$  are all straight lines

$$AD = 2OA \quad \text{and} \quad BZ : ZD = 1 : 3$$

(a) Find, in terms of  $\mathbf{a}$  and  $\mathbf{b}$ , the vectors which represent

(4)

(i)  $\vec{BD}$

$$\begin{aligned} \vec{BD} &= \vec{BO} + \vec{OD} = -4\mathbf{b} + 4\mathbf{a} + 8\mathbf{a} \\ &= 12\mathbf{a} - 4\mathbf{b} = 4(3\mathbf{a} - \mathbf{b}) \end{aligned} \quad \underline{4(3\mathbf{a} - \mathbf{b})}$$

(ii)  $\vec{AZ}$

$$\begin{aligned} \vec{AZ} &= \vec{AO} + \vec{OB} + \vec{BZ} \\ &= -4\mathbf{a} + 4\mathbf{b} + \frac{1}{4}(4)(3\mathbf{a} - \mathbf{b}) \\ &= -4\mathbf{a} + 4\mathbf{b} + 3\mathbf{a} - \mathbf{b} = 3\mathbf{b} - \mathbf{a} \end{aligned} \quad \underline{3\mathbf{b} - \mathbf{a}}$$

Given that  $\vec{BY} = 8\mathbf{b}$

(b) Show that  $AZY$  is a straight line.

(3)

$$\begin{aligned} \vec{AY} &= \vec{AO} + \vec{OY} = -4\mathbf{a} + 4\mathbf{b} + 8\mathbf{b} \\ &= 12\mathbf{b} - 4\mathbf{a} = 4(3\mathbf{b} - \mathbf{a}) \equiv 4(\vec{AZ}) \end{aligned}$$

$\therefore$  Since  $\vec{AY}$  is a scalar multiple of  $\vec{AZ}$ ,

$AZY$  is a straight line. (Total 7 marks)

