

# Vectors

Please write clearly in block capitals

Forename:

Surname:

## Materials

For this paper you must have:

- mathematical instruments



You **can** use a calculator.

## Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer all questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

## Information

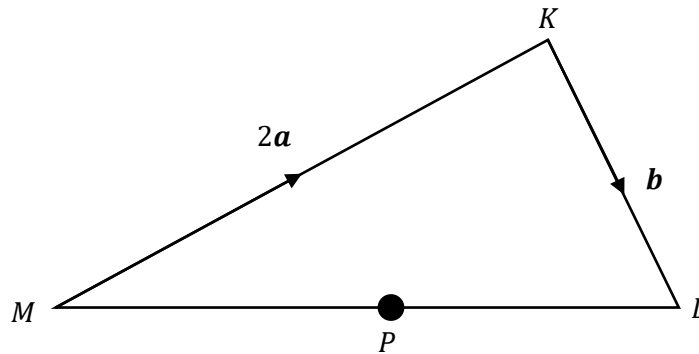
- The marks for questions are shown in brackets.
- You may ask for graph paper, tracing paper and more answer paper. These must be tagged securely to this answer book.

## Advice

- In all calculations, show clearly how you work out your answer.

1  $KLM$  is a scalene triangle.

(Level 6)



Not drawn accurately

Point P is half way along  $\overline{ML}$ .

$$\overline{MK} = 2\mathbf{a}, \quad \overline{KL} = \mathbf{b}.$$

1(a) Write the vector  $\overline{ML}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .

[1 mark]

Answer \_\_\_\_\_

1(b) Find  $\overline{MP}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .

[1 mark]

Answer \_\_\_\_\_

1(c) A new point  $N$  is to the right of  $L$ .

$\overline{MN}$  is 4 times the length of  $\overline{MP}$ .

Write  $\overline{MN}$  as a column vector.

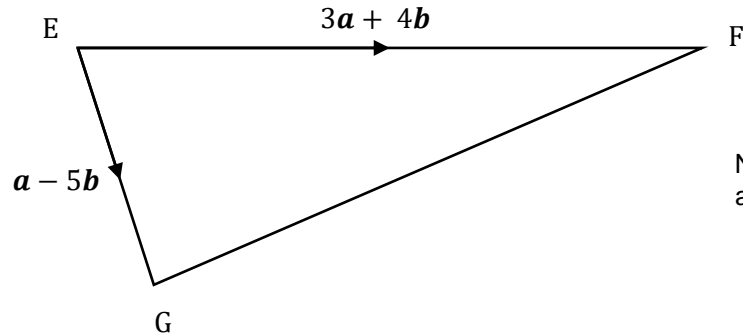
[1 mark]

Answer \_\_\_\_\_

2

 $EFG$  is a scalene triangle.

(Level 6)



$$\vec{EG} = a - 5b, \quad \vec{EF} = 3a + 4b.$$

$\vec{GH}$ , not shown, is 3 times the length of and parallel to  $\vec{GF}$ .

Find  $\vec{GH}$  in terms of  $a$  and  $b$ .

[3 marks]

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Answer



### GCSE Maths Practice Exam Papers

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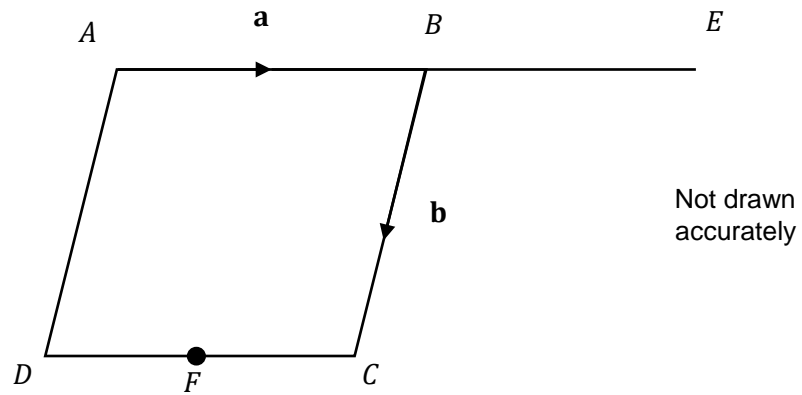
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Turn over ►

3  $ABCD$  is a rhombus. Opposite sides are parallel.

(Level 7)



$\overrightarrow{BE}$  is an extension of  $\overrightarrow{AB}$ , such that  $AB : BE = 4 : 3$

The point  $F$  is halfway along  $\overline{CD}$

Find  $\overrightarrow{FE}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .

[3 marks]

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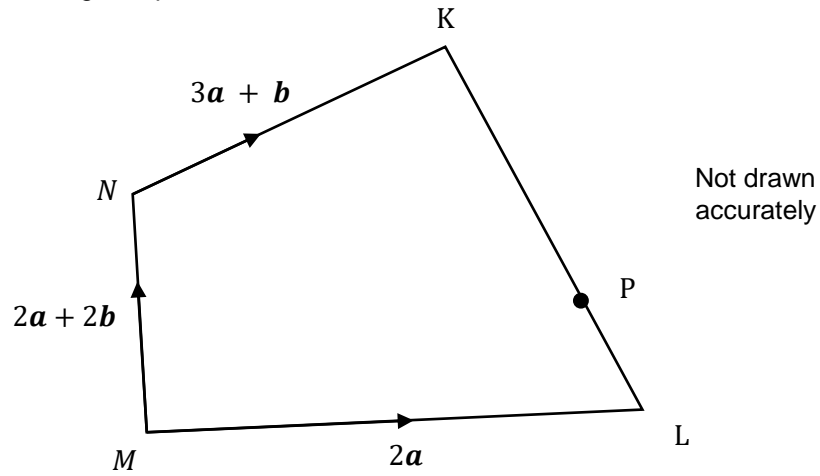
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Answer \_\_\_\_\_

Turn over for next question

4 KLMN is an irregular quadrilateral.

(Level 7)



$$\overrightarrow{ML} = 2\mathbf{a}, \quad \overrightarrow{MN} = 2\mathbf{a} + 2\mathbf{b}, \quad \overrightarrow{NK} = 3\mathbf{a} + \mathbf{b}.$$

Point P is positioned such that  $LP:PK = 1:2$

4(a) Find the vector  $\overrightarrow{LK}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .

[2 marks]

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Answer \_\_\_\_\_

4(b) Show that  $\overrightarrow{MP} = \overrightarrow{NK}$ .

[4 marks]

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Answer \_\_\_\_\_

Turn over for next question

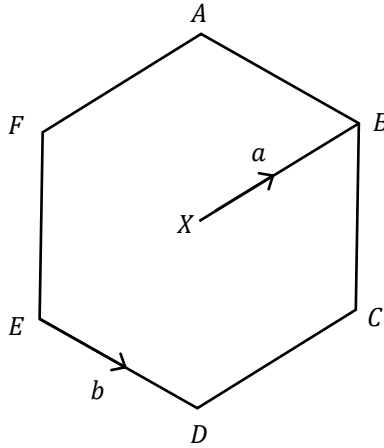
5 The diagram below shows a regular hexagon ABCDEF.

(Level 7)

X is the point at the center of the hexagon.

$$\overrightarrow{XB} = \mathbf{a}$$

$$\overrightarrow{ED} = \mathbf{b}$$



Not drawn accurately

Write down the following vectors in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .

5(a)

$$\overrightarrow{BC}$$

[1 mark]

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5(b)

$$\overrightarrow{BE}$$

[1 mark]

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5(c)

$$\overrightarrow{AE}$$

[1 mark]

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5(d)

$$\overrightarrow{FB}$$

[1 mark]

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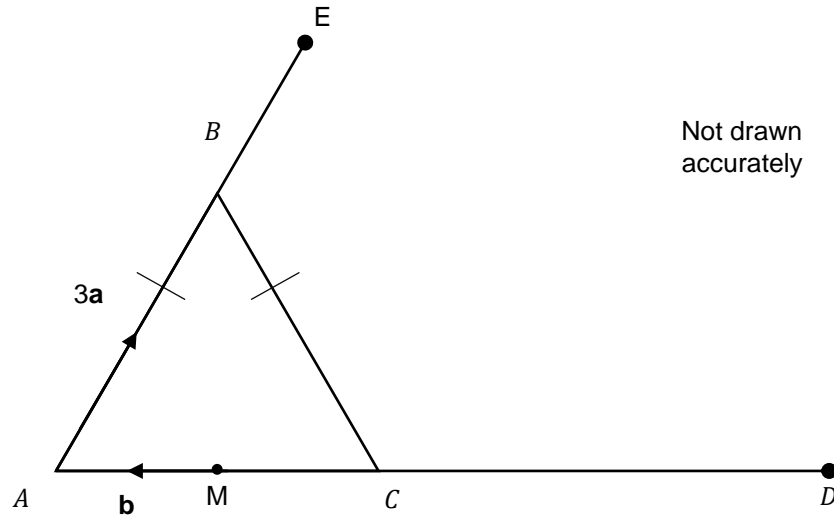
Turn over for next question

Turn over ►

6

 $ABC$  is an isosceles triangle.

(Level 7)



Point  $M$  is halfway along the triangle base,  $AC$ .

Point  $D$  is positioned such that  $\overrightarrow{AC}$  and  $\overrightarrow{AD}$  are collinear.

Point  $E$  is positioned such that  $\overrightarrow{AB}$  and  $\overrightarrow{AE}$  are collinear.

$$AB:BE = 3:2$$

$$\overrightarrow{MA} = \mathbf{b}, \quad \overrightarrow{AB} = 3\mathbf{a}, \quad \overrightarrow{AD} = 2\overrightarrow{AC}.$$

Find  $\overrightarrow{DE}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .

[4 marks]

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Answer

\_\_\_\_\_

Turn over for next question.

Turn over ►

7

On the diagram below:

(Level 7)

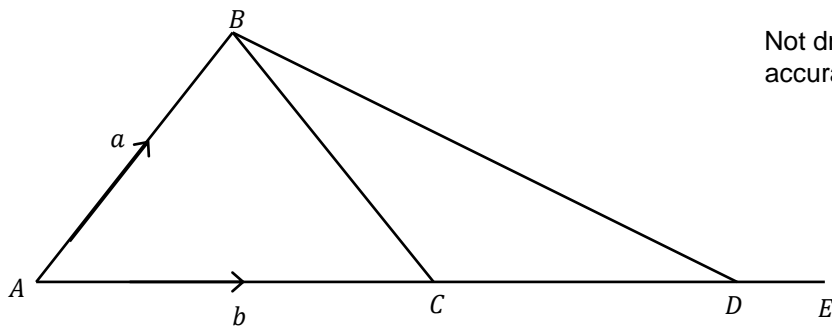
AE is a straight line

$$\overrightarrow{AB} = \mathbf{a}$$

$$\overrightarrow{AC} = \mathbf{b}$$

$$AC = CE$$

$$DE = \frac{1}{4} CE$$

Not drawn  
accuratelyFind expressions for the vectors below in terms of **a** and **b**.

7(a)

$$\overrightarrow{BC}$$

[1 mark]

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Answer \_\_\_\_\_

7(b)

$$\overrightarrow{DB}$$

[4 marks]

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Answer \_\_\_\_\_

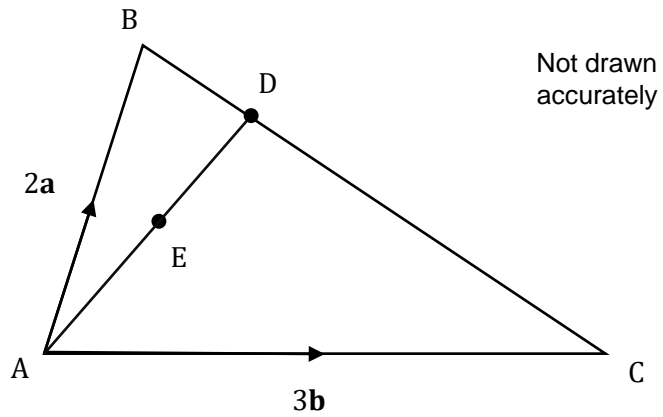
Turn over for next question



8

 $ABC$  is a scalene triangle.

(Level 8)



$$\vec{AC} = 3\mathbf{b}, \quad \vec{AB} = 2\mathbf{a}.$$

Point D is positioned such that  $BD:DC = 1:3$

Point E is positioned such that  $AE:ED = 1:1$

Find  $\vec{AE}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .

[5 marks]

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Answer \_\_\_\_\_

Turn over for next question

Turn over ►

9 On the diagram below:

(Level 8)

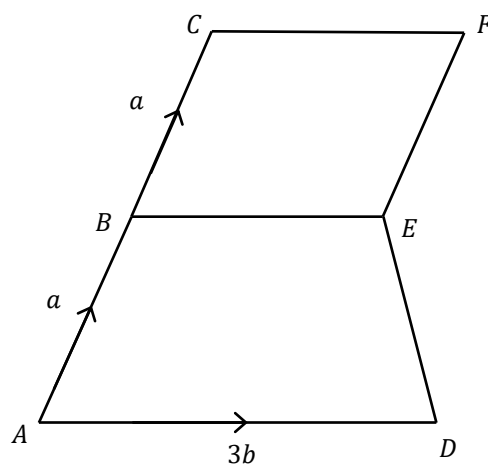
$$\overrightarrow{AB} = \overrightarrow{BC} = \mathbf{a}$$

$$\overrightarrow{AD} = 3\mathbf{b}$$

$AE$  is a straight line

$CBEF$  is a parallelogram

$$AD:BE:CF = 3:2:2$$



Not drawn  
accurately

Find expressions for the vectors below in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .

9(a)  $\overrightarrow{DC}$

[1 mark]

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Answer \_\_\_\_\_

9(b)  $\overrightarrow{FD}$

[2 marks]

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Answer \_\_\_\_\_

Question continues on next page

- 9(c) DE is extended upwards until it hits the line  $CF$ .  
The point of intersection is  $X$ .  
What is the ratio  $CX:XF$ ?

[3 marks]

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Answer \_\_\_\_\_



### GCSE Maths Revision Guide

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- ✓ All exam boards - AQA, OCR, Edexcel, WJEC
- ✓ Suitable for higher and foundation tiers

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10

On the diagram below:

(Level 9)

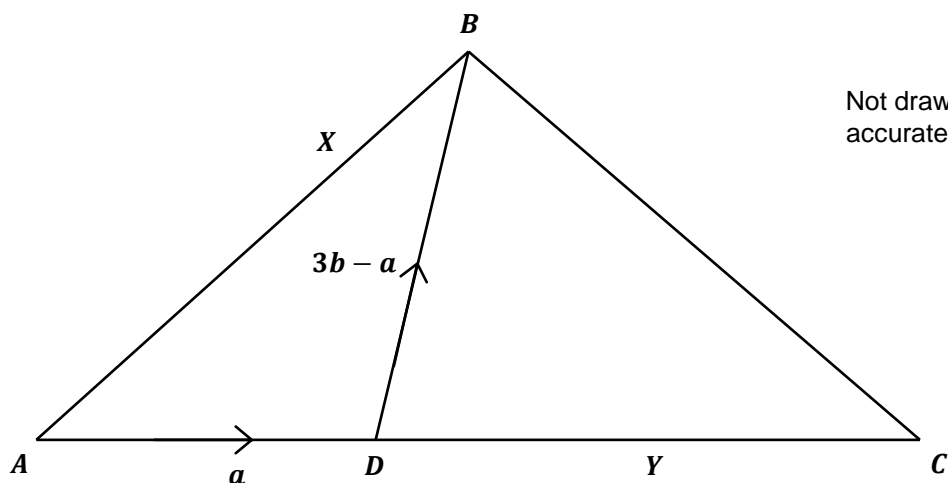
$$\overrightarrow{AD} = \mathbf{a}$$

$$\overrightarrow{DB} = 3\mathbf{b} - \mathbf{a}$$

$AC$  and  $AB$  are straight lines

$$AD:DY:YC = 1:1:1$$

$$AX:XB = 2:1$$



Show that  $XY$  is parallel to  $BC$ .

[3 marks]

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Answer \_\_\_\_\_

**End of Questions**