

1MA1 Higher themed papers: Vectors

Write your name here	
Surname	Other names
Centre Number	Candidate Number
<input type="text"/>	<input type="text"/>
Pearson Edexcel Level 1/Level 2 GCSE (9–1)	
Mathematics Vectors	
	Paper Reference 1MA1
You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. 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.*
- You must **show all your working**.
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.

Information

- The total mark for this paper is **52**. There are **12** questions.
- Questions have been arranged in an ascending order of mean difficulty, as found by all students in the June 2017–November 2019 examinations.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

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.

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1 $\mathbf{a} = \begin{pmatrix} 1 \\ 4 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$

(a) Write down as a column vector

(i) $\mathbf{a} + \mathbf{b}$

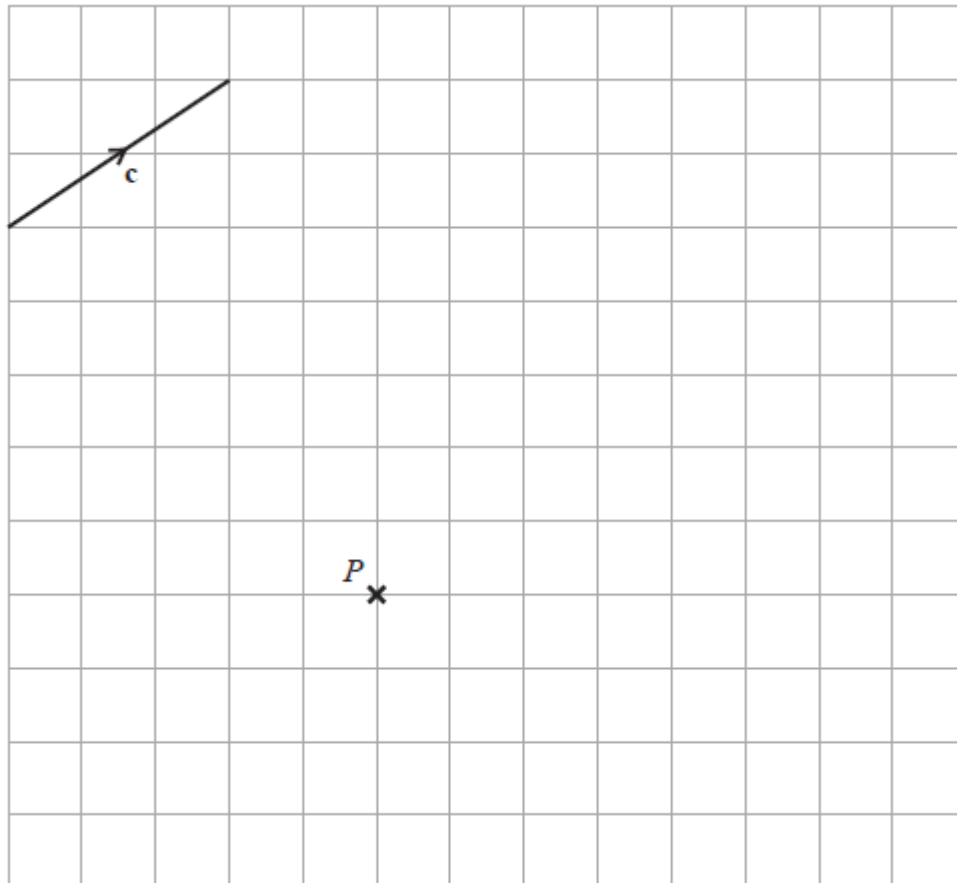
.....

(ii) $2\mathbf{a} + 3\mathbf{b}$

.....

(3)

The vector \mathbf{c} is drawn on the grid.

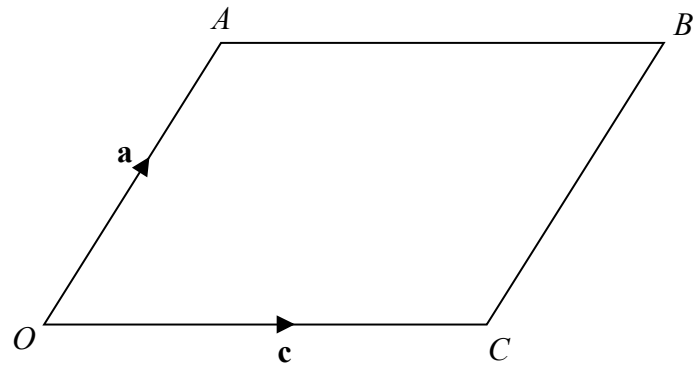


(b) From the point P , draw the vector $2\mathbf{c}$

(1)

(Total for Question 1 is 4 marks)

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$OACB$ is a parallelogram.

$$\vec{OA} = \mathbf{a} \quad \text{and} \quad \vec{OC} = \mathbf{c}$$

X is the midpoint of the line AC .

OCD is a straight line so that $OC : CD = k : 1$

$$\text{Given that } \vec{XD} = 3\mathbf{c} - \frac{1}{2}\mathbf{a}$$

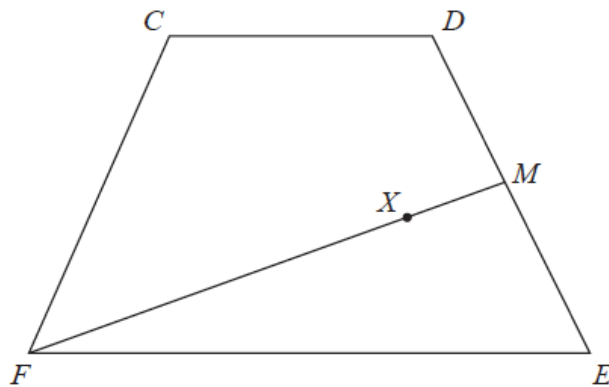
find the value of k .

$$k = \dots\dots\dots$$

(Total for Question 2 is 4 marks)

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3 $CDEF$ is a quadrilateral.



$$\vec{CD} = \mathbf{a}, \quad \vec{DE} = \mathbf{b} \quad \text{and} \quad \vec{FC} = \mathbf{a} - \mathbf{b}.$$

- (a) Express \vec{FE} in terms of \mathbf{a} and/or \mathbf{b} .
Give your answer in its simplest form.

.....
(2)

M is the midpoint of DE .
 X is the point on FM such that $FX : XM = n : 1$
 CXE is a straight line.

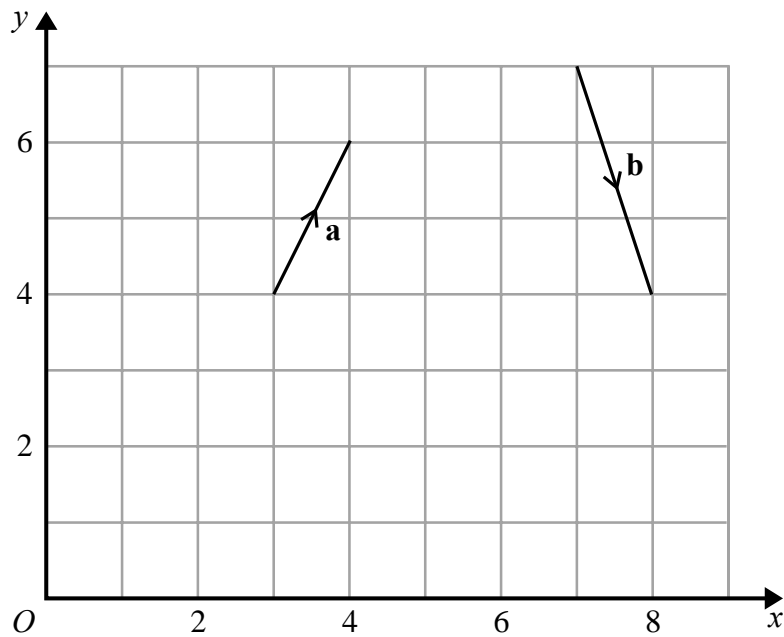
- (b) Work out the value of n .

$n =$
(4)

(Total for Question 3 is 6 marks)

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4 The vector **a** and the vector **b** are shown on the grid.



(a) On the grid, draw and label vector $-2\mathbf{a}$

(1)

(b) Work out $\mathbf{a} + 2\mathbf{b}$ as a column vector.

$$\begin{pmatrix} \\ \text{---} \\ \text{---} \end{pmatrix}$$

(2)

(Total for Question 4 is 3 marks)

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5 The equation of a curve is $y = a^x$
A is the point where the curve intersects the y-axis.

(a) State the coordinates of A.

(..... ,)
(1)

The equation of circle **C** is $x^2 + y^2 = 16$

The circle **C** is translated by the vector $\begin{pmatrix} 3 \\ 0 \end{pmatrix}$ to give circle **B**.

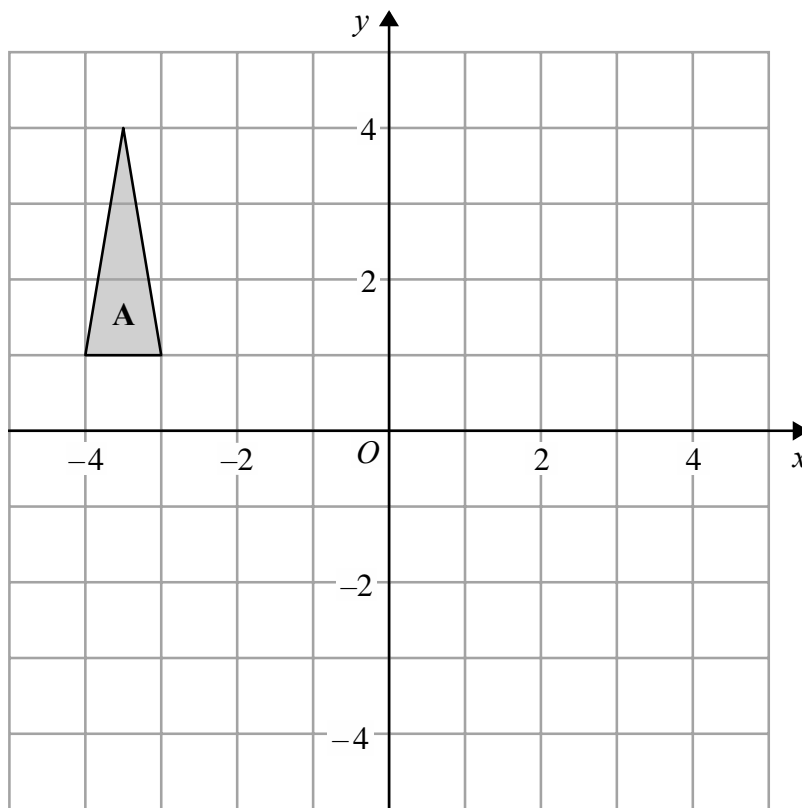
(b) Draw a sketch of circle **B**.

Label with coordinates
the centre of circle **B**
and any points of intersection with the x -axis.

(3)

(Total for Question 5 is 4 marks)

6



Triangle **A** is transformed by the combined transformation of a rotation of 180° about the

point $(-2, 0)$ followed by a translation with vector $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$

One point on triangle **A** is invariant under the combined transformation.

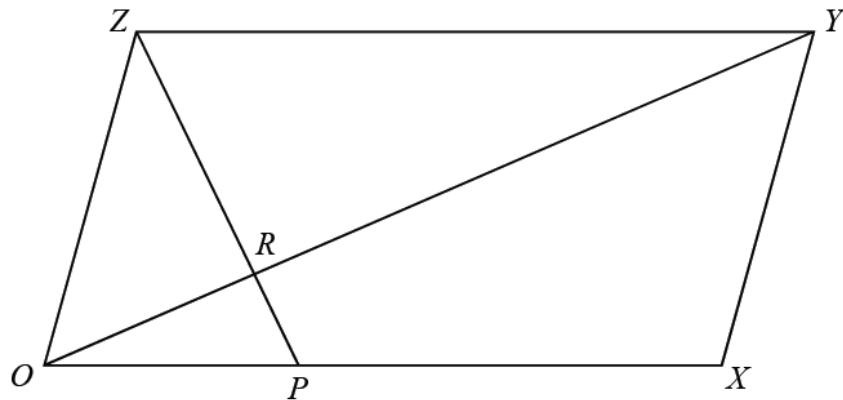
Find the coordinates of this point.

(..... ,)

(Total for Question 6 is 2 marks)

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7 $OXYZ$ is a parallelogram.



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

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

P is the point on OX such that $OP : PX = 1 : 2$

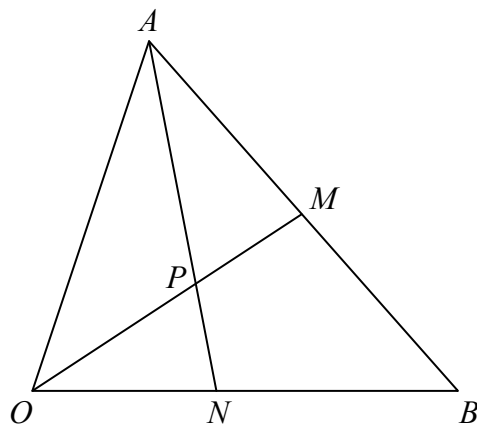
R is the point on OY such that $OR : RY = 1 : 3$

Work out, in its simplest form, the ratio $ZP : ZR$

You must show all your working.

.....
(Total for Question 7 is 5 marks)

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OAB is a triangle.

OPM and APN are straight lines.

M is the midpoint of AB .

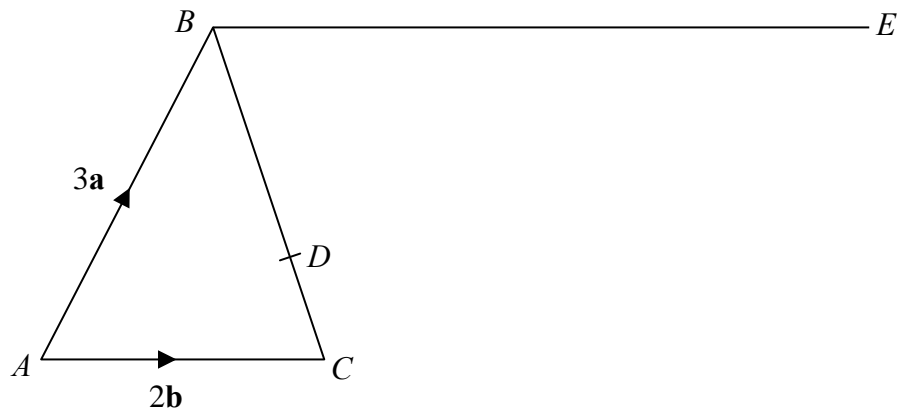
$$\vec{OA} = \mathbf{a} \quad \vec{OB} = \mathbf{b}$$

$$OP : PM = 3 : 2$$

Work out the ratio $ON : NB$

.....
(Total for Question 8 is 5 marks)

9



The diagram shows triangle ABC .

$$\vec{AB} = 3\mathbf{a}$$

$$\vec{AC} = 2\mathbf{b}$$

$$\vec{BE} = 3\vec{AC}$$

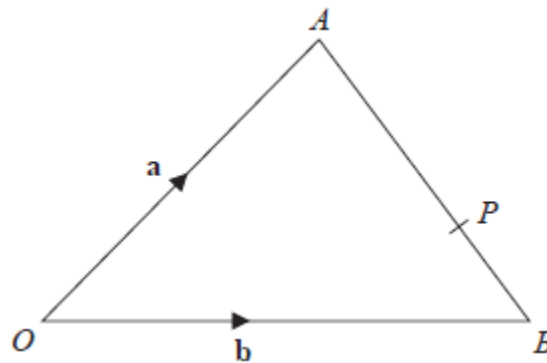
D is the point on BC such that $BD : DC = 3 : 1$

Prove that ADE is a straight line.

(Total for Question 19 is 4 marks)

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10 OAB is a triangle.



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

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

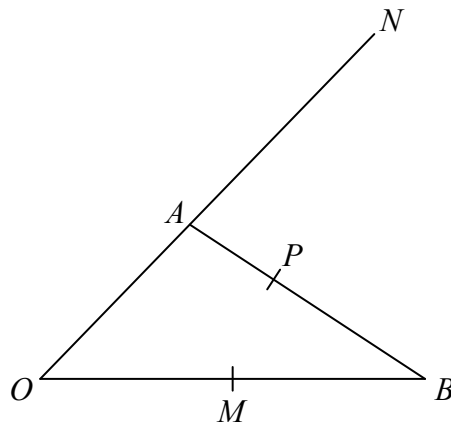
P is the point on AB such that $AP : PB = 3 : 2$

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

Give your answer in its simplest form.

.....
(Total for Question 10 is 3 marks)

11



OAN , OMB and APB are straight lines.

$AN = 2OA$.

M is the midpoint of OB .

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

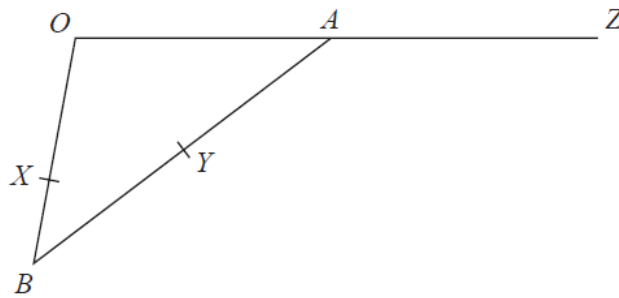
$$\vec{AP} = k \vec{AB} \text{ where } k \text{ is a scalar quantity.}$$

Given that MPN is a straight line, find the value of k .

.....
(Total for Question 11 is 5 marks)

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12



OAB is a triangle.

A is the midpoint of OZ

Y is the midpoint of AB

X is a point on OB

$$\vec{OA} = \mathbf{a} \quad \vec{OX} = 2\mathbf{b} \quad \vec{XB} = \mathbf{b}$$

Prove that XYZ is a straight line.

(Total for Question 12 is 5 marks)

TOTAL MARKS FOR PAPER: 52