Solving Geometric problems & Modelling
Difficulty: Medium

Question Paper 1

Level	AS & A Level
Subject	Maths - Pure
Exam Board	Edexcel
Topic	Vectors
Sub-Topic	Solving Geometric problems & modelling
Difficulty	Medium
Booklet	Question Paper 1

Time allowed: **36 minutes**

Score: **/30**

Percentage: **/100**

Grade Boundaries:

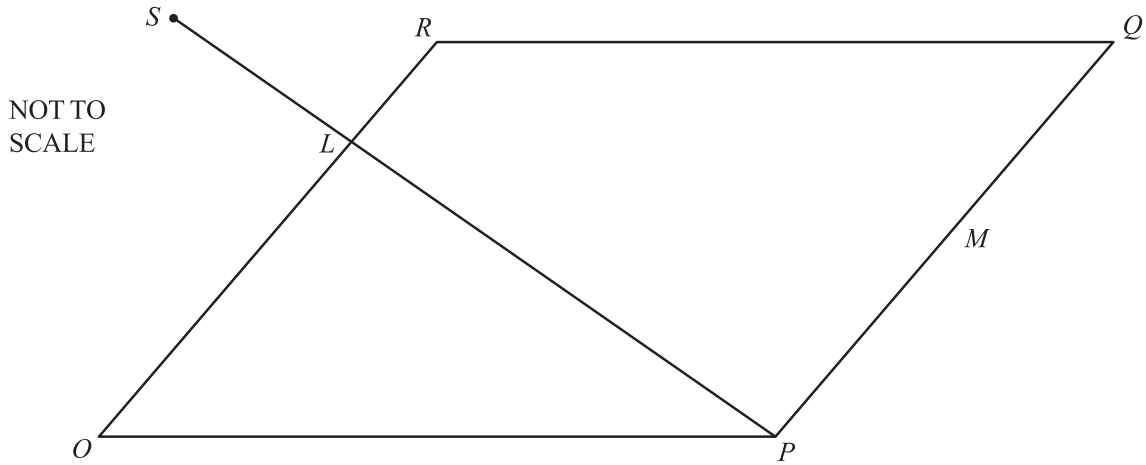
A*	A	B	C	D	E	U
>76%	61%	52%	42%	33%	23%	<23%

The quadrilateral $OABC$ has $\overrightarrow{OA} = 4\mathbf{i} + 2\mathbf{j}$, $\overrightarrow{OB} = 6\mathbf{i} - 3\mathbf{j}$ and $\overrightarrow{OC} = 8\mathbf{i} - 20\mathbf{j}$.

(a) Find $\overrightarrow{AB}$. **(2)**

(*b*) Show that quadrilateral $OABC$ is a trapezium. **(2)**

(Total 4 marks)



OPQR is a parallelogram.
O is the origin.
$\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OR} = \mathbf{r}$.
M is the mid-point of *PQ* and *L* is on *OR* such that $OL : LR = 2 : 1$.
The line *PL* is extended to the point *S*.

(a) Find, in terms of **p** and **r**, in their simplest forms,

(i) $\overrightarrow{OQ}$, [1]

(ii) $\overrightarrow{PR}$, [1]

(iii) $\overrightarrow{PL}$, [1]

(iv) the position vector of *M*. [1]

(b) *PLS* is a straight line and $PS = \frac{\text{š}}{\text{à}} PL$.

Find, in terms of **p** and / or **r**, in their simplest forms,

(i) $\overrightarrow{PS}$, [1]

(ii) $\overrightarrow{QS}$. [2]

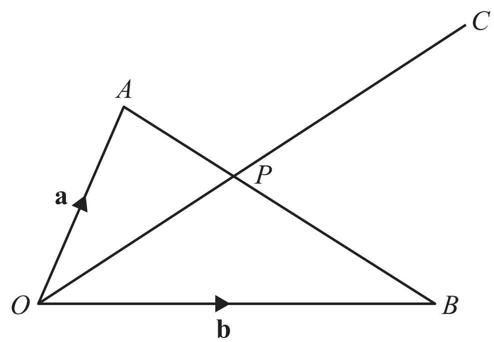
(c) What can you say about the points *Q*, *R* and *S*? [1]

Question 3

(a) Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$. [2]

(b) Find the matrix that represents a clockwise rotation of 90º about the origin. [2]

(c)



NOT TO SCALE

In the diagram, O is the origin and P lies on AB such that $AP : PB = 3 : 4$.
$\overrightarrow{OA} =$ **a** and $\overrightarrow{OB} =$ **b**.

(i) Find $\overrightarrow{OP}$, in terms of **a** and **b**, in its simplest form. [3]

(ii) The line OP is extended to C such that $\overrightarrow{OC} = mOP$ and $BC = k\mathbf{a}$.

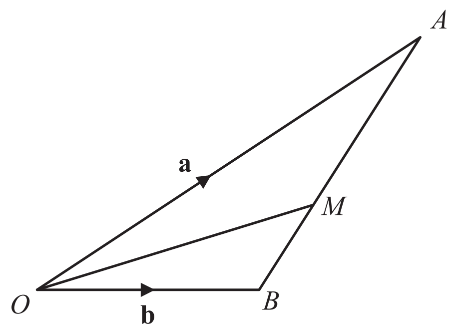
Find the value of m and the value of k. [2]

(a) $\mathbf{m} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$ $\mathbf{n} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

(i) Work out $2\mathbf{m} - 3\mathbf{n}$. [2]

(ii) Calculate $|2\mathbf{m} - 3\mathbf{n}|$. [2]

(b) **(i)**



NOT TO SCALE

In the diagram, O is the origin, $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.
The point M lies on AB such that $AM : MB = 3 : 2$.

Find, in terms of $\mathbf{a}$ and $\mathbf{b}$, in its simplest form

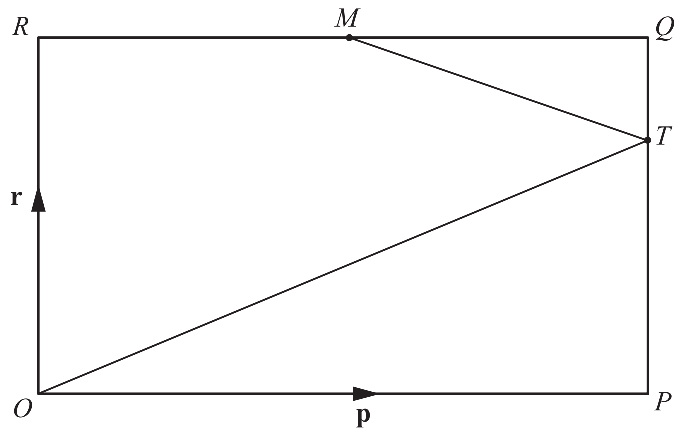
(a) $\overrightarrow{AB}$, [1]

(b) $\overrightarrow{AM}$, [1]

(c) the position vector of M. [2]

(ii) OM is extended to the point C.
The position vector of C is $\mathbf{a} + k\mathbf{b}$.

Find the value of k. [1]



NOT TO SCALE

$OPQR$ is a rectangle and O is the origin.
M is the midpoint of RQ and $PT : TQ = 2 : 1$.
$\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OR} = \mathbf{r}$.

(a) Find, in terms of **p** and/or **r**, in its simplest form

(i) $\overrightarrow{MQ}$, [1]

(ii) $\overrightarrow{MT}$, [1]

(iii) $\overrightarrow{OT}$. [1]

(b) RQ and OT are extended to meet at U.

[2]

Find the position vector of U in terms of $\mathbf{p}$ and $\mathbf{r}$.
Give your answer in its simplest form.

(c) $\overrightarrow{MT} = \begin{pmatrix} 2k \\ -k \end{pmatrix}$ and $|\overrightarrow{MT}| = \sqrt{180}$.

[3]

Find the positive value of k.