

Vectors

Question Paper

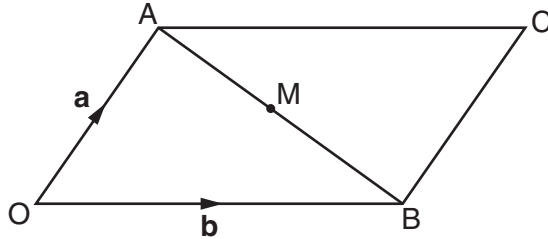
Level	OCR
Subject	Maths
Exam Board	GCSE (9-1)
Topic	Congruence and Similarity
Sub Topic	Vectors
Grade Level	Grade 7
Booklet	Question Paper

Time Allowed: 39 minutes

Score: /32

Percentage: /100

- 1 OACB is a parallelogram.
 $\vec{OA} = \mathbf{a}$ and $\vec{OB} = \mathbf{b}$.
 M is the midpoint of AB.



Not to scale

- (a) Find, in terms of \mathbf{a} and \mathbf{b} , these vectors.

(i) \vec{OC}

(a)(i) _____ [1]

(ii) \vec{AB}

(ii) _____ [1]

(iii) \vec{OM}

(iii) _____ [2]

- (b) Use your answers to write **two** conclusions about points O, M and C.

(1) _____

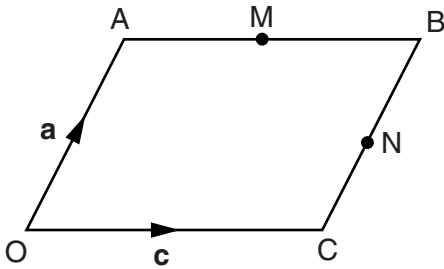
(2) _____

_____ [2]

- 2 (a) Find the resultant of the vectors $\begin{pmatrix} 4 \\ -1 \end{pmatrix}$ and $\begin{pmatrix} -2 \\ 5 \end{pmatrix}$.

(a) $\left(\begin{array}{c} \\ \end{array} \right)$ [1]

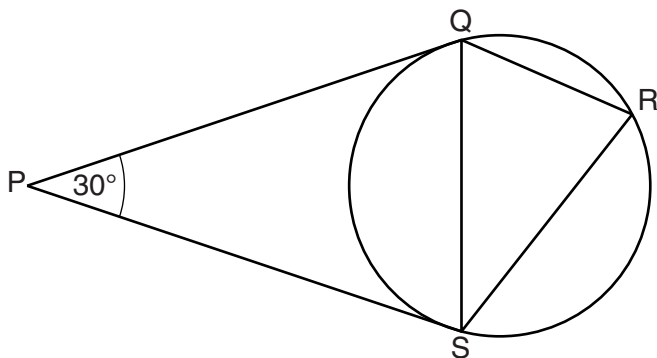
- (b) OABC is a parallelogram.
 M is the midpoint of AB.
 N is the midpoint of BC.
 $\vec{OA} = \mathbf{a}$ and $\vec{OC} = \mathbf{c}$.



Find \vec{MN} in terms of \mathbf{a} and \mathbf{c} .

(b) _____ [2]

- 3 Q, R and S are points on a circle.
PQ and PS are tangents to the circle.
Angle QPS = 30° .



Not to scale

Calculate the size of angle QRS.
Give a reason for each stage of your working.

_____ $^\circ$ [4]

4 (a) Find the resultant of $\begin{pmatrix} 8 \\ -1 \end{pmatrix}$ and $\begin{pmatrix} -2 \\ -5 \end{pmatrix}$.

(a) $\begin{pmatrix} \\ \end{pmatrix}$ [1]

(b) You are given that $\mathbf{p} + \mathbf{q} = \begin{pmatrix} -1 \\ 3 \end{pmatrix}$.

Write the following as column vectors.

(i) $\left[\begin{pmatrix} 3 \\ 7 \end{pmatrix} + \mathbf{p} \right] + \mathbf{q}$

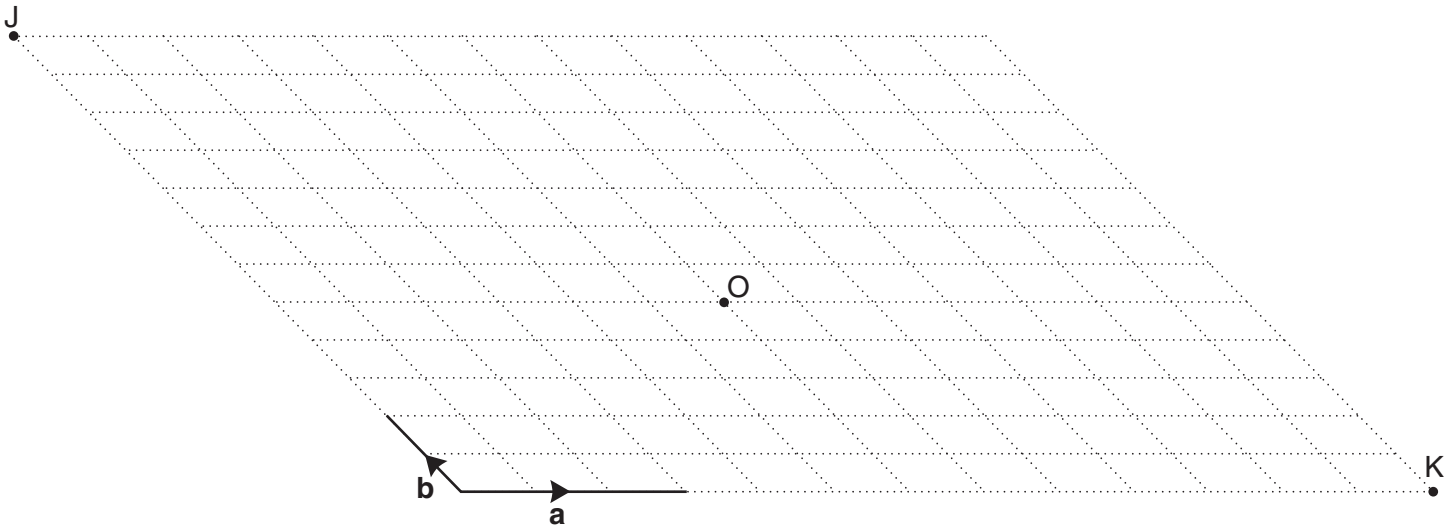
(b)(i) $\begin{pmatrix} \\ \end{pmatrix}$ [2]

(ii) $-4(\mathbf{q} + \mathbf{p})$

(ii) $\begin{pmatrix} \\ \end{pmatrix}$ [2]

5 A wallpaper designer uses this grid to plan the translations of wallpaper designs.

He uses multiples and sums of vectors **a** and **b** to describe the translations.



(a) The centre of a design is translated from O by the vector $2\mathbf{a} + 3\mathbf{b}$.

Mark the image of O with a cross (X) and label it A.

[1]

(b) The centre of another design is translated from O by the vector $\frac{5}{2}\mathbf{b} - \mathbf{a}$.

Mark this image of O with a cross (X) and label it B.

[1]

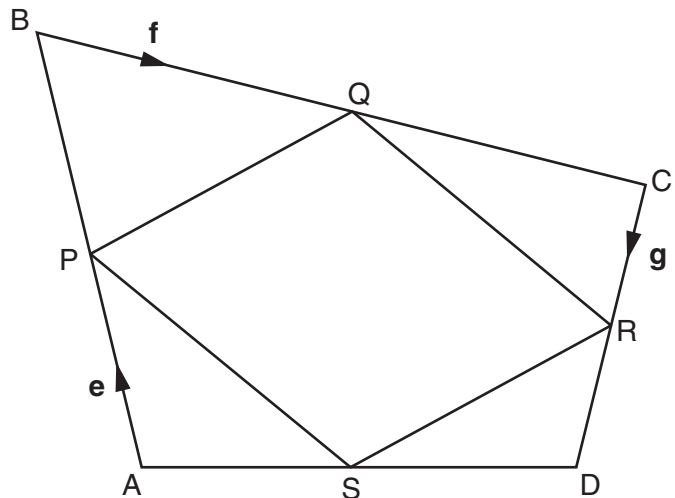
(c) Find the combination of vectors **a** and **b** that would translate the centre of a design from point J to point K.

(c) _____ [3]

6 ABCD is a quadrilateral.

The midpoints of AB, BC, CD and DA are P, Q, R and S respectively.

$$\vec{AB} = 2\mathbf{e}, \vec{BC} = 2\mathbf{f} \text{ and } \vec{CD} = 2\mathbf{g}.$$

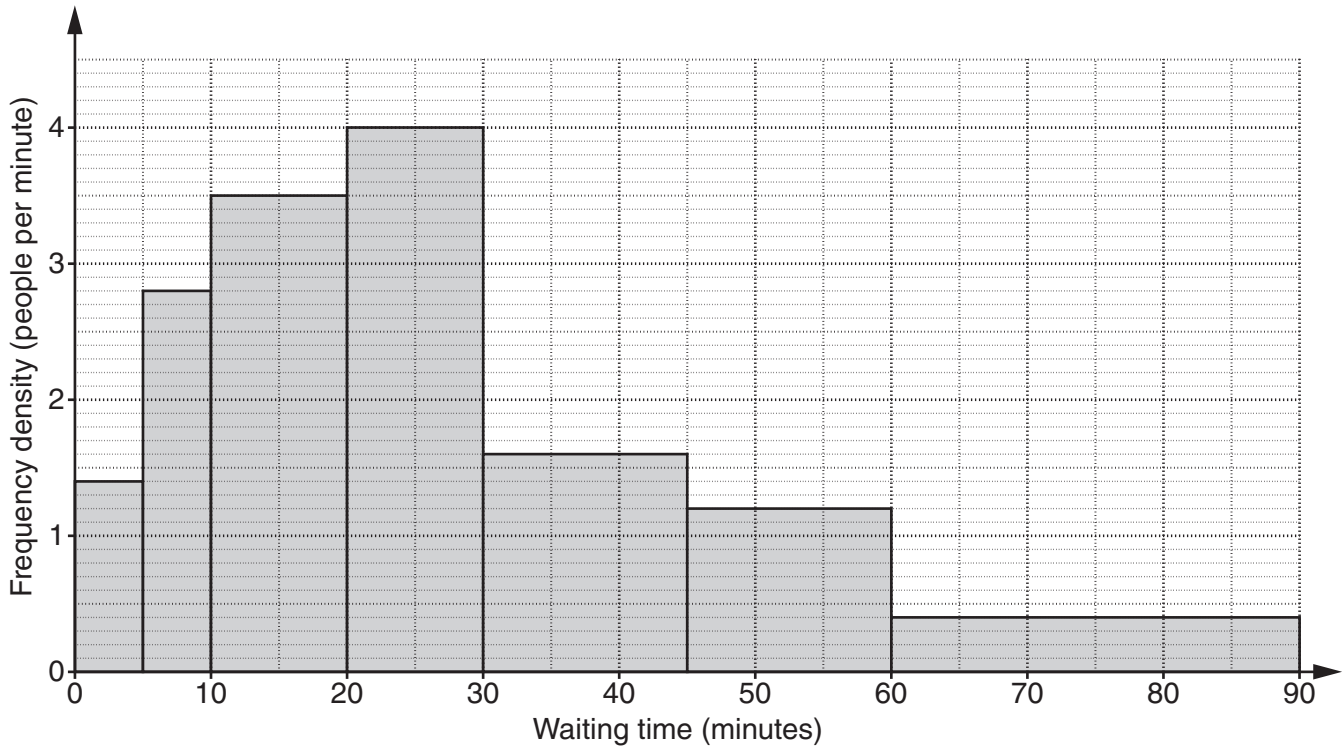


Not to scale

By first finding the vector \vec{AD} in terms of \mathbf{e} , \mathbf{f} and \mathbf{g} , prove that PQRS is a parallelogram.

[5]

- 7 This histogram summarises the times that patients waited one morning in a hospital out-patients department.



The hospital's target is that fewer than $\frac{1}{3}$ of their patients wait for more than 30 minutes.

Show whether the hospital achieved the target on this morning.

[4]