

Vectors Revision

1)

PQR is a triangle.

X is a point on PQ such that $PX = \frac{1}{4}PQ$.

Y is a point on RQ such that $RY = \frac{1}{4}RQ$.

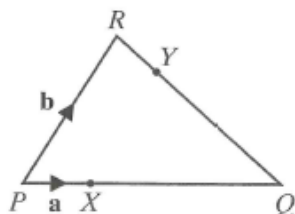


Diagram **NOT** accurately drawn

$$\vec{PX} = \mathbf{a} \text{ and } \vec{PR} = \mathbf{b}.$$

a) Find, in terms of \mathbf{a} and \mathbf{b} :

i) \vec{PQ} ii) \vec{RQ} iii) \vec{PY} . (3)

b) $\vec{XY} = k \vec{PR}$

Find the value of k (2)

(Total 5 marks)

2)

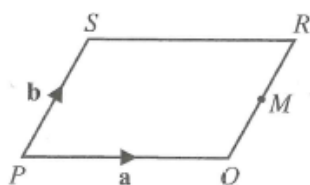


Diagram **NOT** accurately drawn

$PQRS$ is a parallelogram.

M is the midpoint of QR .

$$\vec{PQ} = \mathbf{a} \text{ and } \vec{PS} = \mathbf{b}.$$

a) Find, in terms of \mathbf{a} and \mathbf{b} , an expression for \vec{PM} . (1)

T is the point on SR extended such that $SR = RT$.

b) i) Find, in terms of \mathbf{a} and \mathbf{b} , an expression for \vec{PT} .

ii) Use your answer to part i) to prove that P , M and T lie on the same straight line. (2)

(Total 3 marks)

3)

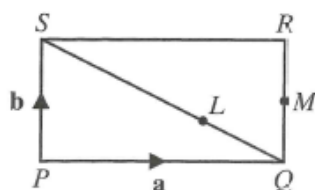


Diagram **NOT** accurately drawn

$PQRS$ is a rectangle.

$$\vec{PQ} = \mathbf{a} \quad \vec{PS} = \mathbf{b}$$

a) L is the point on SQ such that $SL = \frac{2}{3}SQ$.

Find, in terms of \mathbf{a} and \mathbf{b} :

i) \vec{SQ} ii) \vec{PL} . (2)

b) M is the midpoint of QR .

i) Find \vec{PM} in terms of \mathbf{a} and \mathbf{b} .

ii) Prove that PLM is a straight line. (2)

(Total 4 marks)

4)

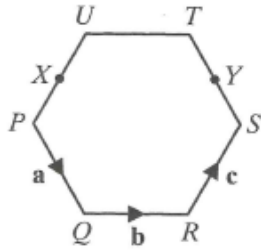


Diagram **NOT** accurately drawn

$PQRSTU$ is a regular hexagon.

$$\vec{PQ} = \mathbf{a} \quad \vec{QR} = \mathbf{b} \quad \vec{RS} = \mathbf{c}$$

a) Express \mathbf{c} in terms of \mathbf{a} and \mathbf{b} .

(2)

X is the midpoint of PU and Y is the midpoint of ST .

b) i) Express \vec{XY} in terms of \mathbf{a} and \mathbf{b} .

ii) What does the answer to part i) show about XY and UT ?

(3)

(Total 5 marks)

5)

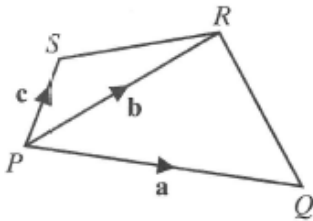


Diagram **NOT** accurately drawn

$PQRS$ is a quadrilateral.

$$\vec{PQ} = \mathbf{a} \quad \vec{PR} = \mathbf{b} \quad \vec{PS} = \mathbf{c}$$

D, E, F and G are the midpoints of the sides PQ, QR, RS and PS respectively.

a) Find, in terms of \mathbf{a}, \mathbf{b} and \mathbf{c} , expressions for

i) \vec{DE} ii) \vec{GF}

(2)

b) Explain what the answers to part a) show about the quadrilateral.

(2)

(Total 4 marks)

6) $a = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$ $b = \begin{pmatrix} 5 \\ 0 \end{pmatrix}$ and $c = \begin{pmatrix} 5 \\ 3 \end{pmatrix}$

a) Find $a + b$

b) Find $3c$

c) Find the resultant of b and c

d) Find the magnitude of all three vectors.

Answers

1ai) $4a$ ii) $4a - b$ iii) $a + \frac{3}{4}b$ b) $\frac{3}{4}$ 2a) $a + \frac{1}{2}b$ bi) $b + 2a$ ii) $\vec{PT} = 2\vec{PM}$

3ai) $a - b$ ii) $\frac{2}{3}a + \frac{1}{2}b$ bi) $a + \frac{1}{2}b$ ii) $\vec{PL} = \frac{2}{3}\vec{PM}$ 4a) $c = b - a$ bi) $\frac{3}{2}b$

ii) XY parallel to UT and $XY = \frac{3}{2}UT$ 5ai) $\frac{1}{2}b$ ii) $\frac{1}{2}b$

b) opposite sides are parallel and equal in length so it is a parallelogram

6a) $\begin{pmatrix} 7 \\ -1 \end{pmatrix}$ b) $\begin{pmatrix} 15 \\ 9 \end{pmatrix}$ c) $\begin{pmatrix} 10 \\ 3 \end{pmatrix}$ d) 2.24, 5 and 5.83