



SEKOLAH BUKIT SION – HIGH SCHOOL

CHAPTER TEST: VECTORS

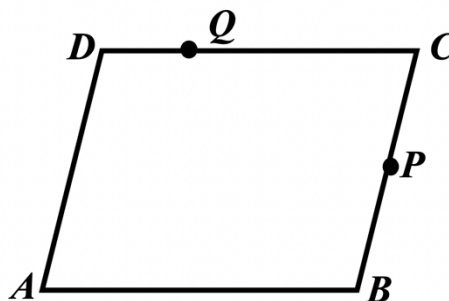
NAME		DATE	
CLASS		SCORE	/60

Answer all questions. Provide necessary working and appropriate notations.

1. In the diagram, $ABCD$ is a parallelogram and P is the midpoint of BC .
 Q is the point on CD such that $CQ = 2QD$.

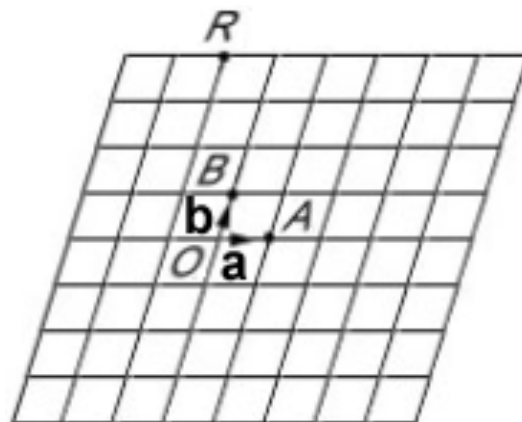
If $\overrightarrow{AB} = \mathbf{a}$ and $\overrightarrow{AD} = \mathbf{b}$, express:

- (a) \overrightarrow{CP} [1]
(b) \overrightarrow{AP} [1]
(c) \overrightarrow{PQ} [2]



2. On the grid given, $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.
The point R is also shown.

- (a) Mark clearly on the grid
(i) the point P , such that $\overrightarrow{OP} = 3\mathbf{a} + 2\mathbf{b}$; [1]
(ii) the point Q , such that $\overrightarrow{OQ} = -3(\mathbf{a} - \mathbf{b})$. [1]
- (b) Write down \overrightarrow{OR} in terms of \mathbf{a} and \mathbf{b} . [1]



3. $\overrightarrow{PQ} = \begin{pmatrix} -8 \\ 20 \end{pmatrix}$ and $\overrightarrow{RS} = \begin{pmatrix} h \\ -25 \end{pmatrix}$. Given that \overrightarrow{PQ} is parallel to \overrightarrow{RS} , find the value of h . [2]

4. It is given that points A , B and C have coordinates $(6, 2)$, $(4, 4)$ and $(-2, -4)$ respectively.

(a) Write down the position vectors of A , B and C . [3]

(b) Find the magnitudes of \overrightarrow{AB} , \overrightarrow{BC} and \overrightarrow{CA} . [6]

(c) Write down the unit vector of \overrightarrow{AB} . [1]

(d) Write down a vector that is parallel to \overrightarrow{CA} of length 4 units. [1]

5.

(a) Given that $\overrightarrow{OP} = \begin{pmatrix} 6 \\ -8 \end{pmatrix}$, $\overrightarrow{OQ} = \begin{pmatrix} 2l \\ -3l \end{pmatrix}$ and $\overrightarrow{PQ} = \begin{pmatrix} m \\ 5 \end{pmatrix}$, find the values of l and m . [3]

(b) A point B lies on PQ such that $\overrightarrow{PB} = \begin{pmatrix} 4 \\ n \end{pmatrix}$. Find

(i) the value of n , [1]

(ii) \overrightarrow{OB} . [1]

6. Given that $\overrightarrow{PQ} = \begin{pmatrix} 1 \\ 4 \end{pmatrix}$, $\overrightarrow{QR} = \begin{pmatrix} 3 \\ 0 \end{pmatrix}$, and $\overrightarrow{RS} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$, find \overrightarrow{SP} . [2]

7. If $\mathbf{u} = \begin{pmatrix} -3 \\ -2 \end{pmatrix}$, $\mathbf{v} = \begin{pmatrix} -5 \\ 4 \end{pmatrix}$, and $\mathbf{w} = \begin{pmatrix} 9 \\ -16 \end{pmatrix}$, then express vector \mathbf{w} in terms of vectors \mathbf{u} and \mathbf{v} . [3]

8. Given that $\overrightarrow{OA} = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$, $\overrightarrow{OB} = \begin{pmatrix} 10 \\ 2 \end{pmatrix}$ and $\overrightarrow{OC} = \begin{pmatrix} 4 \\ 8 \end{pmatrix}$.
 D is a point on BC such that $BD = 2DC$.
 E is a point on AC such that $AE = \frac{3}{2}EC$.

(a) Write down the column vector of \overrightarrow{AB} . [1]

(b) Express in column vectors of
(i) position vectors of D and E [6]

(ii) \overrightarrow{ED} [1]

9. The column vectors \mathbf{p} , \mathbf{q} , \mathbf{r} and \mathbf{s} are defined by

$$\mathbf{p} = \begin{pmatrix} 9 \\ 3 \end{pmatrix}, \quad \mathbf{q} = \begin{pmatrix} -2 \\ 6 \end{pmatrix}, \quad \mathbf{r} = \begin{pmatrix} 1 \\ -5 \end{pmatrix} \text{ and } \mathbf{s} = \begin{pmatrix} a \\ b \end{pmatrix}.$$

(a) Express each of the following as a column vector:

$$\text{(i) } \frac{1}{3}\mathbf{p} - 2\mathbf{q}, \qquad \text{(ii) } \mathbf{p} + \frac{1}{2}\mathbf{q} - 3\mathbf{r} \qquad [4]$$

(b) Evaluate each of the following, giving the answer correct to one decimal place:

$$\text{(i) } |\mathbf{p} - \mathbf{q}|, \qquad \text{(ii) } |\mathbf{q} + 4\mathbf{r}|. \qquad [4]$$

(c) Given that $\mathbf{p} - \mathbf{s} + 2\mathbf{r} = \mathbf{s} - 3\mathbf{q}$, find the values of a and b . [3]

10. $OPQR$ is a parallelogram. OQT , PQS and RST are straight lines.

Given that $\vec{OP} = \mathbf{a}$, $\vec{OR} = \mathbf{b}$, $\vec{RS} = \frac{1}{3}\vec{RT}$ and $\vec{QT} = 2(\mathbf{a} + \mathbf{b})$,

(a) express the following, as simply as possible, in terms of \mathbf{a} and \mathbf{b} .

(i) \vec{PT} [1]

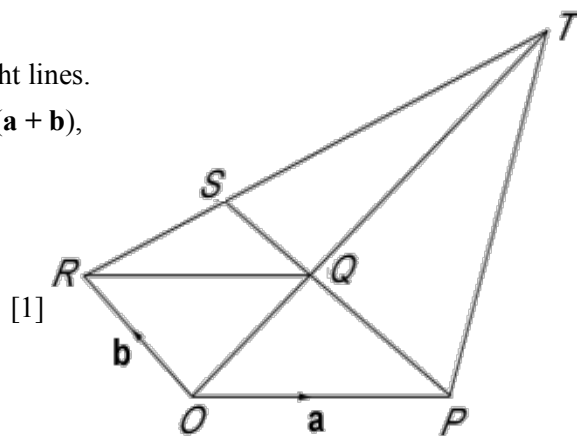
(ii) \vec{OT}

(iii) \vec{PR} [1]

(iv) \vec{RT} [2]

(v) \vec{TS} [2]

(vi) \vec{QS} [1]



(b) write down the value of

(i) $\frac{\text{Area of } \triangle SQT}{\text{Area of } \triangle ROT}$ [2]

(ii) $\frac{\text{Area of } \triangle SQT}{\text{Area of } \triangle RQS}$ [1]