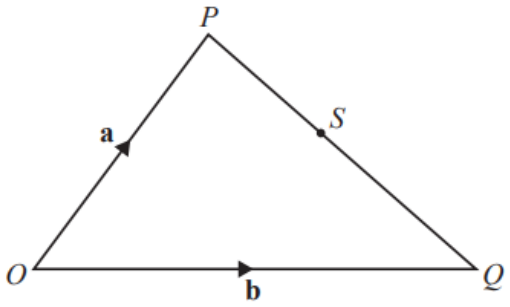
IGCSE PAST PAPER 2 (0580) EXTENDED

Vector Worksheet 1

WRITTEN BY RISHI

1



NOT TO SCALE

S is a point on PQ such that $PS : SQ = 4 : 5$.

Find $\overrightarrow{OS}$, in terms of **a** and **b**, in its simplest form.

$\overrightarrow{OS} =$ ..... [2]

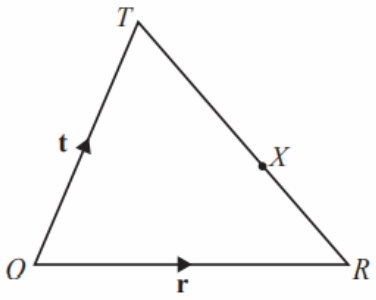
2

The magnitude of the vector $\begin{pmatrix} 20 \\ k \end{pmatrix}$ is 29.

Find the value of k.

$k =$ ..... [3]

3



NOT TO SCALE

ORT is a triangle.
X is a point on TR so that $TX : XR = 3 : 2$.
O is the origin, $\overrightarrow{OR} = \mathbf{r}$ and $\overrightarrow{OT} = \mathbf{t}$.

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

..... [3]

4

(a) (i) $\mathbf{m} = \begin{pmatrix} 5 \\ 7 \end{pmatrix}$

Find $3\mathbf{m}$.

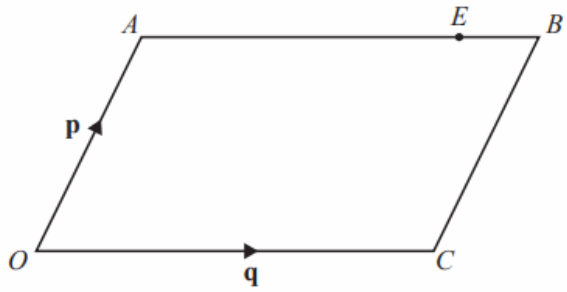
( ) [1]

(ii) $\overrightarrow{VW} = \begin{pmatrix} 10 \\ -24 \end{pmatrix}$

Find $\left|\overrightarrow{VW}\right|$.

..... [2]

(b)



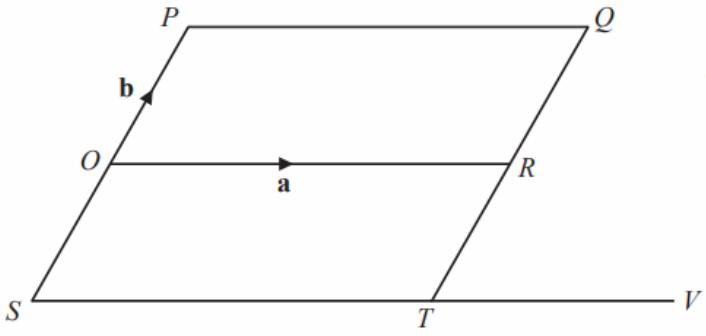
NOT TO SCALE

$OABC$ is a parallelogram.
$\overrightarrow{OA} = \mathbf{p}$ and $\overrightarrow{OC} = \mathbf{q}$.
E is the point on AB such that $AE : EB = 3 : 1$.

Find $\overrightarrow{OE}$, in terms of $\mathbf{p}$ and $\mathbf{q}$, in its simplest form.

$\overrightarrow{OE} =$ ..... [2]

5



NOT TO SCALE

O is the origin and $OPQR$ is a parallelogram.
SOP is a straight line with $SO = OP$.
TRQ is a straight line with $TR = RQ$.
STV is a straight line and $ST : TV = 2 : 1$.
$\overrightarrow{OR} = \mathbf{a}$ and $\overrightarrow{OP} = \mathbf{b}$.

(a) Find, in terms of **a** and **b**, in its simplest form,

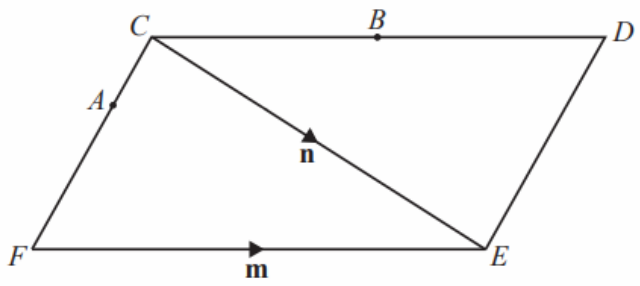
(i) the position vector of T,

..... [2]

(b) Show that PT is parallel to RV.

[2]

6 **(a)**



NOT TO SCALE

The diagram shows a parallelogram $CDEF$.
$\overrightarrow{FE} = \mathbf{m}$ and $\overrightarrow{CE} = \mathbf{n}$.
B is the midpoint of CD.
$FA = 2AC$

Find an expression, in terms of **m** and **n**, for $\overrightarrow{AB}$.
Give your answer in its simplest form.

$\overrightarrow{AB} =$ ..... [3]

(b) $\overrightarrow{GH} = \frac{5}{6}(2\mathbf{p} + \mathbf{q})$ $\overrightarrow{JK} = \frac{5}{18}(2\mathbf{p} + \mathbf{q})$

Write down **two** facts about vectors $\overrightarrow{GH}$ and $\overrightarrow{JK}$.

.....

..... [2]

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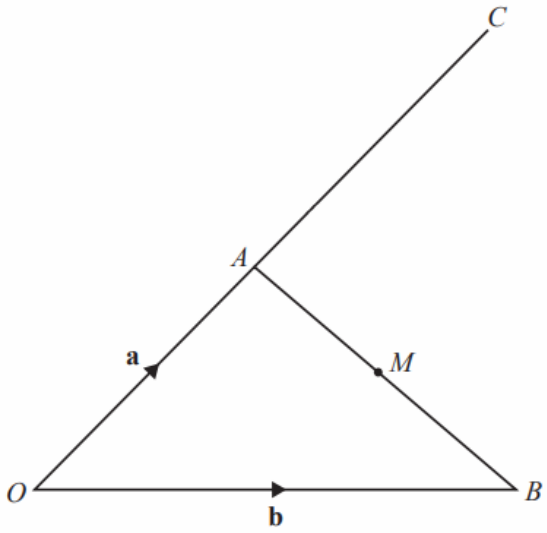

NOT TO SCALE

The diagram shows a triangle OAB and a straight line OAC.
$OA : OC = 2 : 5$ and M is the midpoint of AB.
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.

Find, in terms of **a** and **b**, in its simplest form

(a) $\overrightarrow{AB}$,

$\overrightarrow{AB} =$ ..... [1]

(b) $\overrightarrow{MC}$.

$\overrightarrow{MC} =$ ..... [3]

8 $\overrightarrow{XY} = 3\mathbf{a} + 2\mathbf{b}$ and $\overrightarrow{ZY} = 6\mathbf{a} + 4\mathbf{b}$.

Write down two statements about the relationship between the points X, Y and Z.

1 .....

2 ..... [2]

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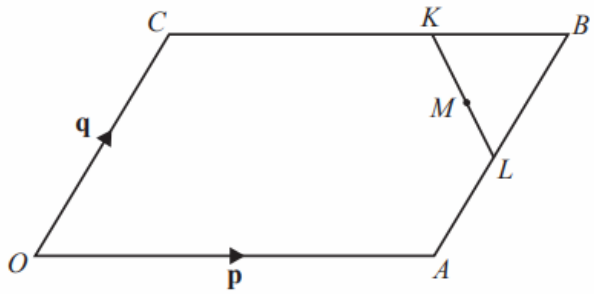

NOT TO SCALE

$OABC$ is a parallelogram and O is the origin.
$CK = 2KB$ and $AL = LB$.
M is the midpoint of KL.
$\overrightarrow{OA} = \mathbf{p}$ and $\overrightarrow{OC} = \mathbf{q}$.

Find, in terms of **p** and **q**, giving your answer in its simplest form

(a) $\overrightarrow{KL}$,

$\overrightarrow{KL}$ = ... [2]

(b) the position vector of M.

..... [2]

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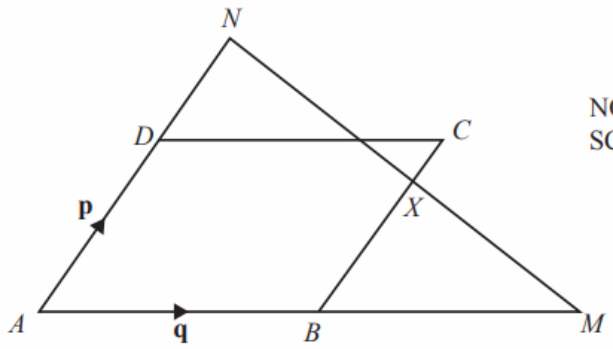


NOT TO SCALE

$ABCD$ is a parallelogram with $\overrightarrow{AB} = \mathbf{q}$ and $\overrightarrow{AD} = \mathbf{p}$.
ABM is a straight line with $AB : BM = 1 : 1$.
ADN is a straight line with $AD : DN = 3 : 2$.

(a) Write $\overrightarrow{MN}$, in terms of **p** and **q**, in its simplest form.

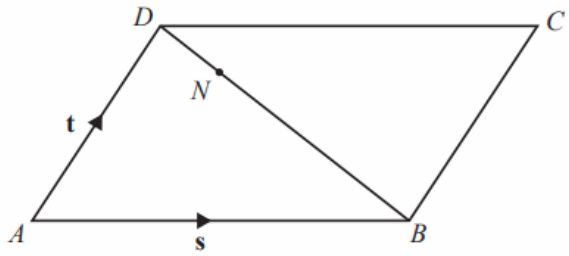
$\overrightarrow{MN}$ = ... [2]

(b) The straight line NM cuts BC at X.
X is the midpoint of MN.
$\overrightarrow{BX} = k\mathbf{p}$

Find the value of k.

k = ... [2]

10



NOT TO SCALE

$ABCD$ is a parallelogram.
N is the point on BD such that $BN : ND = 4 : 1$.
$\overrightarrow{AB} = \mathbf{s}$ and $\overrightarrow{AD} = \mathbf{t}$.

Find, in terms of **s** and **t**, an expression in its simplest form for

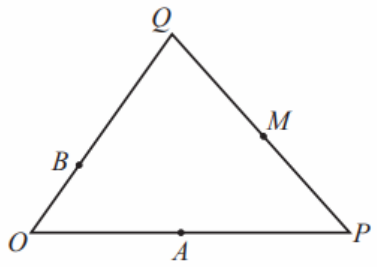
(a) $\overrightarrow{BD}$,

$\overrightarrow{BD} =$ ..... [1]

(b) $\overrightarrow{CN}$.

$\overrightarrow{CN} =$ ..... [3]

11



NOT TO SCALE

O is the origin, $\overrightarrow{OP} = 2\overrightarrow{OA}$, $\overrightarrow{OQ} = 3\overrightarrow{OB}$ and $\overrightarrow{PM} = \overrightarrow{MQ}$.

$\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OQ} = \mathbf{q}$.

Find, in terms of **p** and **q**, in its simplest form

(a) $\overrightarrow{BA}$,

$\overrightarrow{BA} =$ ..... [2]

(b) the position vector of M.

..... [2]

12 O is the origin, $\overrightarrow{OA} = 2\mathbf{x} + 3\mathbf{y}$ and $\overrightarrow{BA} = \mathbf{x} - 4\mathbf{y}$.

Find the position vector of B, in terms of $\mathbf{x}$ and $\mathbf{y}$, in its simplest form.

..... [2]

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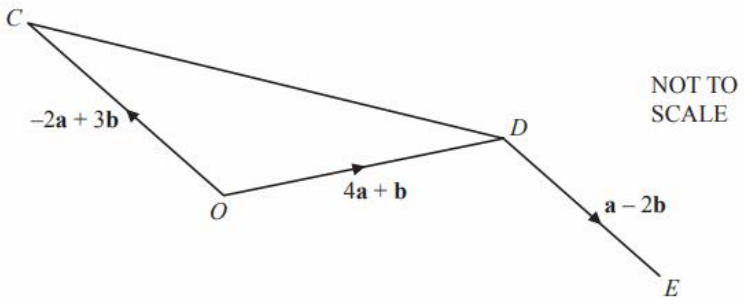

In the diagram, O is the origin, $\overrightarrow{OC} = -2\mathbf{a} + 3\mathbf{b}$ and $\overrightarrow{OD} = 4\mathbf{a} + \mathbf{b}$.

(a) Find $\overrightarrow{CD}$, in terms of $\mathbf{a}$ and $\mathbf{b}$, in its simplest form.

$\overrightarrow{CD}$ = ... [2]

(b) $\overrightarrow{DE} = \mathbf{a} - 2\mathbf{b}$

Find the position vector of E, in terms of $\mathbf{a}$ and $\mathbf{b}$, in its simplest form.

..... [2]

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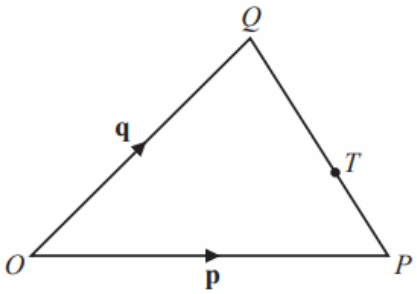


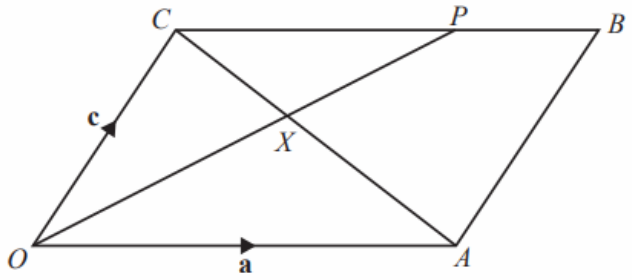
NOT TO SCALE

O is the origin, $\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OQ} = \mathbf{q}$.
$QT : TP = 2 : 1$

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

..... [2]

15



NOT TO SCALE

In the diagram, $OABC$ is a parallelogram.
OP and CA intersect at X and $CP : PB = 2 : 1$.
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OC} = \mathbf{c}$.

(a) Find $\overrightarrow{OP}$, in terms of **a** and **c**, in its simplest form.

$\overrightarrow{OP} =$ ..... [2]

(b) $CX : XA = 2 : 3$

(i) Find $\overrightarrow{OX}$, in terms of **a** and **c**, in its simplest form.

$\overrightarrow{OX} =$ ..... [2]

(ii) Find $OX : XP$.

$OX : XP =$ ..... : ..... [2]

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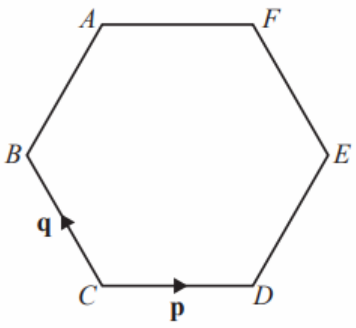
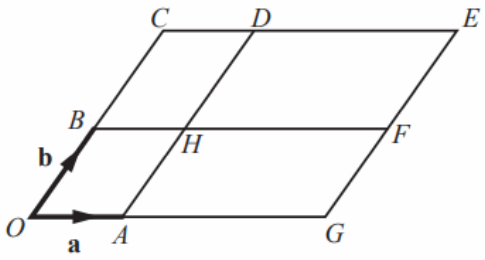


The diagram shows a regular hexagon $ABCDEF$.
$\overrightarrow{CD} = \mathbf{p}$ and $\overrightarrow{CB} = \mathbf{q}$.

Find $\overrightarrow{CA}$, in terms of $\mathbf{p}$ and $\mathbf{q}$, giving your answer in its simplest form.

$\overrightarrow{CA}$ = ... [2]

17 The diagram shows a parallelogram $OCEG$.



NOT TO SCALE

O is the origin, $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.
BHF and AHD are straight lines parallel to the sides of the parallelogram.
$\overrightarrow{OG} = 3\overrightarrow{OA}$ and $\overrightarrow{OC} = 2\overrightarrow{OB}$.

(a) Write the vector $\overrightarrow{HE}$ in terms of **a** and **b**.

$\overrightarrow{HE} =$ ..... [1]

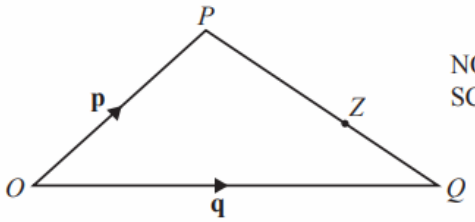
(b) Complete this statement.

a + 2**b** is the position vector of point ..... [1]

(c) Write down two vectors that can be written as 3**a** − **b**.

..... and ..... [2]

18



NOT TO SCALE

O is the origin, $\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OQ} = \mathbf{q}$.
Z is a point on PQ such that $PZ : ZQ = 5 : 2$.

Work out, in terms of $\mathbf{p}$ and $\mathbf{q}$, the position vector of Z.
Give your answer in its simplest form.

..... [3]

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19

(a) D is the point $(2, -5)$ and $\overrightarrow{DE} = \begin{pmatrix} 7 \\ 1 \end{pmatrix}$.

Find the co-ordinates of the point E.

(..... , ...) [1]

(b) $\mathbf{v} = \begin{pmatrix} t \\ 12 \end{pmatrix}$ and $|\mathbf{v}| = 13$.

Work out the value of t, where t is negative.

$t =$ ..... [2]

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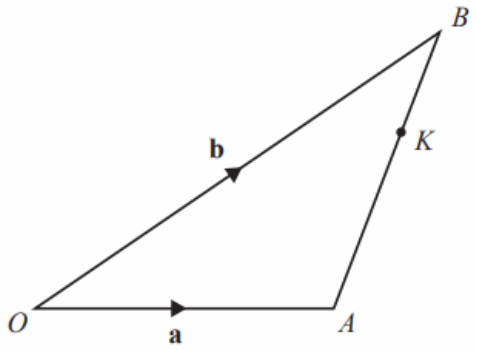

NOT TO SCALE

O is the origin and K is the point on AB so that $AK : KB = 2 : 1$.
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.

Find the position vector of K.
Give your answer in terms of **a** and **b** in its simplest form.

..... [3]