VECTORS

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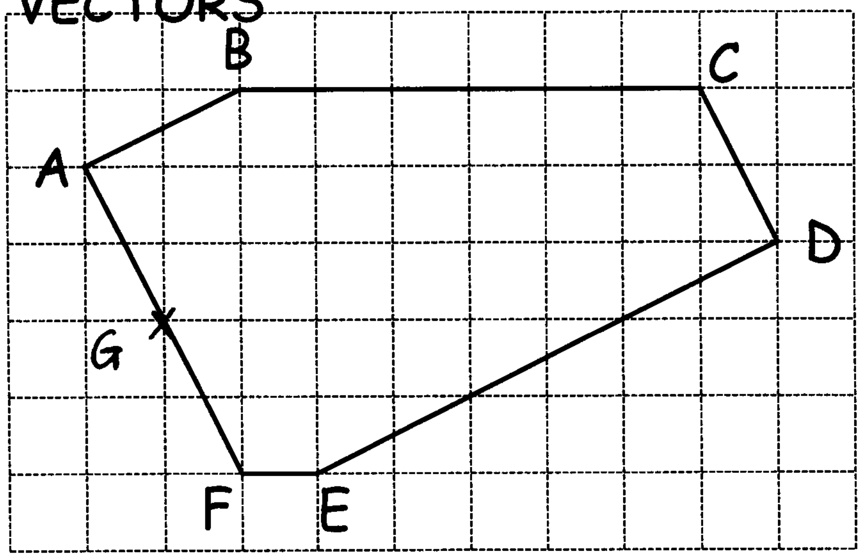
VECTORS



$\overrightarrow{AB} = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$

$\overrightarrow{BC} = \begin{bmatrix} 6 \\ 0 \end{bmatrix}$

$\overrightarrow{CD}$ $\begin{bmatrix} 1 \\ -2 \end{bmatrix}$

$\overrightarrow{DE}$ $\begin{bmatrix} -6 \\ -3 \end{bmatrix}$

$\overrightarrow{EF}$ $\begin{bmatrix} -1 \\ 0 \end{bmatrix}$

$\overrightarrow{FA}$ $\begin{bmatrix} -2 \\ 4 \end{bmatrix}$

$\overrightarrow{ED}$ $\begin{bmatrix} 6 \\ 3 \end{bmatrix}$

$\overrightarrow{AF}$ $\begin{bmatrix} 2 \\ -4 \end{bmatrix}$

Complete the vectors

$\overrightarrow{BA}$ $\begin{bmatrix} -2 \\ -1 \end{bmatrix}$

$\overrightarrow{AC}$ $\begin{bmatrix} 8 \\ 1 \end{bmatrix}$

$\overrightarrow{AD}$ $\begin{bmatrix} 9 \\ -1 \end{bmatrix}$

$\overrightarrow{AE}$ $\begin{bmatrix} 3 \\ -4 \end{bmatrix}$

There are three pairs of parallel sides, write down their letters.

AB and ED   BC and FE   CD and FA

How can you tell by looking at the vectors that they will be parallel? one is a multiple of the other

How many times longer is side ED than side AB? 3

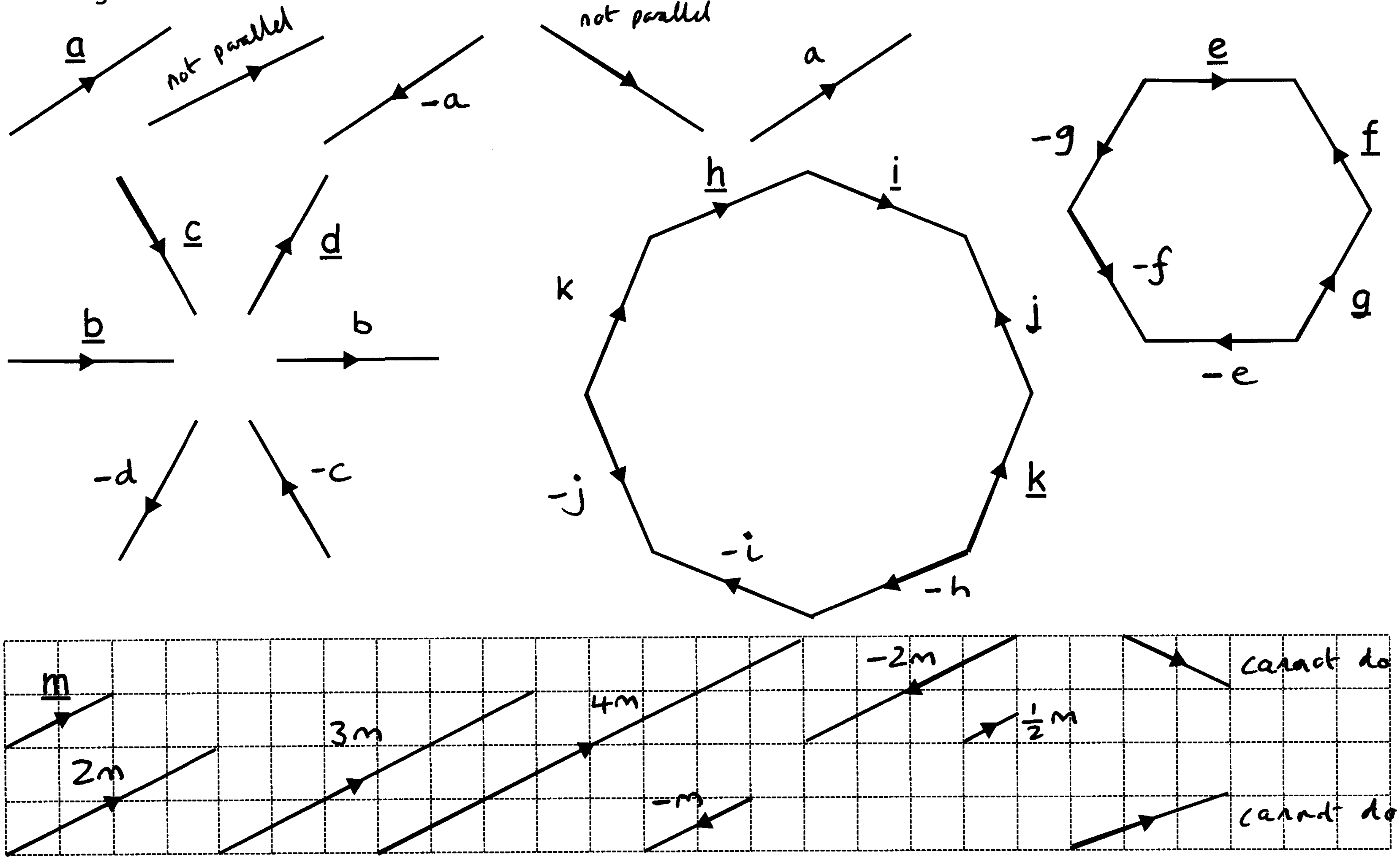
How many times longer is side BC than side FE? 6

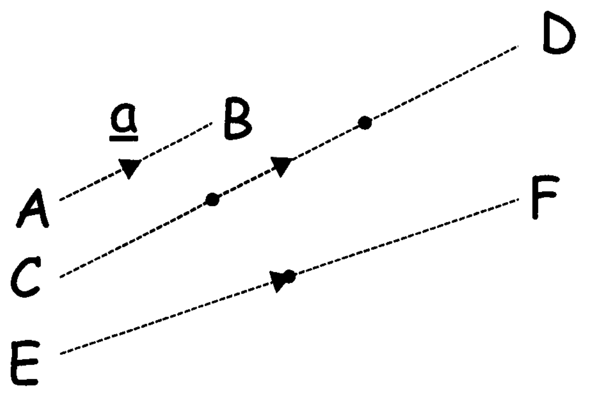
How many times longer is side AF than side CD? 2

Write down the vector $\overrightarrow{AC}$ $\begin{bmatrix} 8 \\ 1 \end{bmatrix}$

G is the midpoint of side AF. Write down the vectors $\overrightarrow{AG}$ $\begin{bmatrix} 1 \\ -2 \end{bmatrix}$ and $\overrightarrow{DG}$ $\begin{bmatrix} -8 \\ -1 \end{bmatrix}$

In these examples the vectors define a movement, both direction and length. For a vector to be equal in must be parallel, the same length and the same direction. Parallel, the same length but opposite direction would be "minus" the original. Label these vectors. It is not possible to do them all.

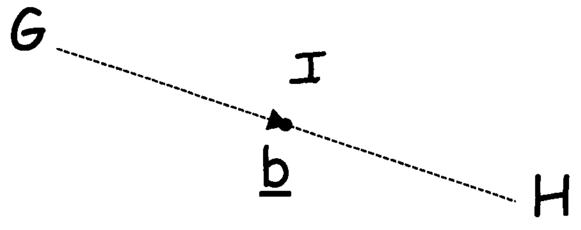


1) 

$\overrightarrow{AB} = \underline{a}$ $\overrightarrow{CD} = 3a$ $\overrightarrow{EF}$ ×

$\overrightarrow{BA}$ $-a$ $\overrightarrow{DC} = -3a$ $\overrightarrow{FE}$ ×

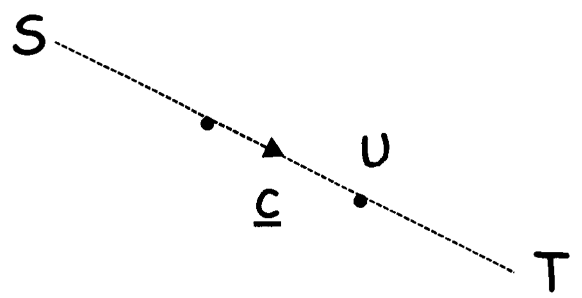
AB and CD are parallel. CD is 3 times longer than AB.

2) 

$\overrightarrow{GH} = \underline{b}$ $\overrightarrow{HG}$ $-b$

I is the midpoint of GH

$\overrightarrow{GI} = \frac{1}{2}b$ $\overrightarrow{IG} = -\frac{1}{2}b$ $\overrightarrow{IH} = \frac{1}{2}b$

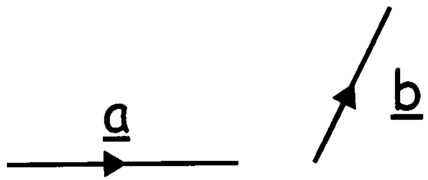
3) 

$\overrightarrow{ST} = \underline{c}$ $\overrightarrow{TS} = -c$

U is a point on the line ST, such that SU:UT is 2:1. Mark U.

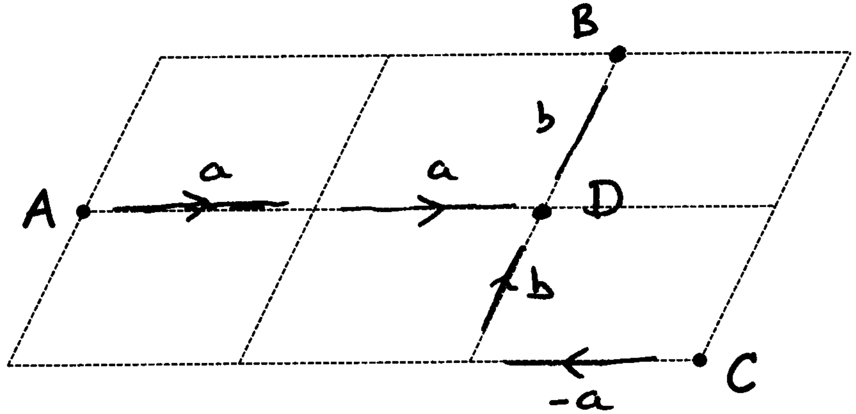
$\overrightarrow{SU} = \frac{2}{3}c$ $\overrightarrow{UT} = \frac{1}{3}c$ $\overrightarrow{TU} = -\frac{1}{3}c$

1) Mark the points B and D on this grid

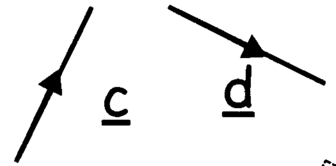


$\overrightarrow{AB} = 2\underline{a} + \underline{b}$

$\overrightarrow{CD} = -\underline{a} + \underline{b}$

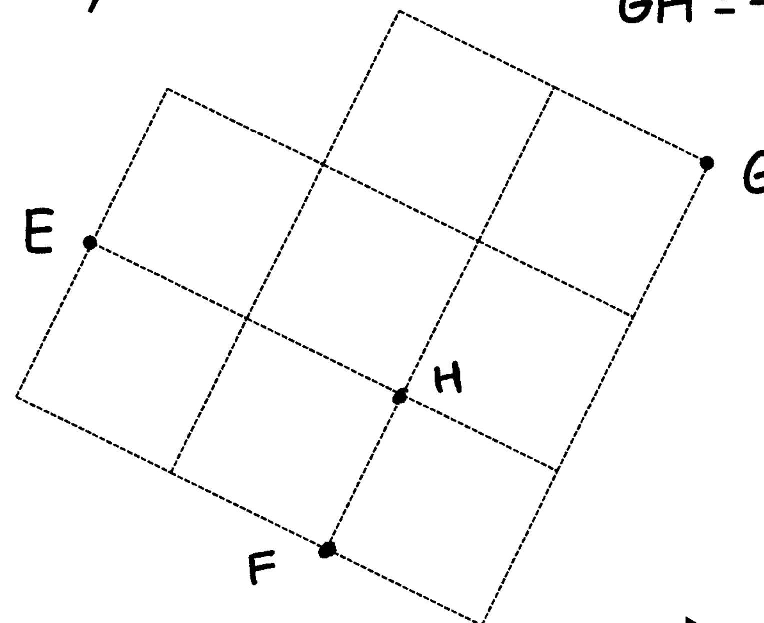


2) Mark the points F and H on this grid



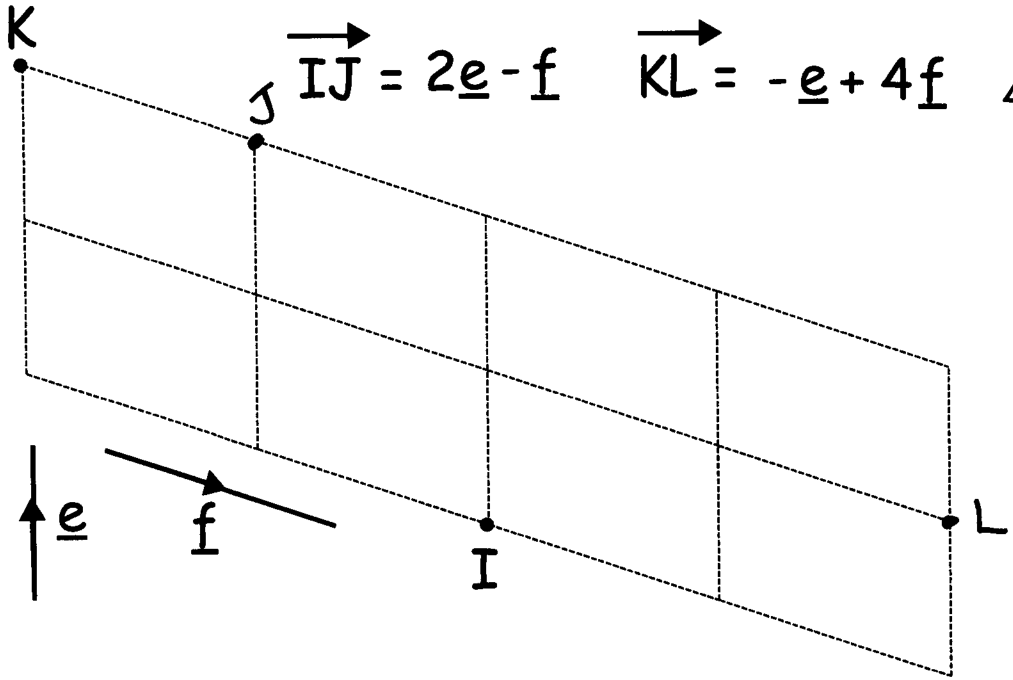
$\overrightarrow{EF} = -\underline{c} + 2\underline{d}$

$\overrightarrow{GH} = -2\underline{c} - \underline{d}$



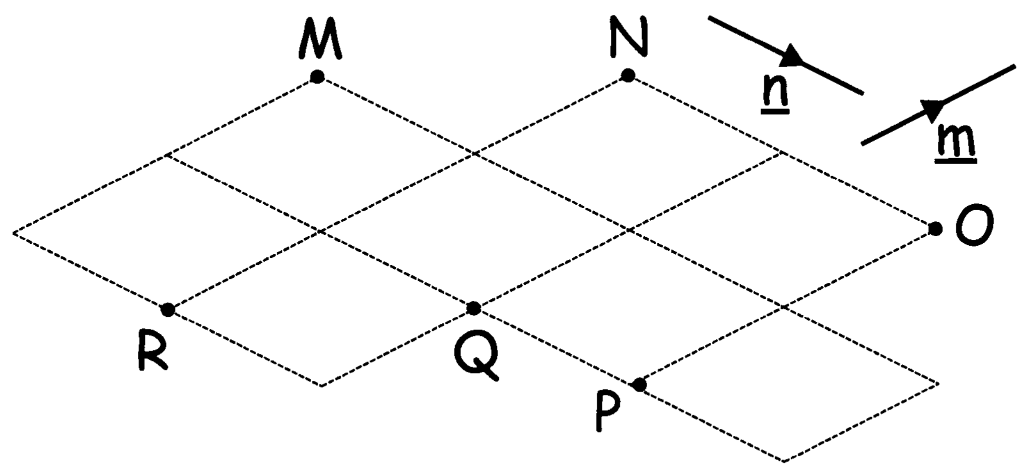
3) Mark the points J and L on this grid

$\overrightarrow{IJ} = 2\underline{e} - \underline{f}$ $\quad \overrightarrow{KL} = -\underline{e} + 4\underline{f}$



4) Write down the vectors $\overrightarrow{MN} = n + m$ $\quad \overrightarrow{NM} = -n - m$

$\overrightarrow{PO} = 2m$ $\quad \overrightarrow{ON} = -2n$ $\quad \overrightarrow{NQ} = -2m + n$ $\quad \overrightarrow{NP} = 2n - 2m$

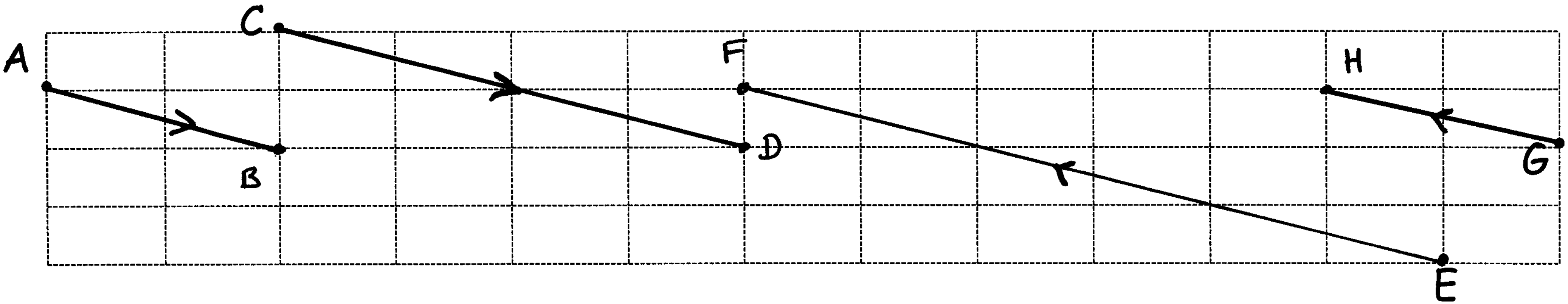


4

Parallel Vectors

Draw these vectors on the grid below.

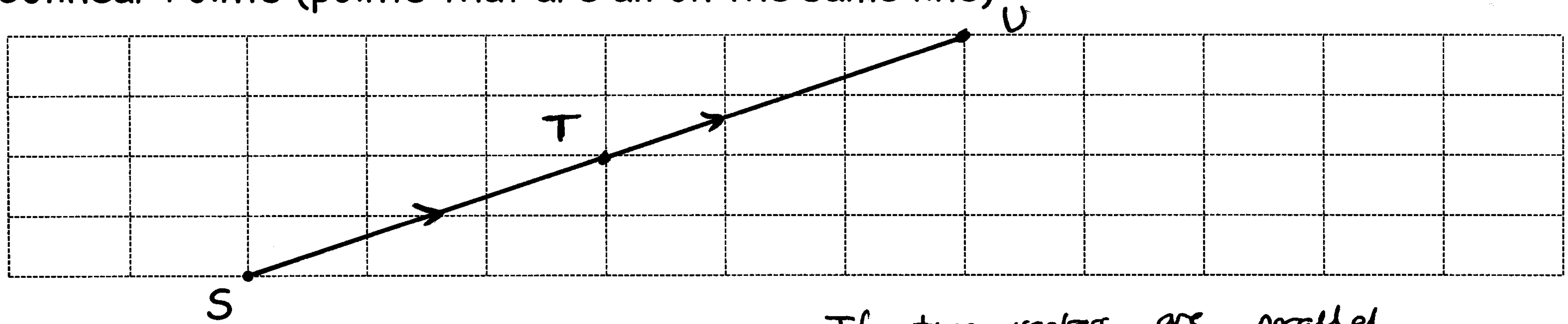
$\underline{a}$ $\underline{b}$ $\overrightarrow{AB} = 2\underline{a} - \underline{b}$ $\overrightarrow{CD} = 4\underline{a} - 2\underline{b}$ $\overrightarrow{EF} = -6\underline{a} + 3\underline{b}$ $\overrightarrow{GH} = -2\underline{a} + \underline{b}$



If one vector is a multiple of another they are parallel.

$\overrightarrow{AB}$ and $\overrightarrow{CD}$ are parallel $\overrightarrow{CD} = 2\overrightarrow{AB}$ $\overrightarrow{EF}$ and $\overrightarrow{GH}$ are parallel $3\overrightarrow{GH} = EF$

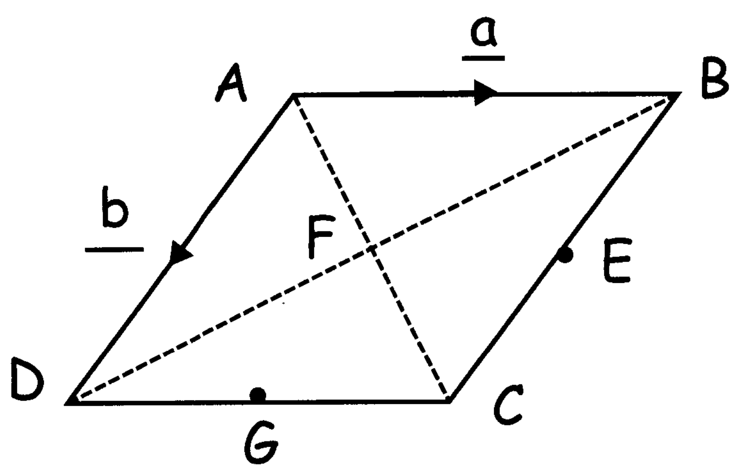
Colinear Points (points that are all on the same line)



$\overrightarrow{ST} = 3\underline{a} + 2\underline{b}$ $\overrightarrow{SU} = 6\underline{a} + 4\underline{b}$

If two vectors are parallel and share a common point, together they must form a straight line.

ABCD is a Rhombus. E is the midpoint of BC.
F is the midpoint of AC and BD. G is the midpoint of CD.



Express in terms of $\underline{a}$ and $\underline{b}$

$\overrightarrow{DC} = a$ the shape is a rhombus. opposite sides are parallel and same length

$\overrightarrow{BC} = b$

$\overrightarrow{BE} = \frac{1}{2}b$ E midpoint of BC

$\overrightarrow{AC} = \overrightarrow{AD} + \overrightarrow{DC} = b + a$

$\overrightarrow{AF} = \frac{1}{2}b + \frac{1}{2}a$

$\overrightarrow{CG} = -\frac{1}{2}a$

$\overrightarrow{EG} = \overrightarrow{EC} + \overrightarrow{CG} = \frac{1}{2}b - \frac{1}{2}a$

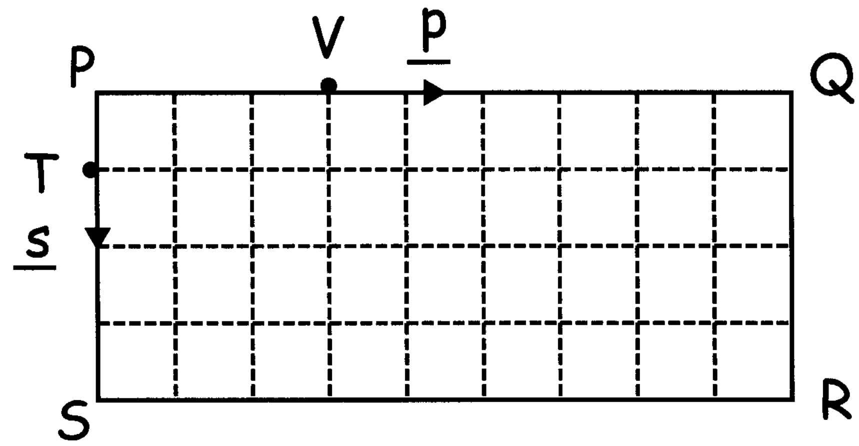
$\overrightarrow{BD} = \overrightarrow{BC} + \overrightarrow{CD} = b - a$

$\overrightarrow{DF} = \frac{1}{2}\overrightarrow{DB} = \frac{1}{2}a - \frac{1}{2}b$

$\overrightarrow{FE} = \overrightarrow{FC} + \overrightarrow{CE} = \frac{1}{2}b + \frac{1}{2}a - \frac{1}{2}b = \frac{1}{2}a$

6

PQRS is a rectangle. T is on side PS, PT is a quarter of PS. V is on side PQ, PV is a third PQ.



$\overrightarrow{PQ} = \underline{p}$ $\overrightarrow{PS} = \underline{s}$

Express in terms of $\underline{p}$ and $\underline{s}$

$\overrightarrow{RQ} = -s$

$\overrightarrow{PR} = \overrightarrow{PQ} + \overrightarrow{QR} = p + s$

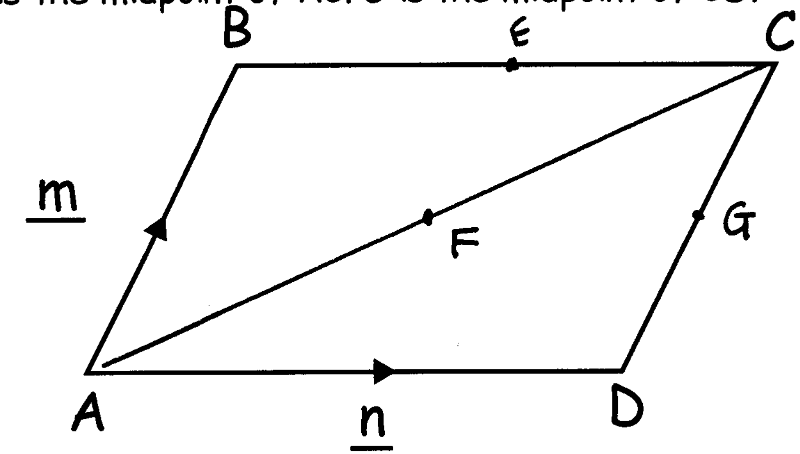
$\overrightarrow{PT} = \frac{1}{4}s$

$\overrightarrow{PV} = \frac{1}{3}p$

$\overrightarrow{TV} = \overrightarrow{TP} + \overrightarrow{PV} = -\frac{1}{4}s + \frac{1}{3}p$

$\overrightarrow{TR} = \overrightarrow{TS} + \overrightarrow{SR} = \frac{3}{4}s + p$

ABCD is a parallelogram. E is the midpoint of BC.
F is the midpoint of AC. G is the midpoint of CD.



Express in terms of $\underline{m}$ and $\underline{n}$

$\overrightarrow{BC} = n$

$\overrightarrow{CB} = -n$

$\overrightarrow{CD} = -m$

$\overrightarrow{DC} = m$

$\overrightarrow{AC} = \overrightarrow{AD} + \overrightarrow{DC}$
$= n + m$

$\overrightarrow{BE} = \frac{1}{2}\overrightarrow{BC} = \frac{1}{2}n$

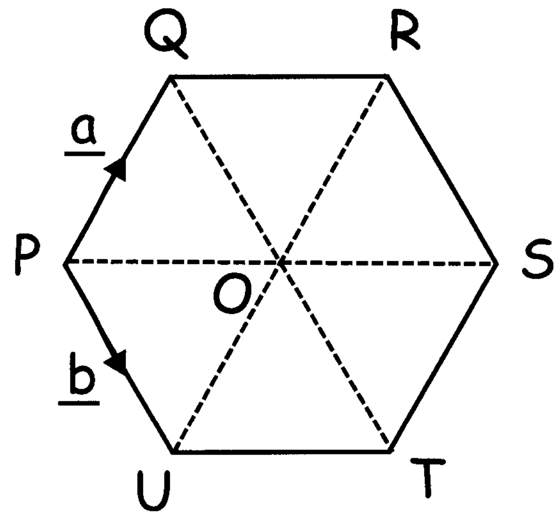
$\overrightarrow{AF} = \frac{1}{2}\overrightarrow{AC} = \frac{1}{2}n + \frac{1}{2}m$

$\overrightarrow{CG} = \frac{1}{2}\overrightarrow{CD} = -\frac{1}{2}m$

$\overrightarrow{EG} = \overrightarrow{EC} + \overrightarrow{CG}$
$\frac{1}{2}n - \frac{1}{2}m$

$\overrightarrow{BD} = \overrightarrow{BC} + \overrightarrow{CD}$
$= n - m$

PQRSTU is a regular hexagon.



Express in terms of a and b

$\overrightarrow{UO} = a$

$\overrightarrow{OR} = a$

$\overrightarrow{TS} = a$

$\overrightarrow{RS} = b$

$\overrightarrow{QO} = b$

$\overrightarrow{OT} = b$

$\overrightarrow{QR} = \overrightarrow{QO} + \overrightarrow{OR}$
$= b + a$

$\overrightarrow{PS} = 2\overrightarrow{QR} = 2b + 2a$

$\overrightarrow{UT} = \overrightarrow{QR} = b + a$

$\overrightarrow{OP} = -\overrightarrow{QR}$
$= -b - a$