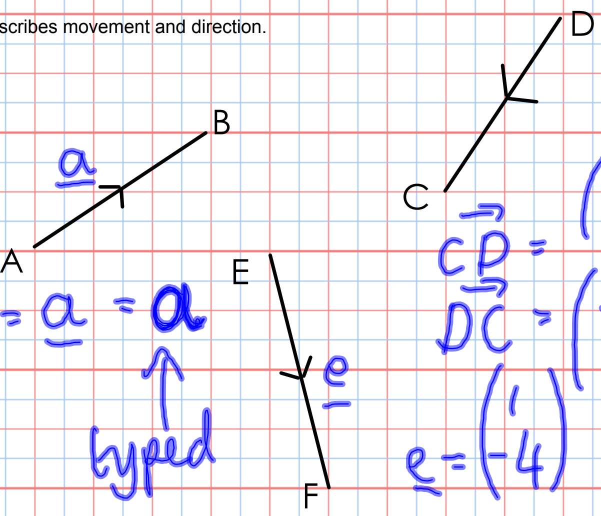
Vector Notation

A vector describes movement and direction.



$\overrightarrow{AB} = \begin{pmatrix}3\\2\end{pmatrix} = \underline{a} = \mathbf{a}$

typed

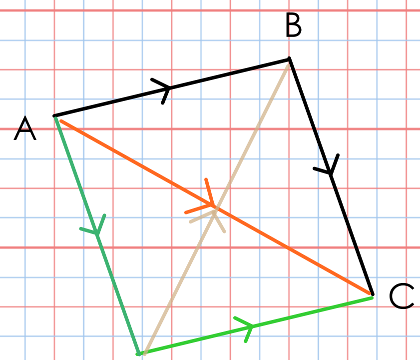
$\overrightarrow{CD} = \begin{pmatrix}2\\3\end{pmatrix}$

$\overrightarrow{DC} = \begin{pmatrix}-2\\-3\end{pmatrix}$

$\underline{e} = \begin{pmatrix}1\\-4\end{pmatrix}$

Page 400- 402

Vector Relationships



Vector multiplication

Vectors can be multiplied by a scalar (enlargement) but not by other vectors.

If $\underline{a} = \begin{pmatrix}4\\-3\end{pmatrix}$ work out $3\underline{a}$

$3\underline{a} = \begin{pmatrix}12\\-9\end{pmatrix}$

Vectors multiplied by a scalar increase their length (magnitude) but not their direction.
So, $\underline{a}$ and $11\underline{a}$ are parallel.

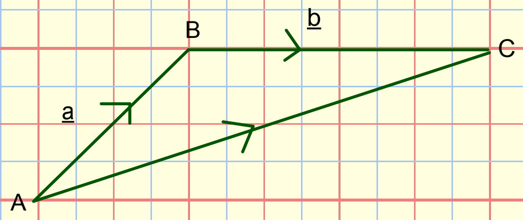
Vector addition

$\mathbf{a} = \begin{pmatrix} 2 \\ 2 \end{pmatrix}$

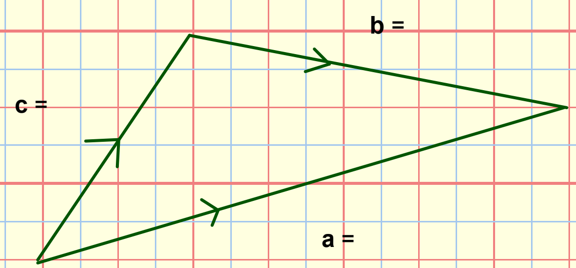
$\mathbf{b} = \begin{pmatrix} 4 \\ 0 \end{pmatrix}$

$\overrightarrow{AC} = \begin{pmatrix} 6 \\ 2 \end{pmatrix}$

$\overrightarrow{CA} = \begin{pmatrix} -6 \\ -2 \end{pmatrix}$

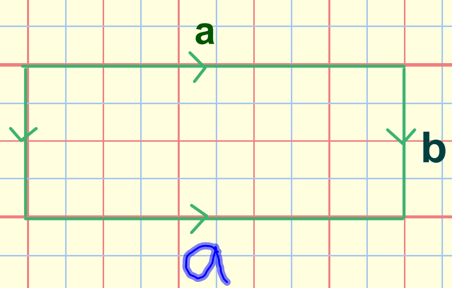


Draw a "vector triangle" in your book.
Using column vectors check whether **a** + **b** = your resultant vector



Page 402 B1, B3, B5

True or false?

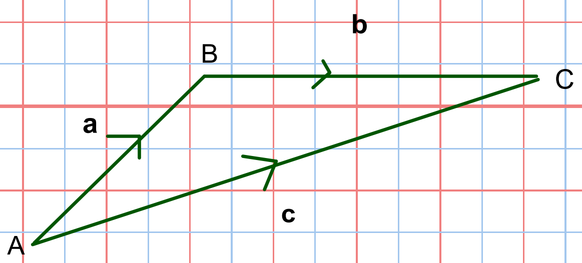


$\underline{a} + \underline{b} - \underline{a} - \underline{b}$

Vectors describe movement and direction.
If you travel around the outside of this rectangle the resultant vector is 2**a** +2**b**

Adding vectors

Vector Subtraction



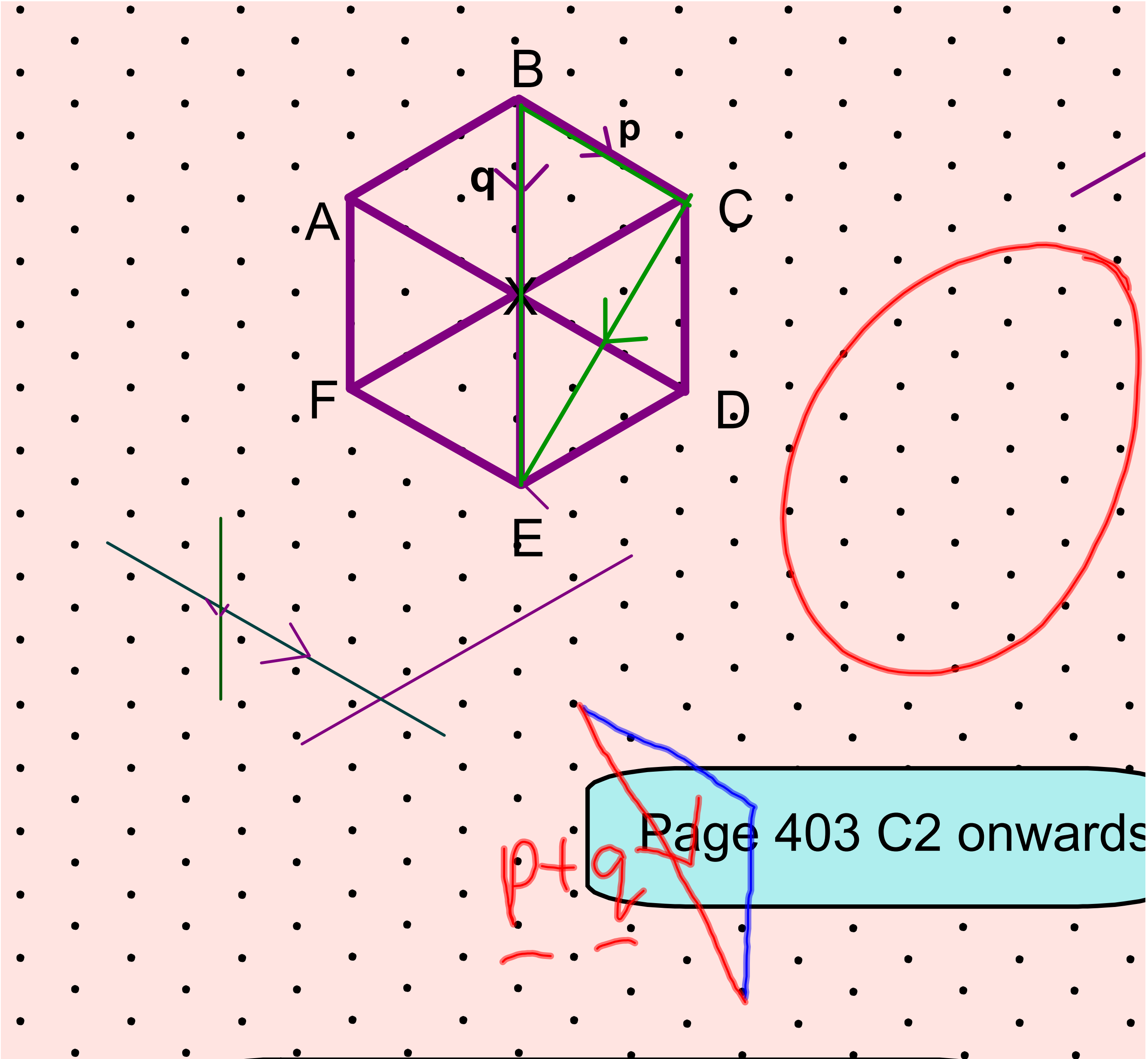
$\overrightarrow{AC} = \underline{a} + \underline{b}$

$\overrightarrow{BC} = \underline{c} - \underline{a}$

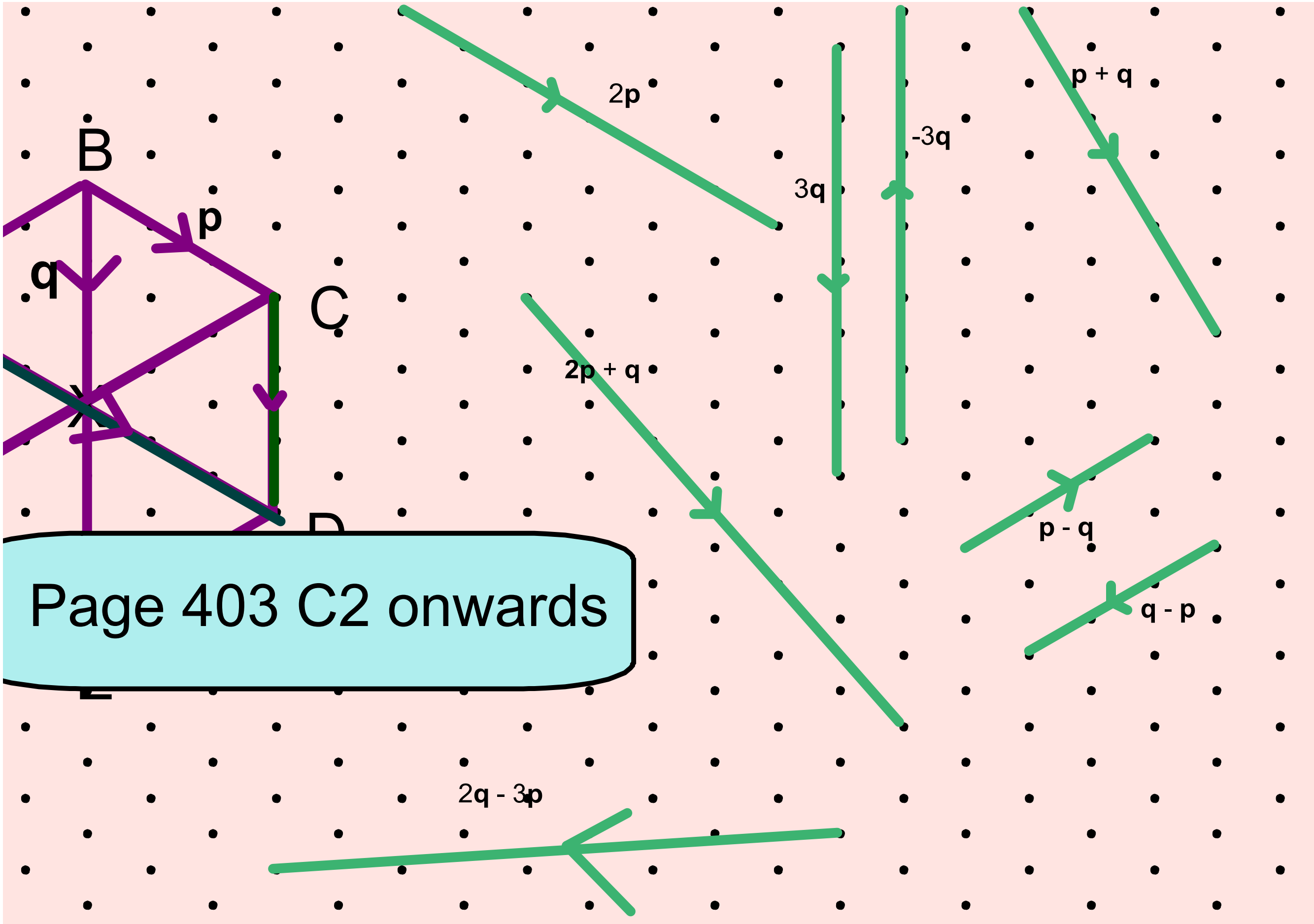
$\overrightarrow{CB} = \underline{a} - \underline{c}$

$\underline{b} = -\underline{a} + \underline{c}$ $\quad \underline{c} = \underline{a} + \underline{b}$

Two ways of calculating **b** :



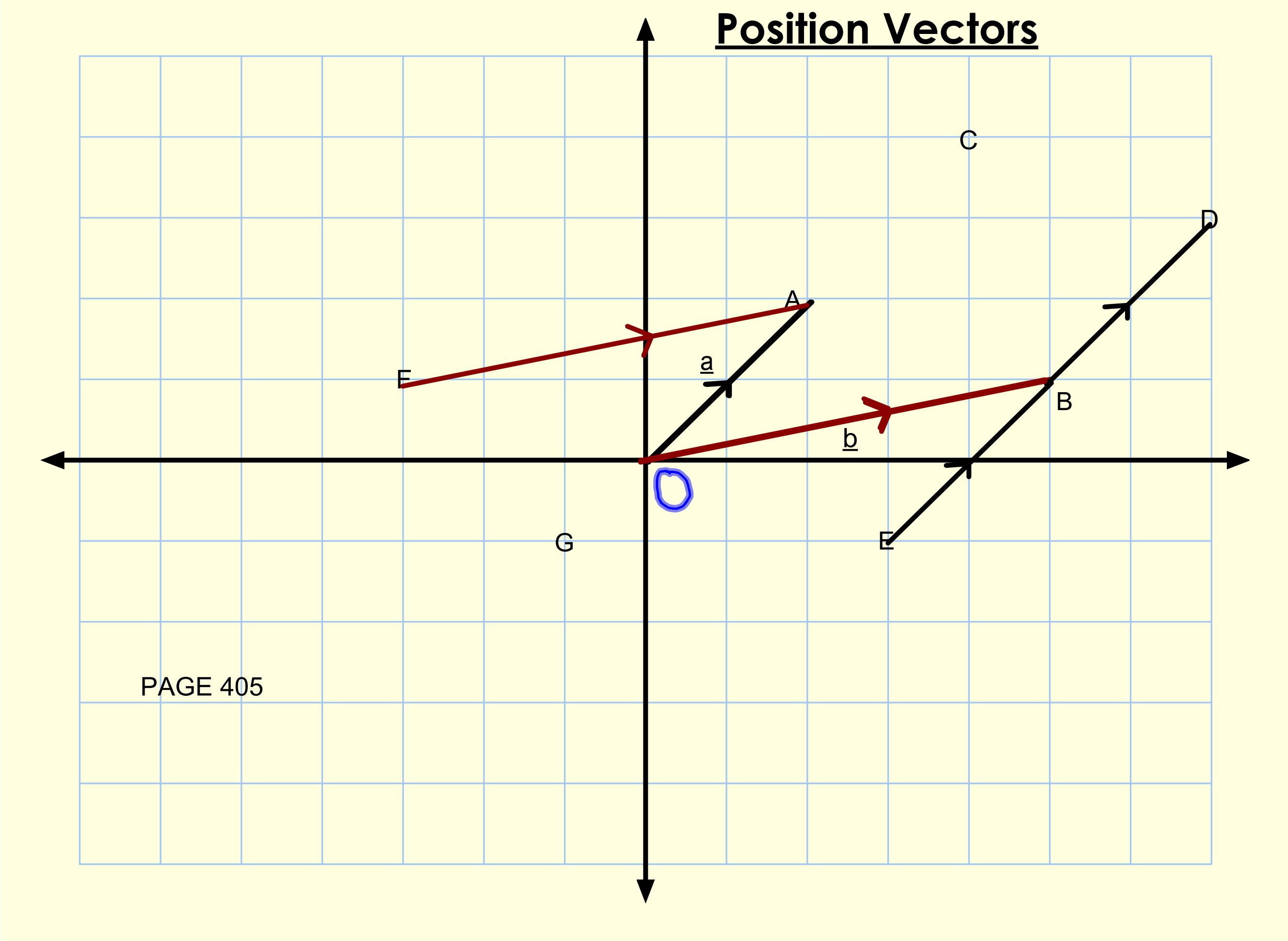
On a piece of triangular dotty paper copy the above diagram.
Somewhere on the sheet mark the following vectors:
2**p**, 3**q**, -3**p**, **p+q,** 2**p**+**q**, **p-q, q-p**, 2**q-3p**



Page 403 C2 onwards

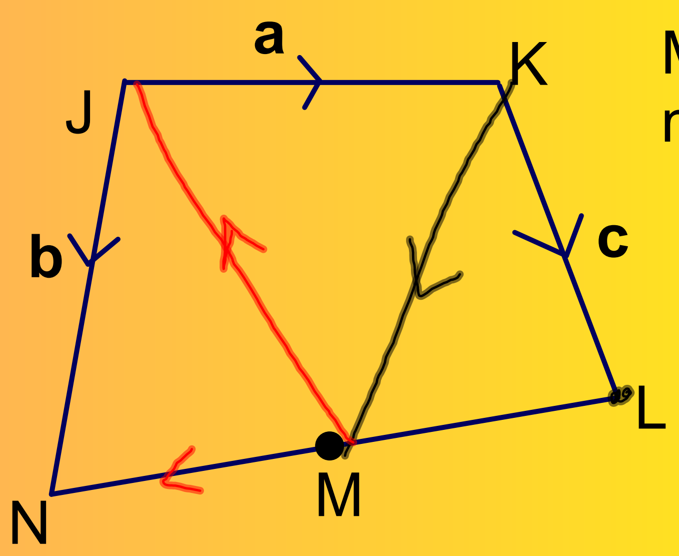
On your paper construct another vector and give it to your partner (on the tracing paper) to work out.

Position Vectors



Vector algebra

In pairs look at page 406 and decide if
the statements are true or false.
Draw diagrams to help.



M is the midpoint of LN.

$\overrightarrow{LN} = -\underline{c} - \underline{a} + \underline{b}$

$\overrightarrow{LM} = \frac{1}{2}(-\underline{c} - \underline{a} + \underline{b})$

Express in terms of **a**, **b**, **c**

$\overrightarrow{LN}$, $\overrightarrow{LM}$, $\overrightarrow{KN}$, $\overrightarrow{KM}$, $\overrightarrow{MJ}$

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

$\overrightarrow{KM} = \underline{c} + \frac{1}{2}(-\underline{c} - \underline{a} + \underline{b})$

$\overrightarrow{KM} = \frac{1}{2}\underline{c} - \frac{1}{2}\underline{a} + \frac{1}{2}\underline{b}$

$= \frac{1}{2}(\underline{c} - \underline{a} + \underline{b})$

Page 406 E3 onwards

Proof by vectors

(OCR)

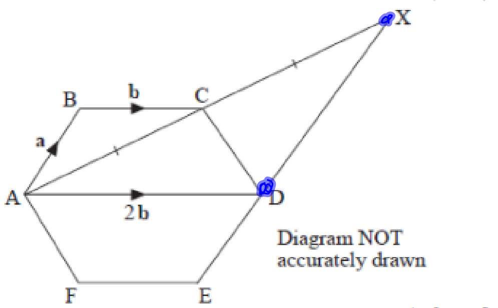
9. ABCDEF is a regular hexagon.

$\vec{AB} = \mathbf{a}$, $\vec{BC} = \mathbf{b}$, $\vec{AD} = 2\mathbf{b}$

(a) Find the vector $\vec{AC}$ in terms of $\mathbf{a}$ and $\mathbf{b}$.

$\vec{AC} = \vec{CX}$

(b) Prove that AB is parallel to DX.



(Edexcel)

$\vec{AC} = \underline{a} + \underline{b}$

$\vec{DX} = -2\underline{b} + 2\underline{a} + 2\underline{b}$ $\quad \vec{AX} = 2\underline{a} + 2\underline{b}$

$= 2\underline{a}$ which is a multiple $\underline{a}$ and $\therefore$ parallel to $\underline{a}$

To prove: AB is parallel to $\vec{AX}$

ie $\vec{AB}$ is a multiple of AX

$\vec{AX} = 2\underline{a} + 2\underline{b}$ (C is the mdpt of AX - given)

$\vec{DX} = -2\underline{b} + 2\underline{a} + 2\underline{b}$

$\vec{DX} = 2\underline{a}$

Page 408

which is a multiple of $\underline{a}$

$\therefore$ DX is parallel to AB

QED