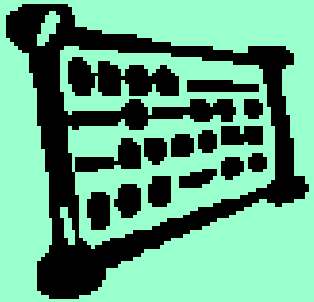
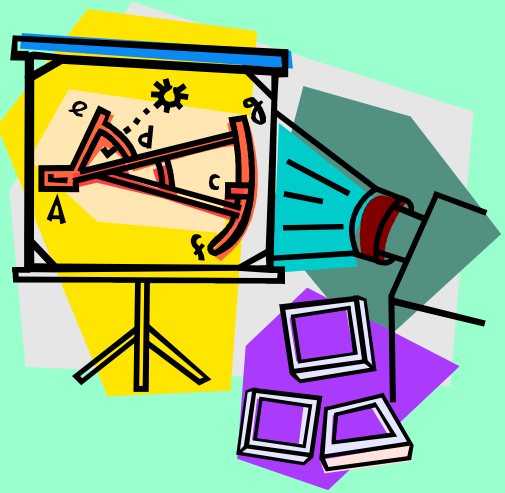
1. Vector components and addition



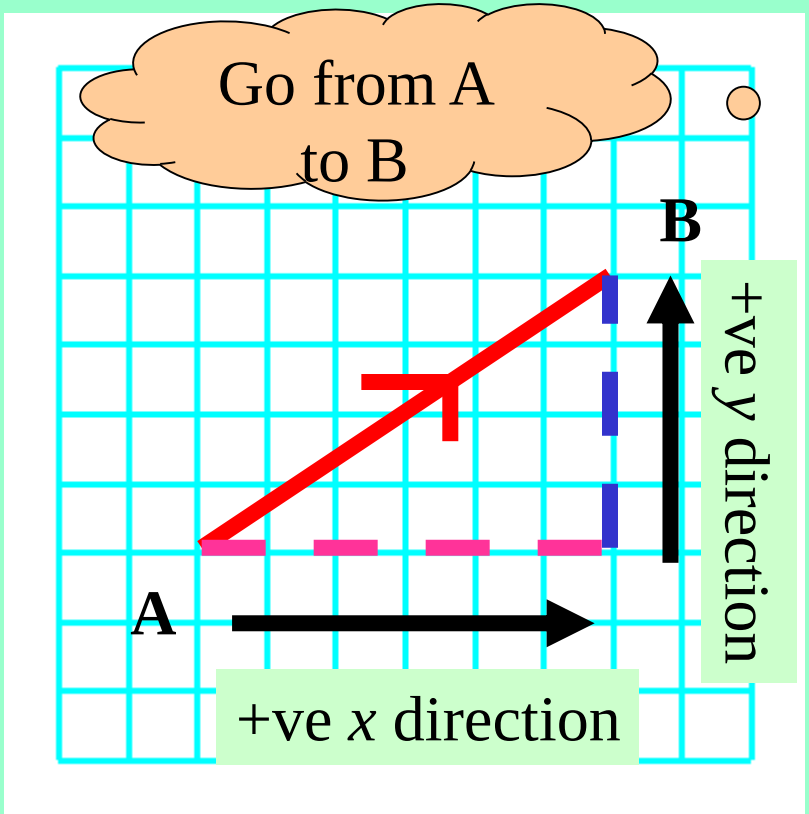


What is a vector?

Coordinates give the position of something (a point) on a grid.

Vectors give the movement required to arrive at that position.
This means that vectors must have two qualities:

MAGNITUDE (size) and DIRECTION



$\overrightarrow{AB}$ is a **directed line segment**

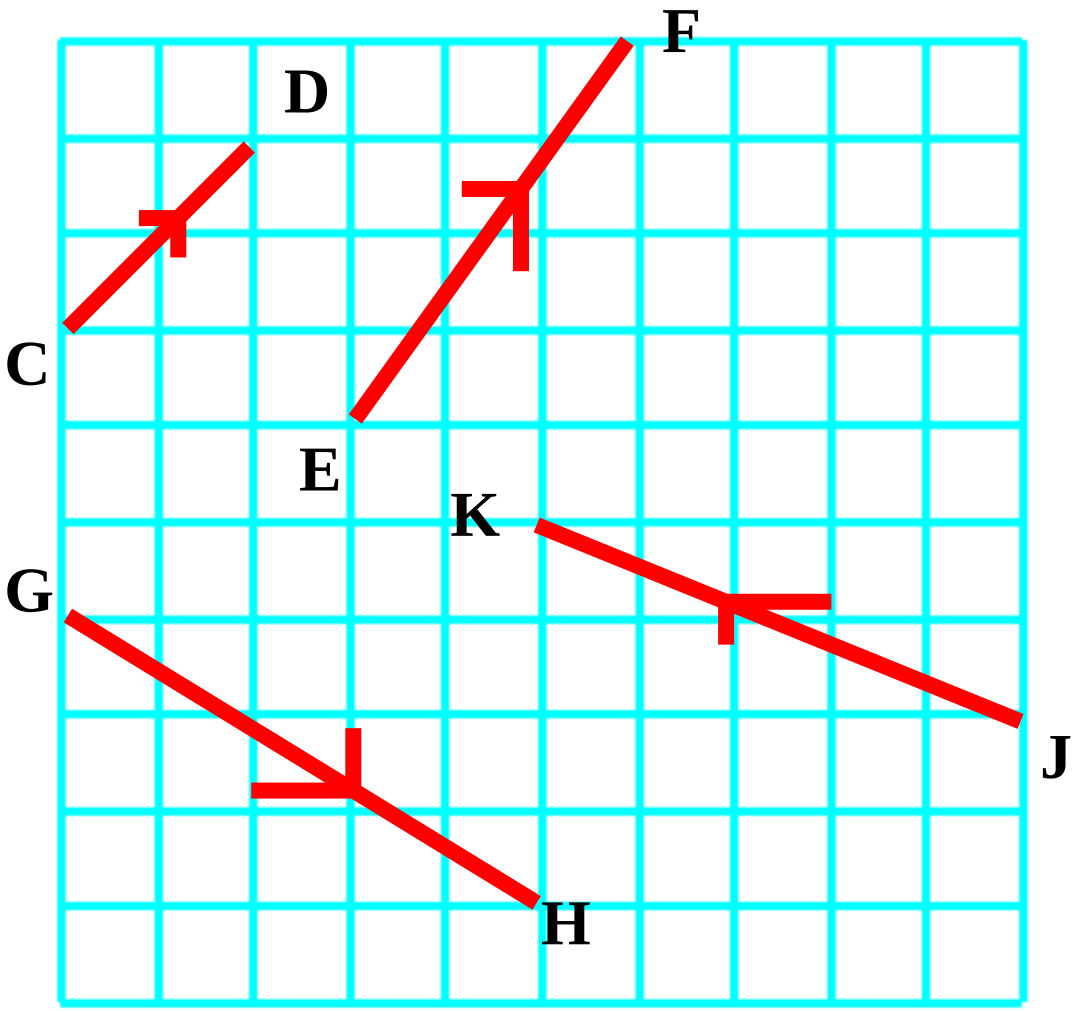
In **component form** this is:

$$\overrightarrow{AB} = \begin{pmatrix} 6 \\ 4 \end{pmatrix}$$

x-component

y-component

Write the following directed line segments in component form:



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

$$\overrightarrow{EF} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$$

$$\overrightarrow{GH} = \begin{pmatrix} 5 \\ -3 \end{pmatrix}$$

$$\overrightarrow{JK} = \begin{pmatrix} -5 \\ 2 \end{pmatrix}$$

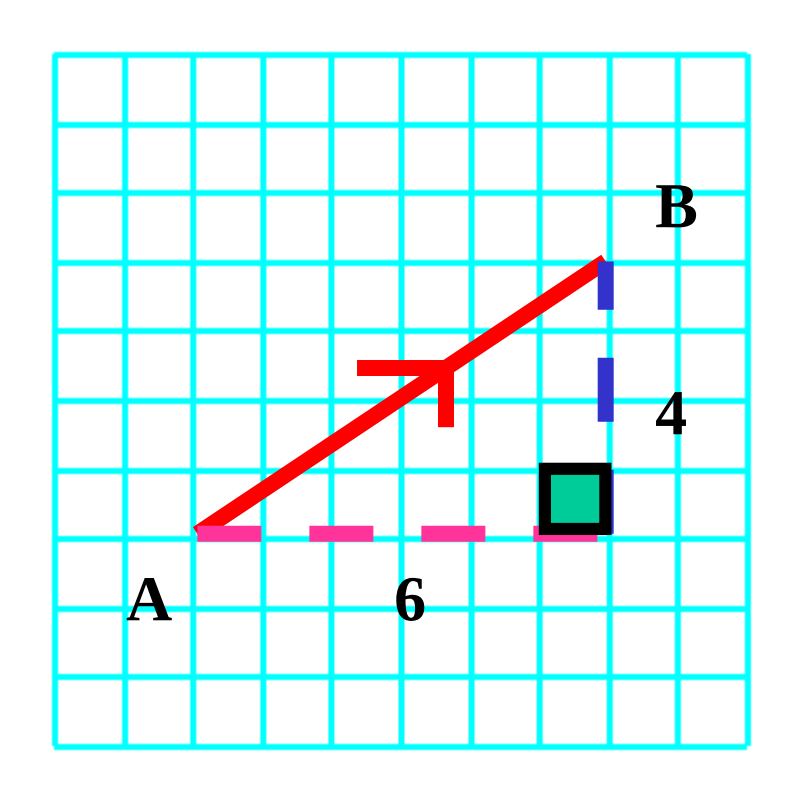
Magnitude of a vector

Writing a vector in component form gives us a way of expressing the direction of a vector.

Now we must find a way of determining **the magnitude** of a vector.

Lets return to our original vector:

$$\overrightarrow{AB} = \begin{pmatrix} 6 \\ 4 \end{pmatrix}$$

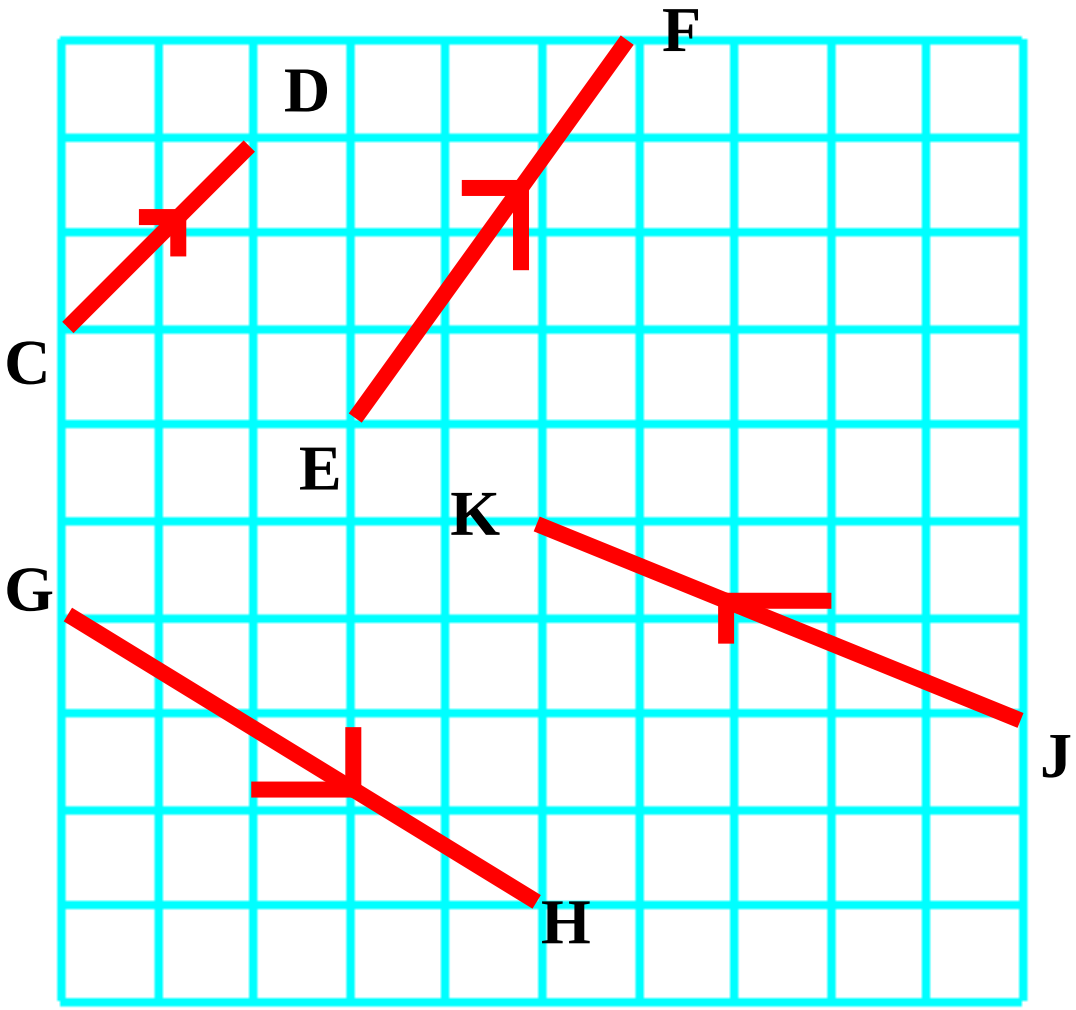


By Pythagoras:

$$\left|\overrightarrow{AB}\right| = \sqrt{x^2 + y^2}$$

$$\Rightarrow \left|\overrightarrow{AB}\right| = \sqrt{6^2 + 4^2} = \sqrt{52}$$

Use your previous answers to find the magnitude of these vectors:



$\overrightarrow{CD} = \begin{pmatrix} 2 \\ 2 \end{pmatrix}$ $\left|\overrightarrow{CD}\right| = \sqrt{8}$

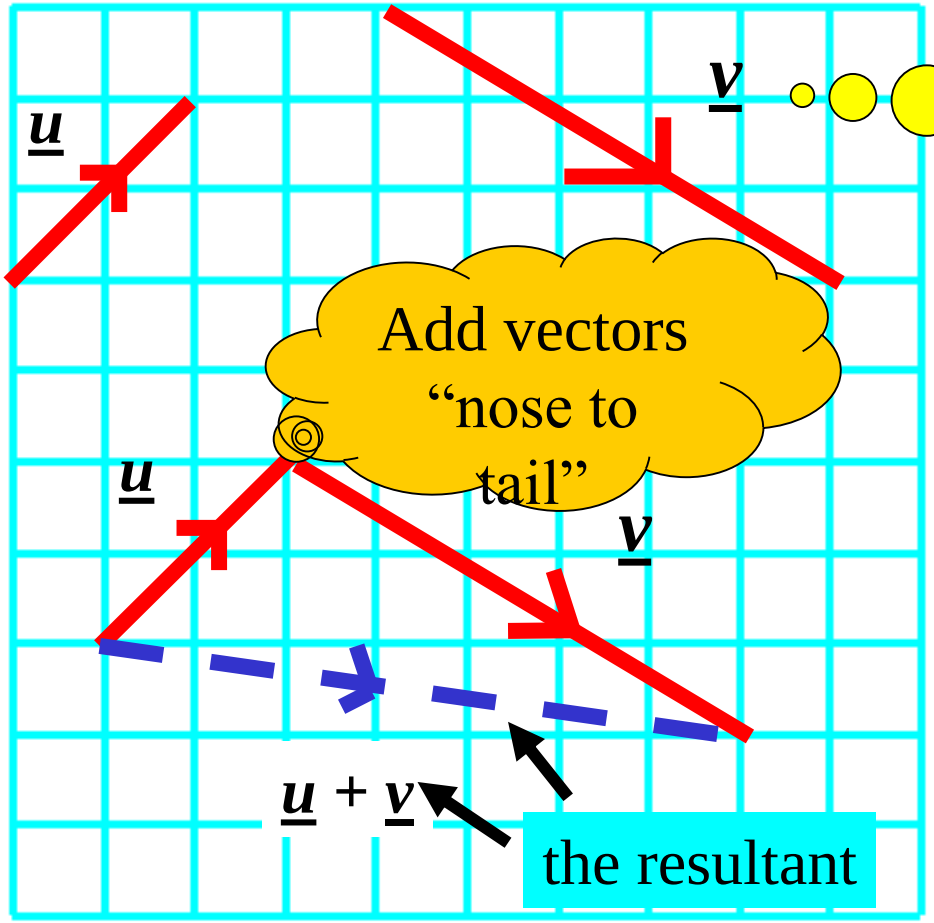
$\overrightarrow{EF} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$ $\left|\overrightarrow{EF}\right| = 5$

$\overrightarrow{GH} = \begin{pmatrix} 5 \\ -3 \end{pmatrix}$ $\left|\overrightarrow{GH}\right| = \sqrt{34}$

$\overrightarrow{JK} = \begin{pmatrix} -5 \\ 2 \end{pmatrix}$ $\left|\overrightarrow{JK}\right| = \sqrt{29}$

Adding vectors

Lets now look at the result of adding two vectors together:

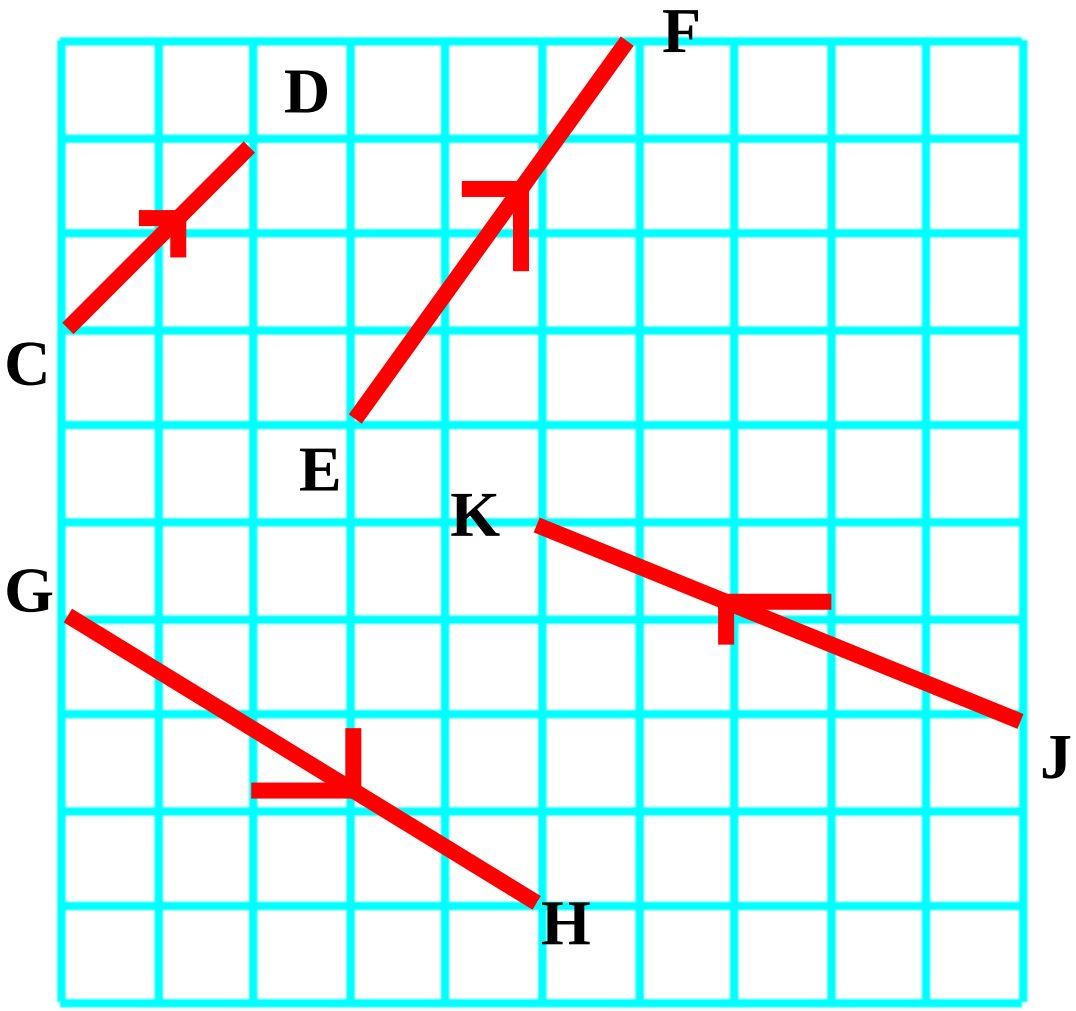


Vectors can be written as underlined letters

$$\underline{u} = \begin{pmatrix} 2 \\ 2 \end{pmatrix} \quad \underline{v} = \begin{pmatrix} 5 \\ -3 \end{pmatrix}$$

$$\underline{u} + \underline{v} = \begin{pmatrix} 7 \\ -1 \end{pmatrix} = \begin{pmatrix} 2+5 \\ 2+(-3) \end{pmatrix}$$

Use your previous answers to find the resultant vector for:



$$\overrightarrow{CD} + \overrightarrow{EF} = \begin{pmatrix} 5 \\ 6 \end{pmatrix}$$

$$\overrightarrow{JK} + \overrightarrow{CD} = \begin{pmatrix} -3 \\ 4 \end{pmatrix}$$

$$\overrightarrow{GH} + \overrightarrow{EF} = \begin{pmatrix} 8 \\ 1 \end{pmatrix}$$

$$\overrightarrow{JK} + \overrightarrow{GH} = \begin{pmatrix} 0 \\ -1 \end{pmatrix}$$

Heinemann, p.234, EX 13C, Q2,3 & 7