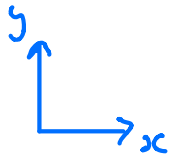
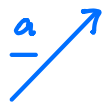
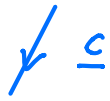
Vectors

A vector has both size and direction





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



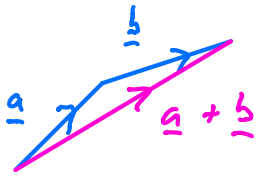
$\underline{c} = \begin{pmatrix} -1 \\ -2 \end{pmatrix}$

$\underline{b} = \begin{pmatrix} 3 \\ 1 \end{pmatrix}$

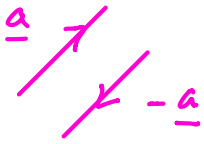
$\underline{d} = \begin{pmatrix} 3 \\ 0 \end{pmatrix}$

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

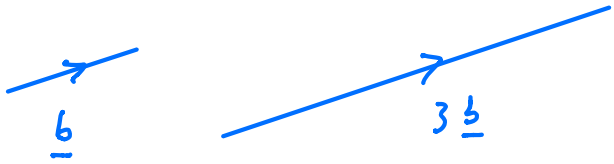
nose to tail rule for adding vectors



$\underline{a} + \underline{b} = \begin{pmatrix} 2 \\ 2 \end{pmatrix} + \begin{pmatrix} 3 \\ 1 \end{pmatrix} = \begin{pmatrix} 5 \\ 3 \end{pmatrix}$

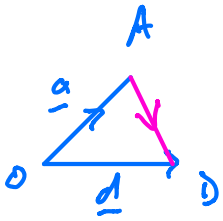


$\underline{a} = \begin{pmatrix} 2 \\ 2 \end{pmatrix} \quad -\underline{a} = \begin{pmatrix} -2 \\ -2 \end{pmatrix}$



$\underline{b} = \begin{pmatrix} 3 \\ 1 \end{pmatrix}$

$3\underline{b} = 3\begin{pmatrix} 3 \\ 1 \end{pmatrix} = \begin{pmatrix} 9 \\ 3 \end{pmatrix}$



$\overrightarrow{AD} = \overrightarrow{AO} + \overrightarrow{OD}$

$= -\underline{a} + \underline{d}$

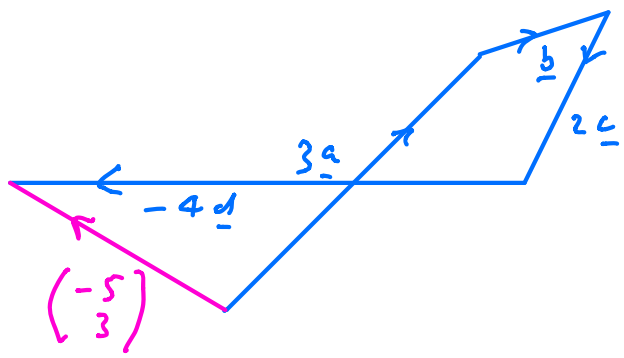
Example

Find $3\underline{a} + \underline{b} + 2\underline{c} - 4\underline{d}$

$$3\begin{pmatrix}2\\2\end{pmatrix} + \begin{pmatrix}3\\1\end{pmatrix} + 2\begin{pmatrix}-1\\-2\end{pmatrix} - 4\begin{pmatrix}3\\0\end{pmatrix}$$

$$= \begin{pmatrix}6\\6\end{pmatrix} + \begin{pmatrix}3\\1\end{pmatrix} + \begin{pmatrix}-2\\-4\end{pmatrix} - \begin{pmatrix}12\\0\end{pmatrix}$$

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



Exam Question $\quad \underline{a} = \begin{pmatrix}5\\2\end{pmatrix} \quad \underline{b} = \begin{pmatrix}-1\\7\end{pmatrix}$

Find $2\underline{a} + \underline{b}$

$$= 2\begin{pmatrix}5\\2\end{pmatrix} + \begin{pmatrix}-1\\7\end{pmatrix}$$

$$= \begin{pmatrix}10\\4\end{pmatrix} + \begin{pmatrix}-1\\7\end{pmatrix} = \begin{pmatrix}9\\11\end{pmatrix}$$