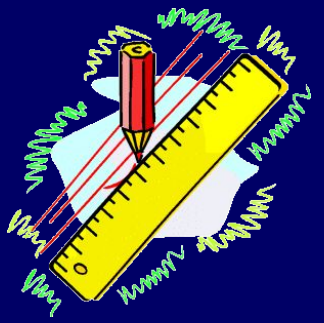
Higher



Outcome 1

Тема урока

Скалярное произведение векторов, угол между векторами

Higher

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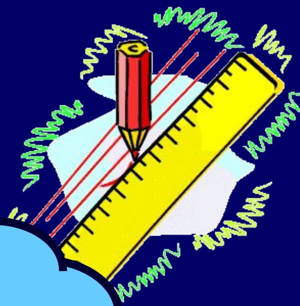
The scalar product

Outcome 1



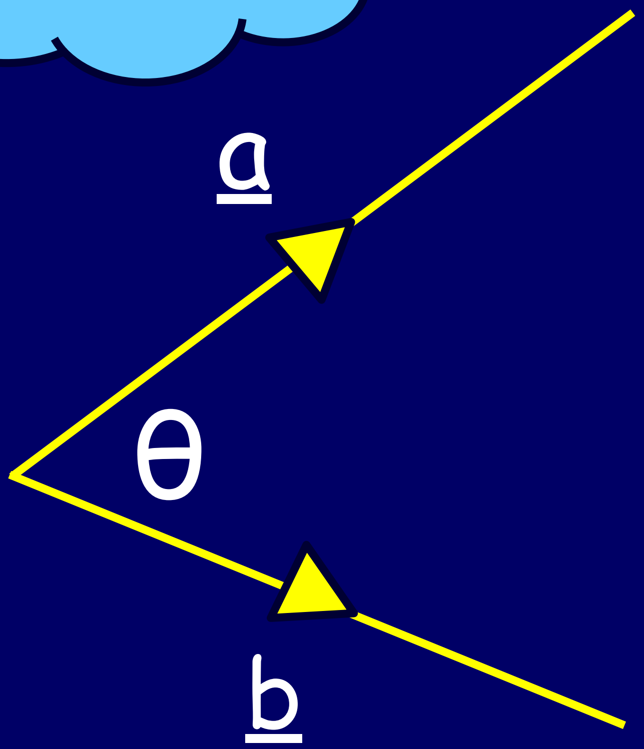
Must be

tail to tail

The scalar product is de

$$\underline{a} \cdot \underline{b} = |\underline{a}||\underline{b}|\cos\theta$$

$$0 \leq \theta \leq 180^0$$



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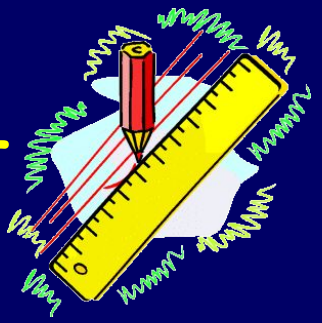
Component Form Scalar Product



Outcome 1

If $\underline{a} = \begin{pmatrix} a_1 \\ a_2 \\ a_3 \end{pmatrix}$ and $\underline{b} = \begin{pmatrix} b_1 \\ b_2 \\ b_3 \end{pmatrix}$ then

$$\underline{a} \cdot \underline{b} = a_1 b_1 + a_2 b_2 + a_3 b_3$$

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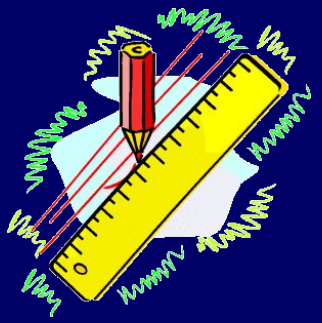
Angle between Vectors

Outcome 1



To find the angle between two vectors we simply use the scalar product formula rearranged

$$\cos\theta = \frac{\underline{a} \cdot \underline{b}}{|\underline{a}||\underline{b}|}$$

or

$$\cos\theta = \frac{a_1b_1 + a_2b_2 + a_3b_3}{|\underline{a}||\underline{b}|}$$

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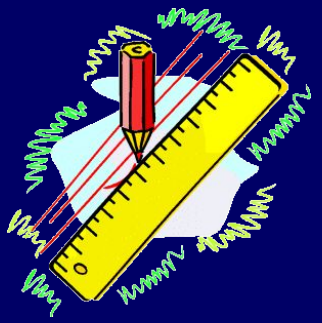
Perpendicular Vectors

Outcome 1



Given $|\underline{a}| \neq 0$ and $|\underline{b}| \neq 0$ and $\underline{a} \cdot \underline{b} = 0$

Then $$\cos\theta = \frac{\underline{a} \cdot \underline{b}}{|\underline{a}||\underline{b}|} = \frac{0}{|\underline{a}||\underline{b}|} = 0$$

$$\theta = \cos^{-1}(0) = 90^{\circ}$$

If $\underline{a}$. $\underline{b}$ = 0 then $\underline{a}$ and $\underline{b}$ are perpendicular

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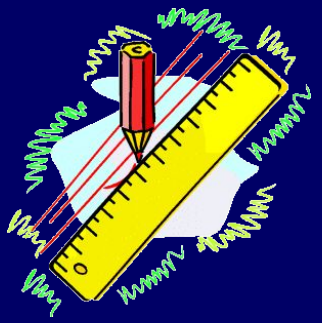
Properties of a Scalar Product

Outcome 1



Two properties that you need to be aware of

$$\underline{a} \cdot \underline{b} = \underline{b} \cdot \underline{a}$$

$$\underline{a} \cdot (\underline{b} + \underline{c}) = \underline{a} \cdot \underline{b} + \underline{a} \cdot \underline{c}$$