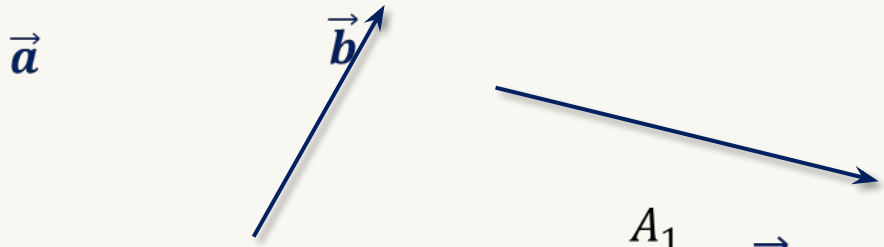
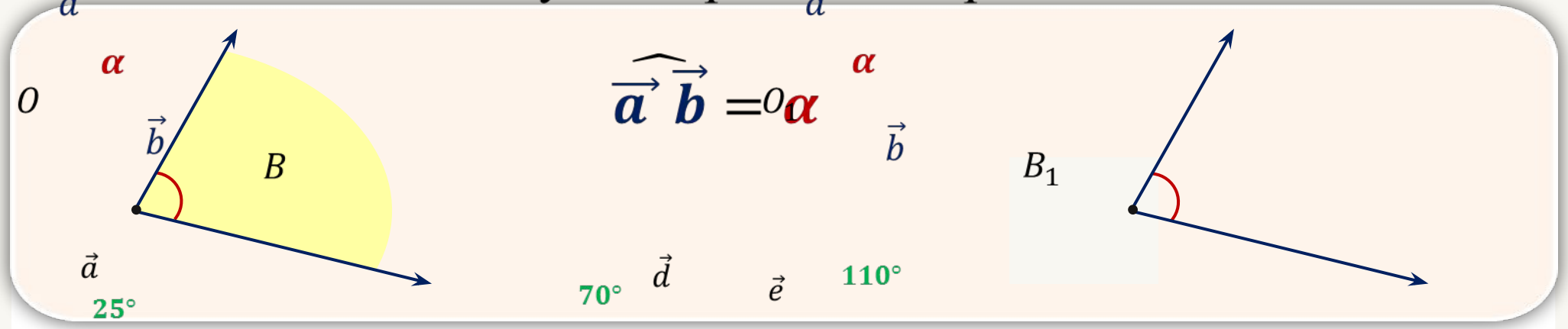
Угол между векторами



A A_1

«Угол между векторами $\vec{a}$ и $\vec{b}$ равен α»



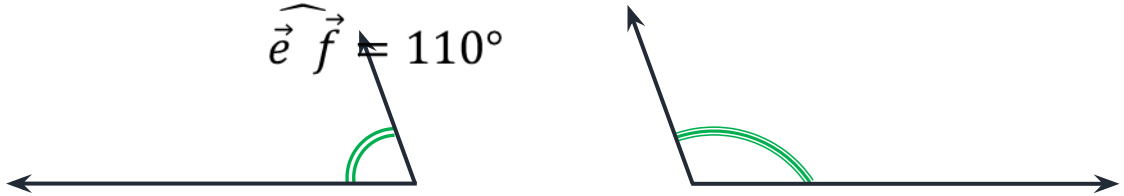
$\vec{b}$ $\vec{c}$ $\vec{f}$

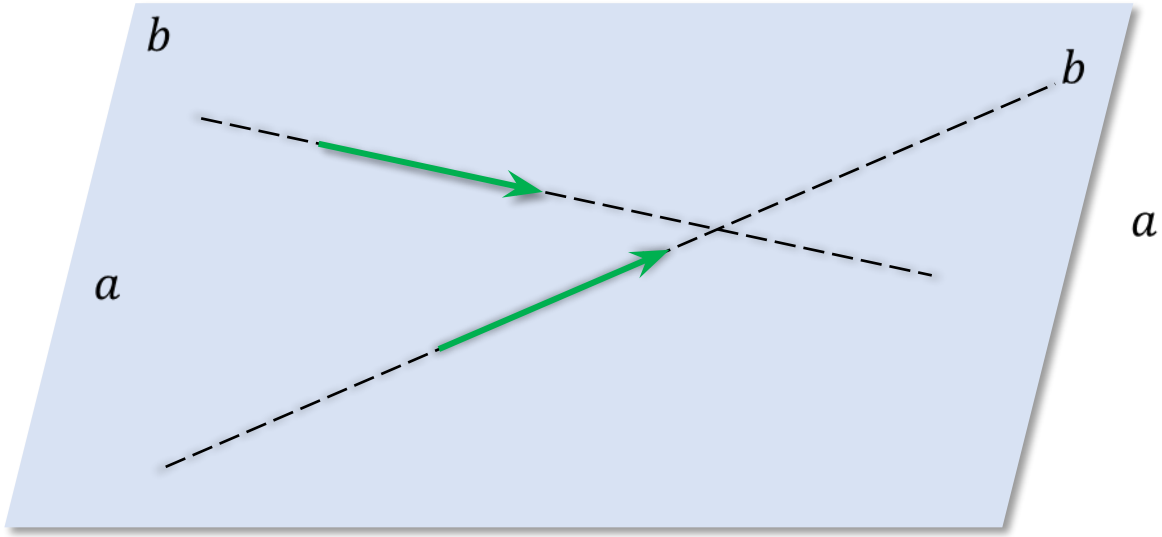
Пример:

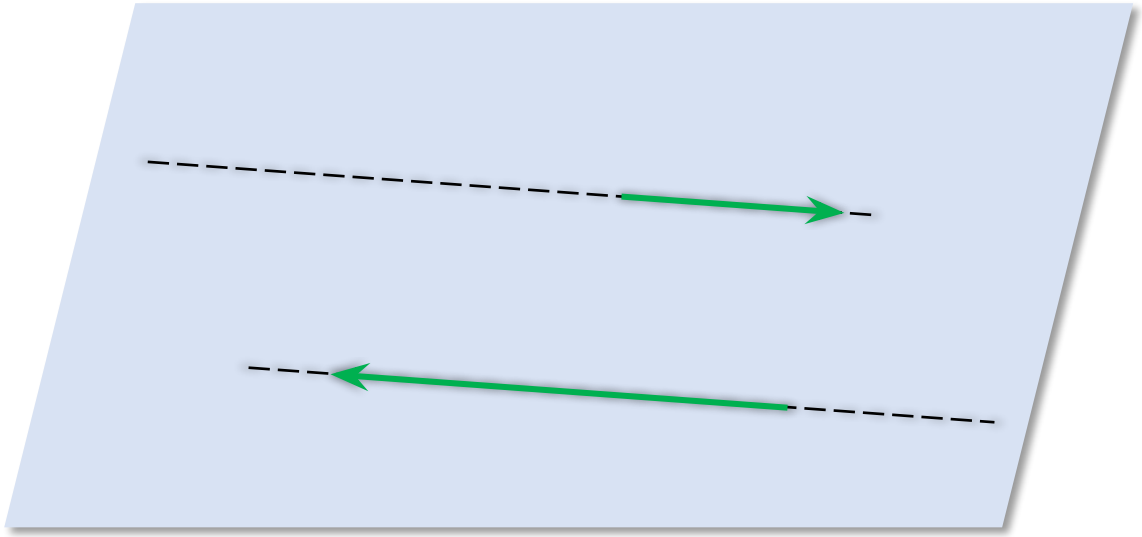
$\vec{a}\ \vec{b} = 25°$

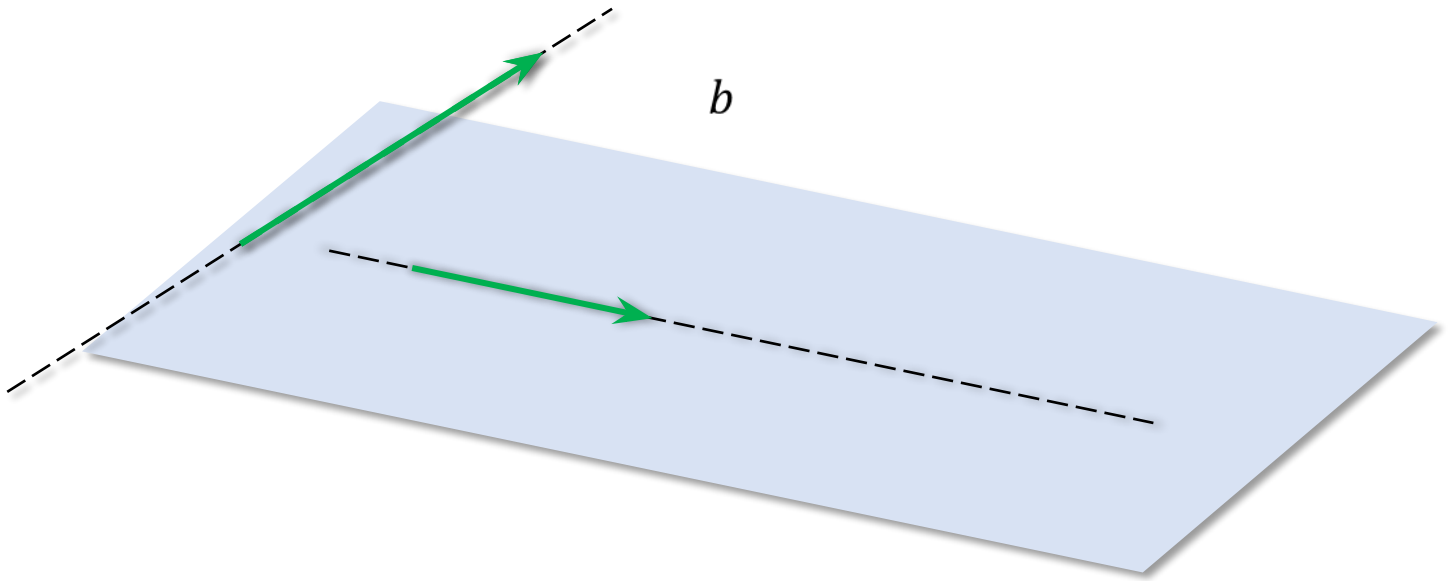
$\vec{c}\ \vec{d} = 70°$

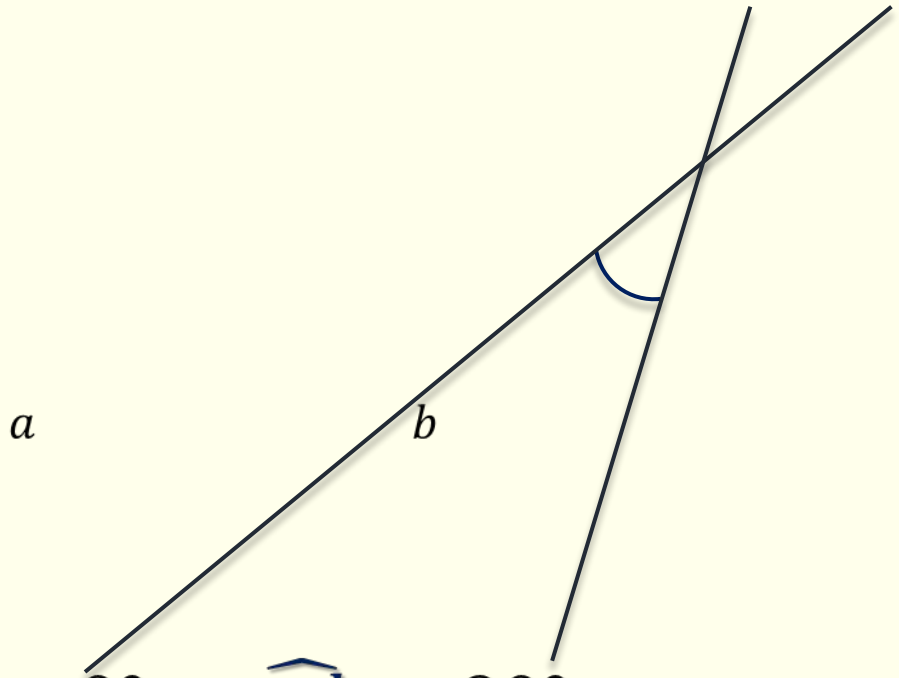
$\vec{e}\ \vec{f} = 110°$



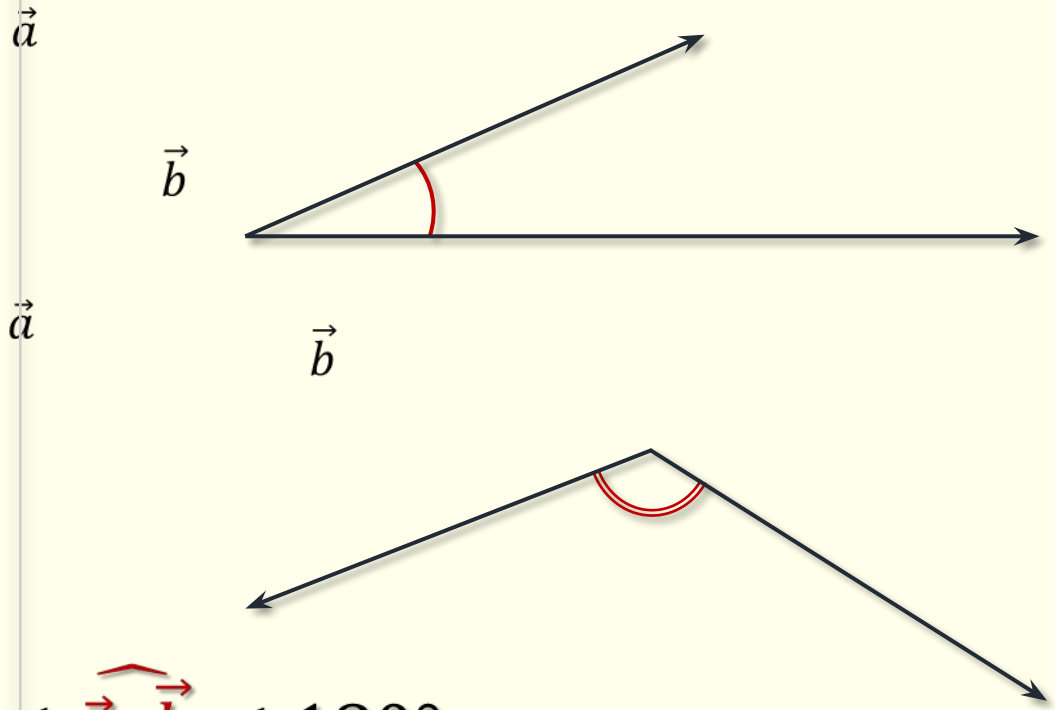

b
b
a


a


a
b

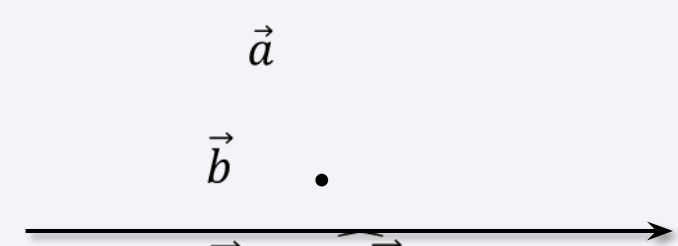


$0° \leq \widehat{a\ b} \leq 90°$

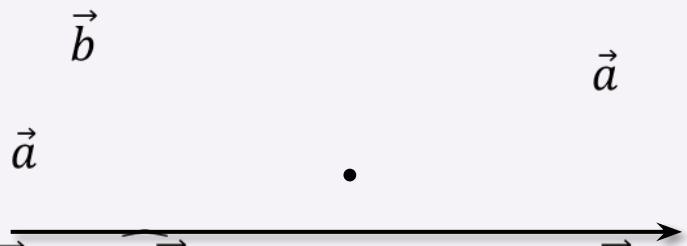


$0° \leq \widehat{\vec{a}\ \vec{b}} \leq 180°$

Если $\vec{a} \uparrow\uparrow \vec{b}$, то $\widehat{\vec{a}\ \vec{b}} = 0°$.



Если $\vec{a} = \vec{0}$, то $\widehat{\vec{a}\ \vec{b}} = 0°$.

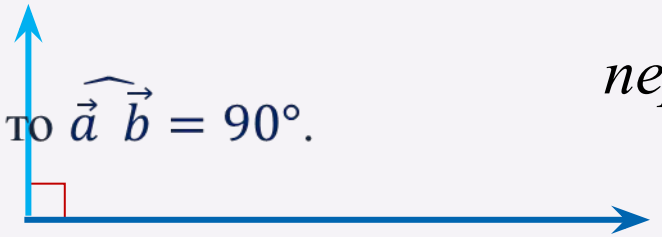


Если $\vec{b} = \vec{0}$, то $\widehat{\vec{a}\ \vec{b}} = 0°$.

Если $\vec{a} = \vec{b} = \vec{0}$, то $\widehat{\vec{a}\ \vec{b}} = 0°$.

Если $\vec{a} \uparrow\downarrow \vec{b}$, то $\widehat{\vec{a}\ \vec{b}} = 180°$.

Если $\vec{a} \perp \vec{b}$, то $\widehat{\vec{a}\ \vec{b}} = 90°$.



перпендикулярные векторы

Найти углы между векторами (с объяснением).

а) $\widehat{\overrightarrow{B_1B}\ \overrightarrow{B_1C}} = \angle BB_1C = 45°$ (ΔBB_1C – прямоугольный, равнобедренный).

б) $\widehat{\overrightarrow{DA}\ \overrightarrow{B_1D_1}}$

в) $\widehat{\overrightarrow{A_1C_1}\ \overrightarrow{A_1B_1}}$

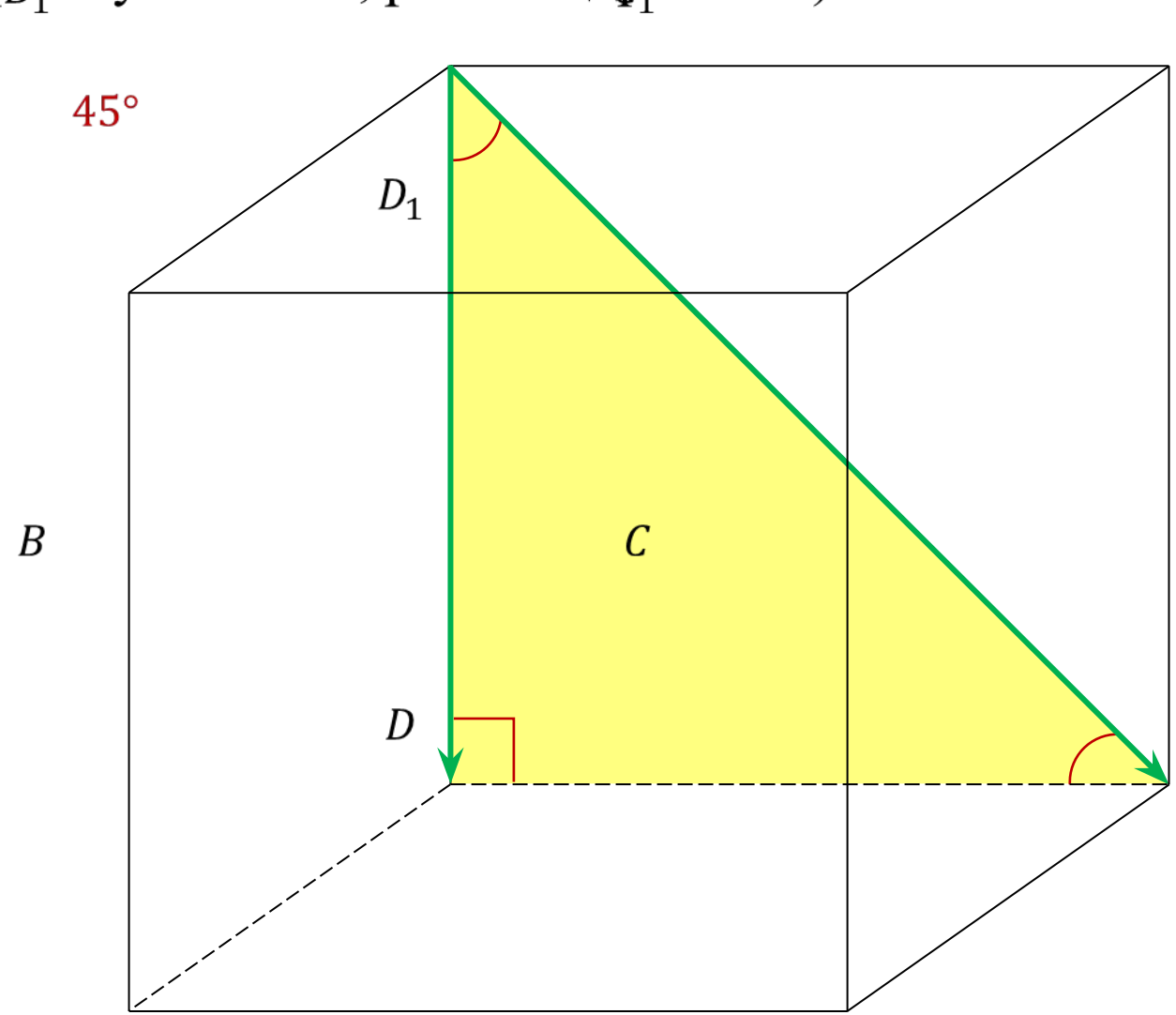
г) $\widehat{\overrightarrow{BC}\ \overrightarrow{AC}}$

д) $\widehat{\overrightarrow{BB_1}\ \overrightarrow{AC}}$

е) $\widehat{\overrightarrow{B_1C}\ \overrightarrow{AD_1}}$

ж) $\widehat{\overrightarrow{A_1D_1}\ \overrightarrow{BC}}$

з) $\widehat{\overrightarrow{AA_1}\ \overrightarrow{C_1C}}$

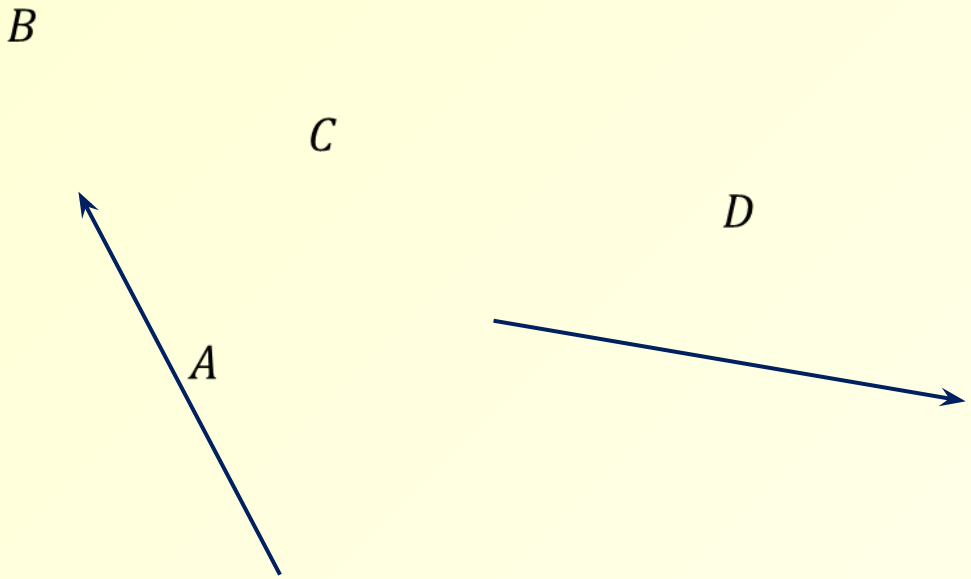


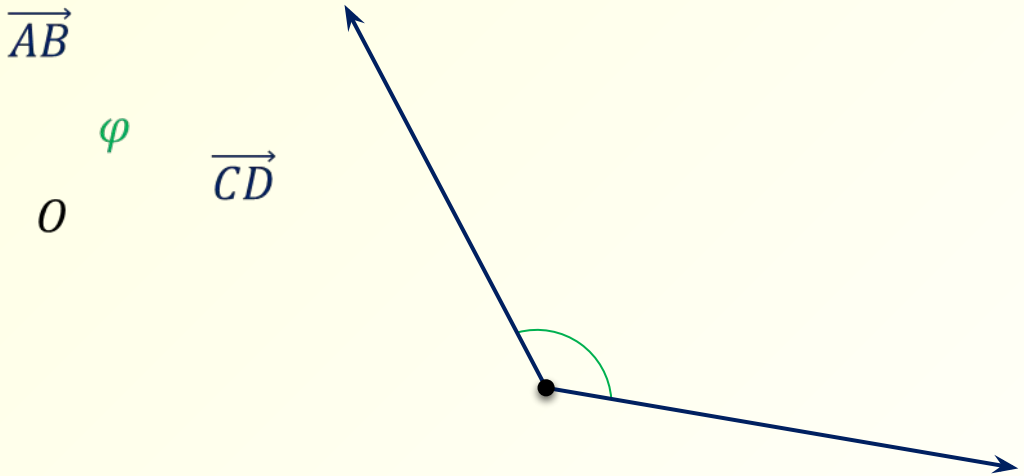
$\widehat{\overrightarrow{AB}\ \overrightarrow{CD}} = \varphi$

$\widehat{\overrightarrow{BA}\ \overrightarrow{DC}}$

$\widehat{\overrightarrow{BA}\ \overrightarrow{CD}}$

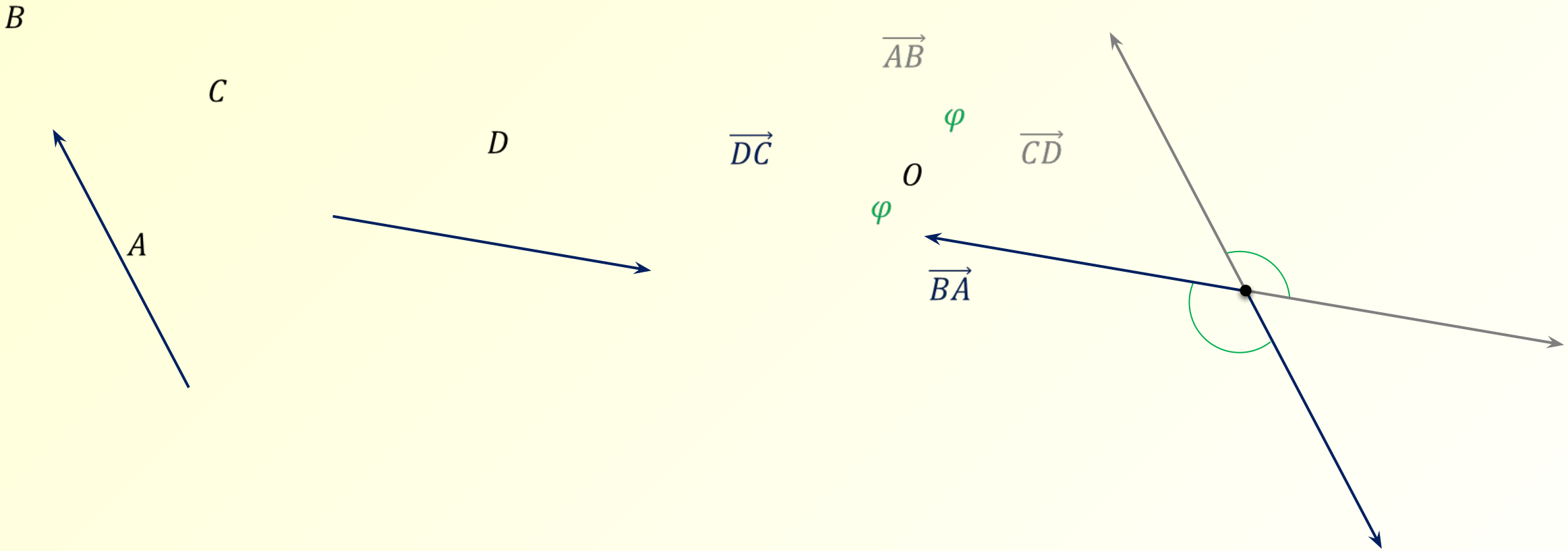
$\widehat{\overrightarrow{AB}\ \overrightarrow{DC}}$





$\widehat{\overrightarrow{AB}\ \overrightarrow{CD}} = \varphi$

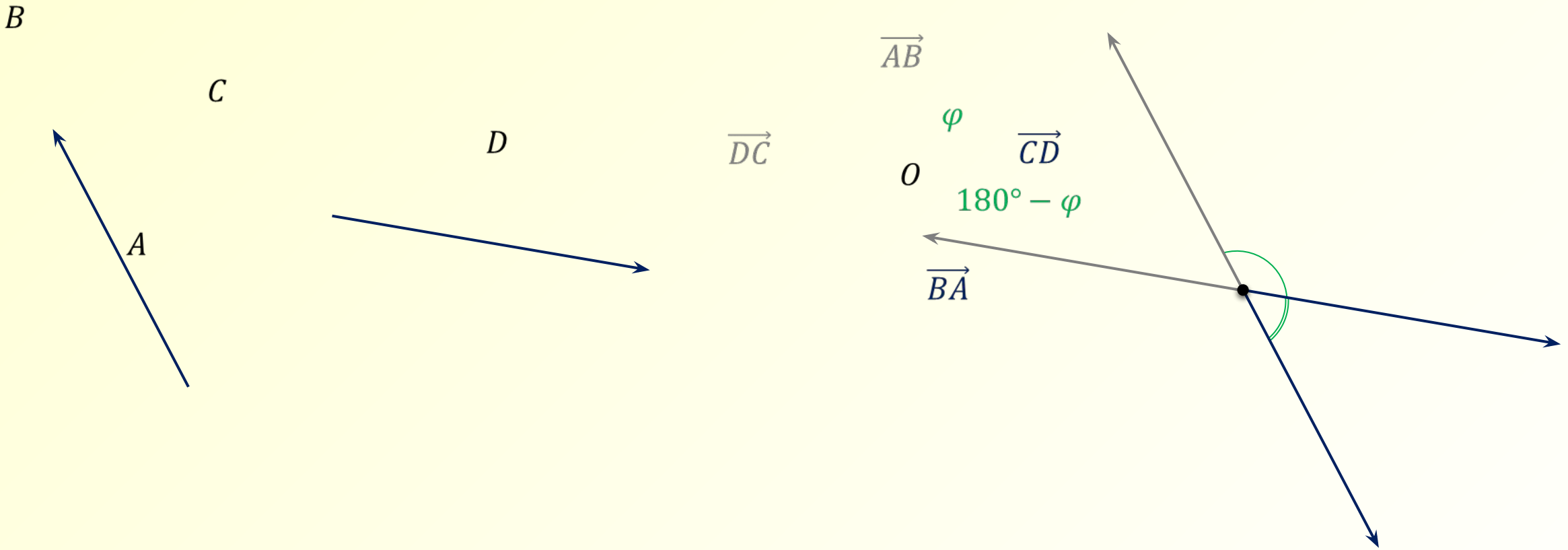
$\widehat{\overrightarrow{BA}\ \overrightarrow{DC}} = \varphi$



$\widehat{\overrightarrow{AB}\ \overrightarrow{CD}} = \varphi$

$\widehat{\overrightarrow{BA}\ \overrightarrow{DC}} = \varphi$

$\widehat{\overrightarrow{BA}\ \overrightarrow{CD}} = 180° - \varphi$

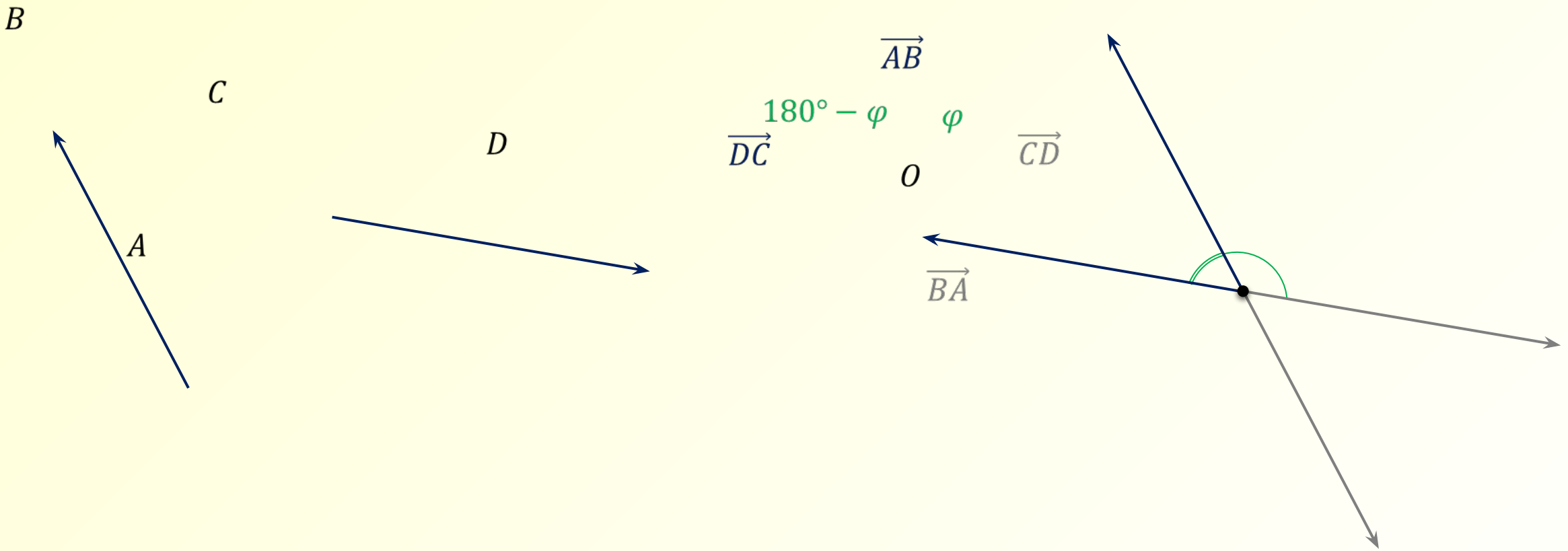


$\widehat{\overrightarrow{AB}\ \overrightarrow{CD}} = \varphi$

$\widehat{\overrightarrow{BA}\ \overrightarrow{DC}} = \varphi$

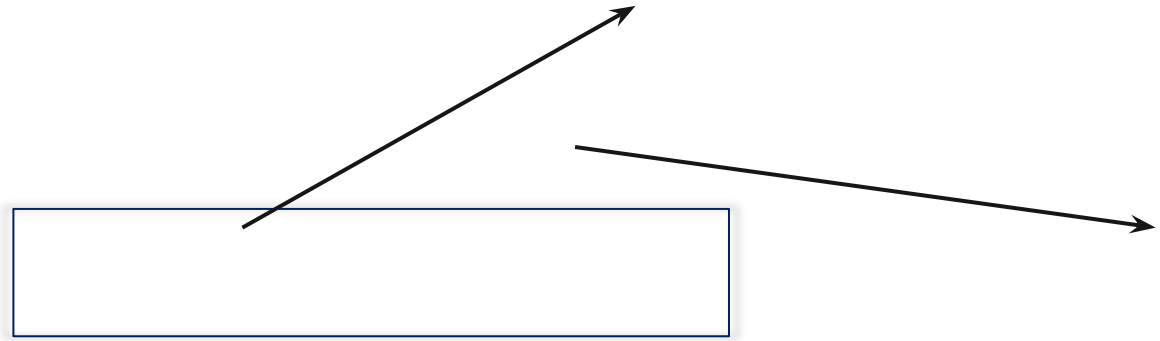
$\widehat{\overrightarrow{BA}\ \overrightarrow{CD}} = 180° - \varphi$

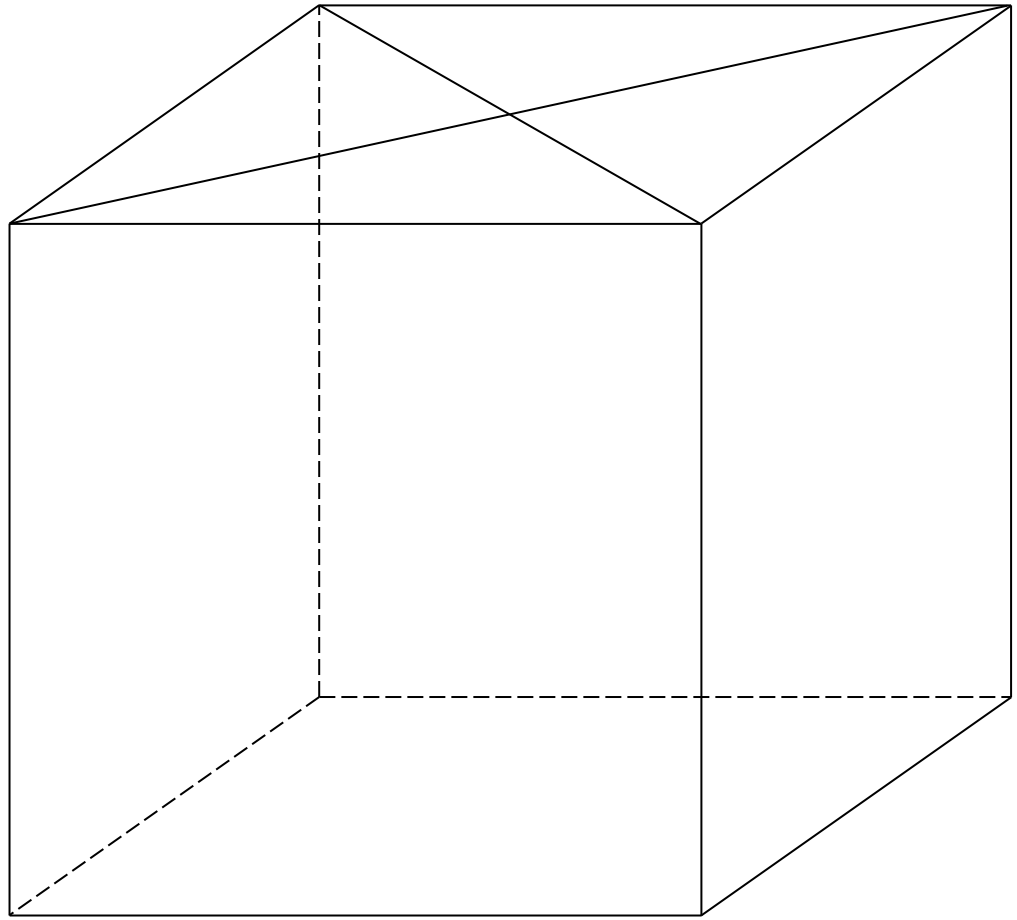
$\widehat{\overrightarrow{AB}\ \overrightarrow{DC}} = 180° - \varphi$

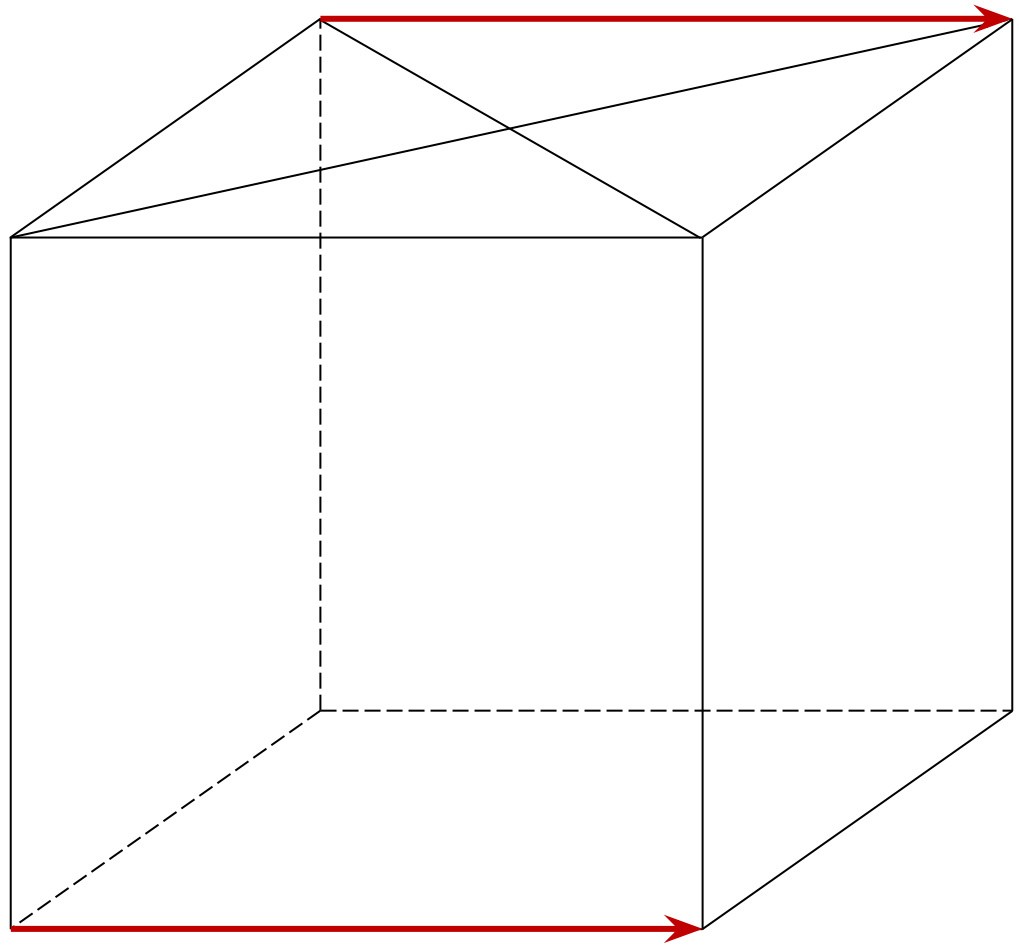


Скалярное произведение векторов

Определение. **Скалярным произведением** двух векторов называется произведение их *длин* на *косинус угла между ними*.







Вычислить скалярные произведения (показать решение).

б) $\overrightarrow{AC} \cdot \overrightarrow{C_1A_1} = \left|\overrightarrow{AC}\right| \cdot \left|\overrightarrow{C_1A_1}\right| \cdot \cos \overrightarrow{AC}\ \overrightarrow{C_1A_1} = \cdots$

в) $\overrightarrow{D_1B} \cdot \overrightarrow{AC} = \ldots$

г) $\overrightarrow{BA_1} \cdot \overrightarrow{BC_1} = \ldots$

д) $\overrightarrow{A_1O_1} \cdot \overrightarrow{A_1C_1} = \ldots$

е) $\overrightarrow{D_1O_1} \cdot \overrightarrow{B_1O_1} = \cdots$

ж) $\overrightarrow{BO_1} \cdot \overrightarrow{C_1B} = \cdots$