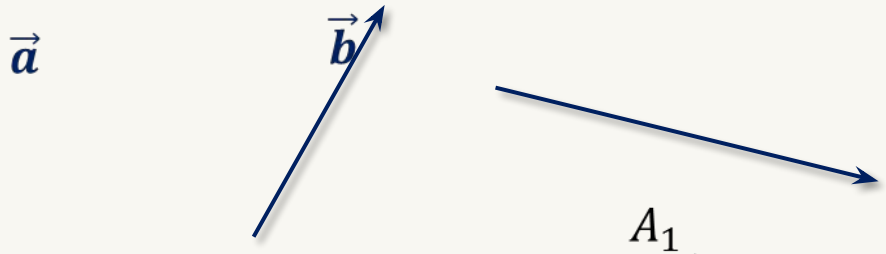
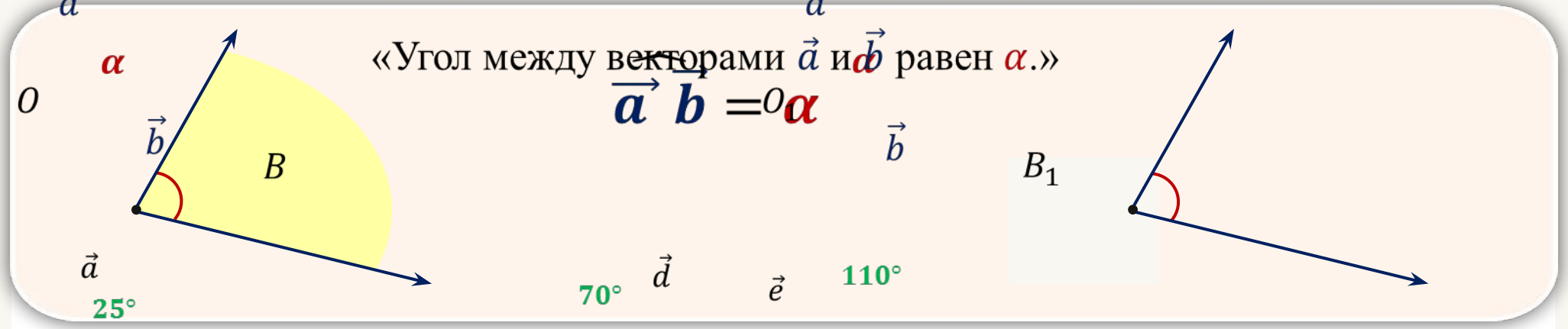
Угол между векторами



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



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

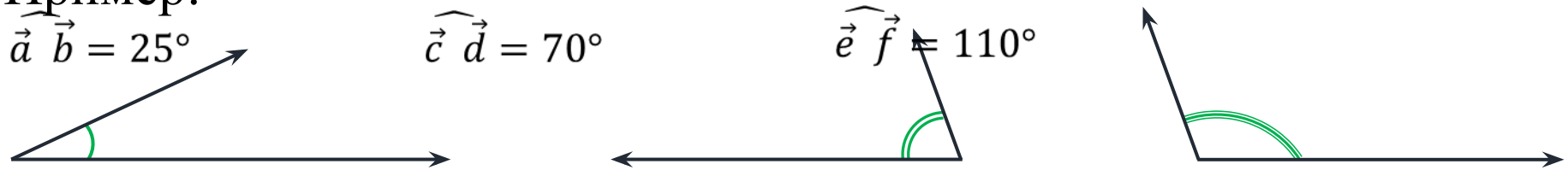
$\vec{a}\ \vec{b} = {}^{0}\alpha$

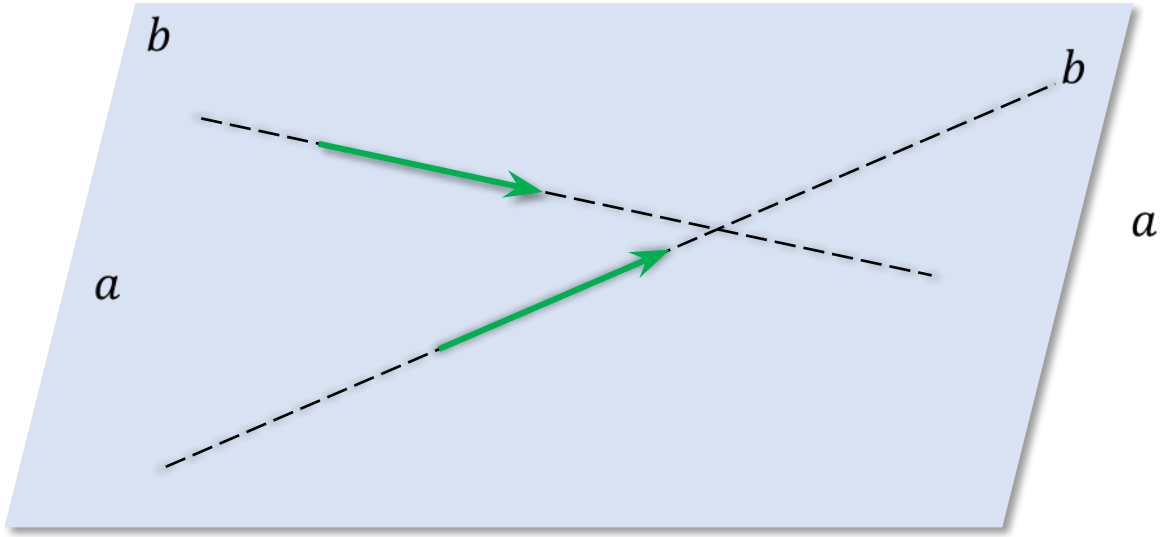
Пример:

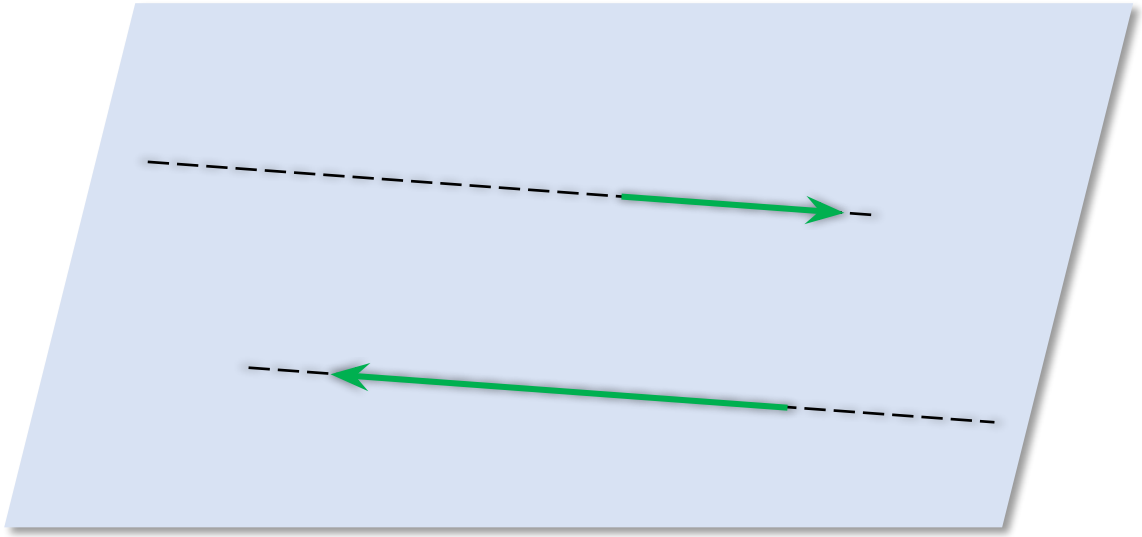
$\widehat{\vec{a}\ \vec{b}} = 25°$

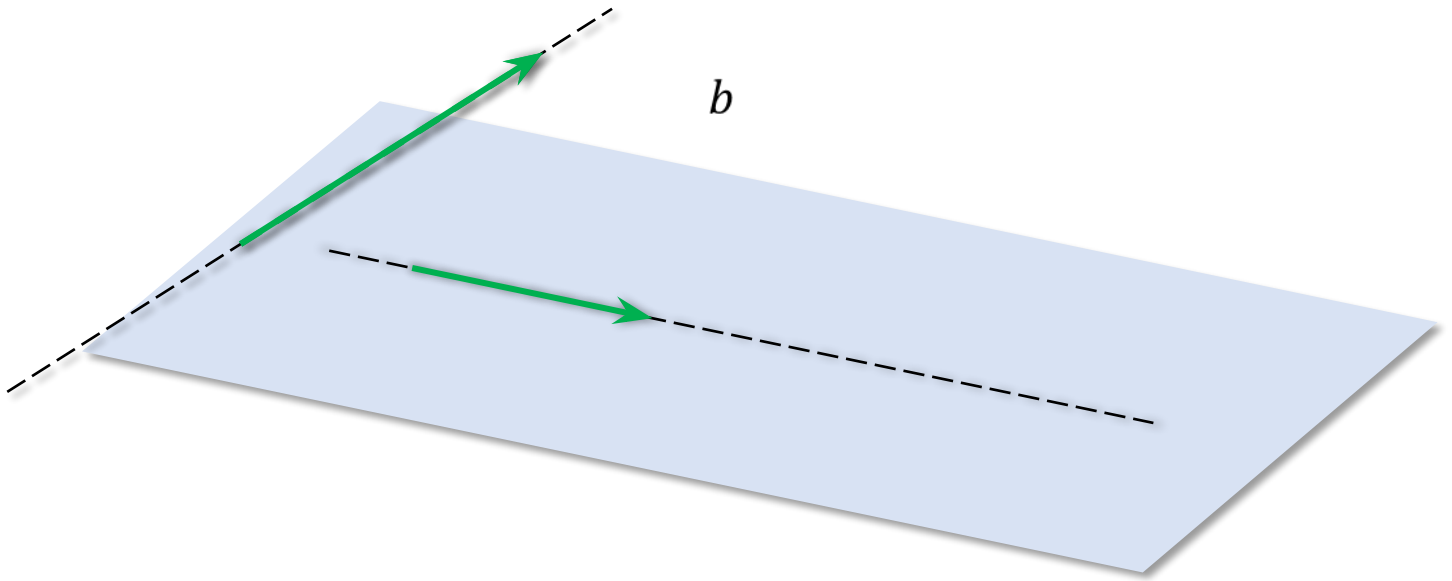
$\widehat{\vec{c}\ \vec{d}} = 70°$

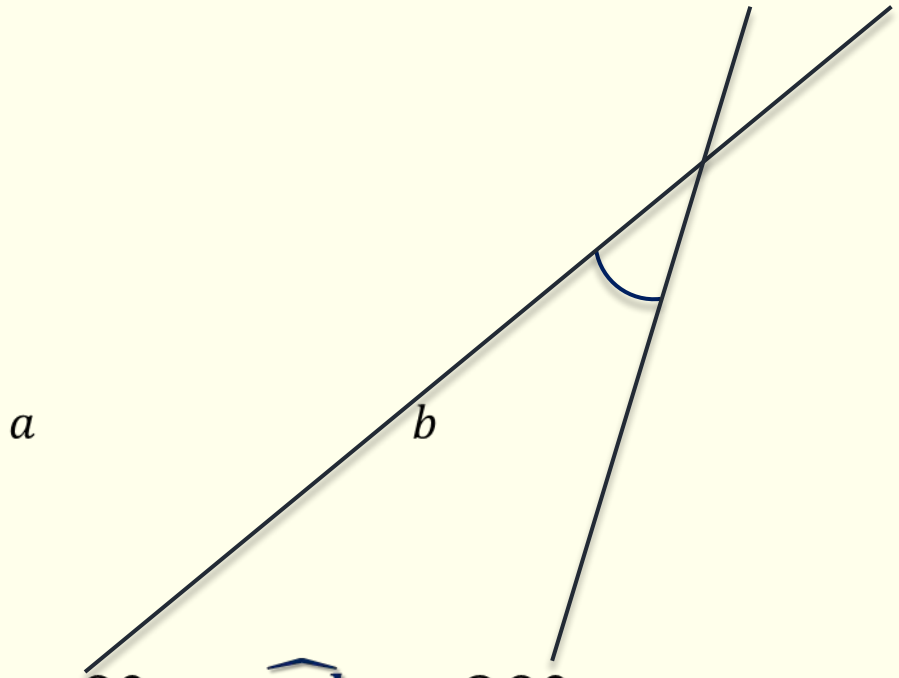
$\widehat{\vec{e}\ \vec{f}} = 110°$



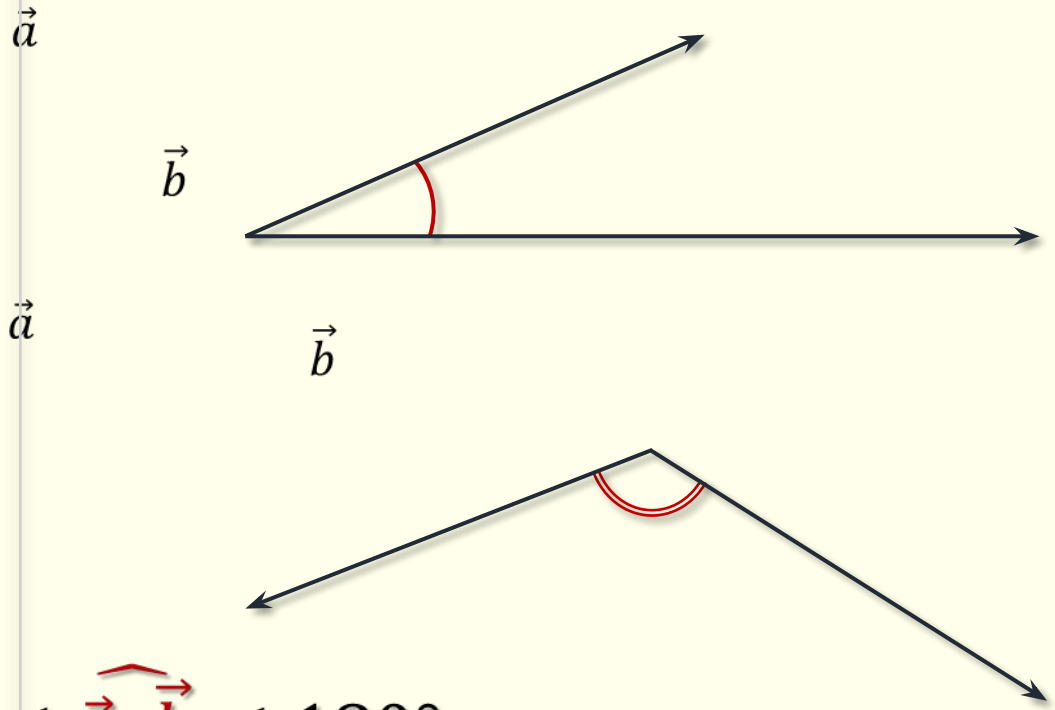






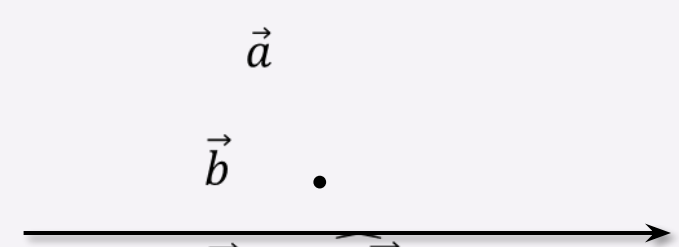


$0° \leq \widehat{a\ b} \leq 90°$

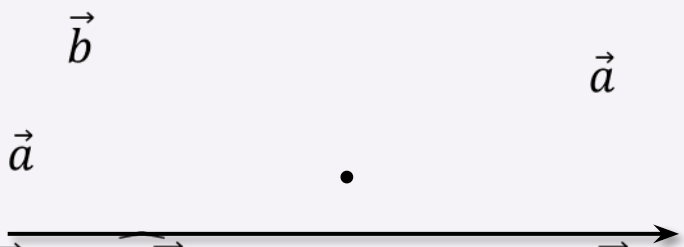


$0° \leq \widehat{\vec{a}\ \vec{b}} \leq 180°$

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



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

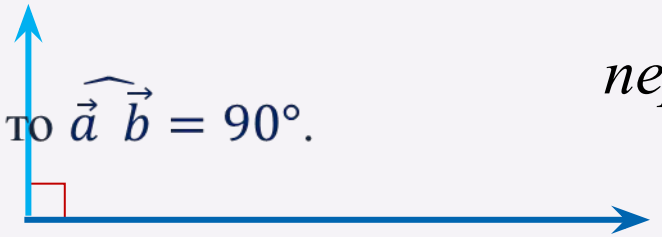


Если $\vec{b} = \vec{0}$, то $\widehat{\vec{a}\ \vec{b}} = 0°$.

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

а) $\widehat{\overrightarrow{B_1B}\ \overrightarrow{B_1C}} = 45$

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

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

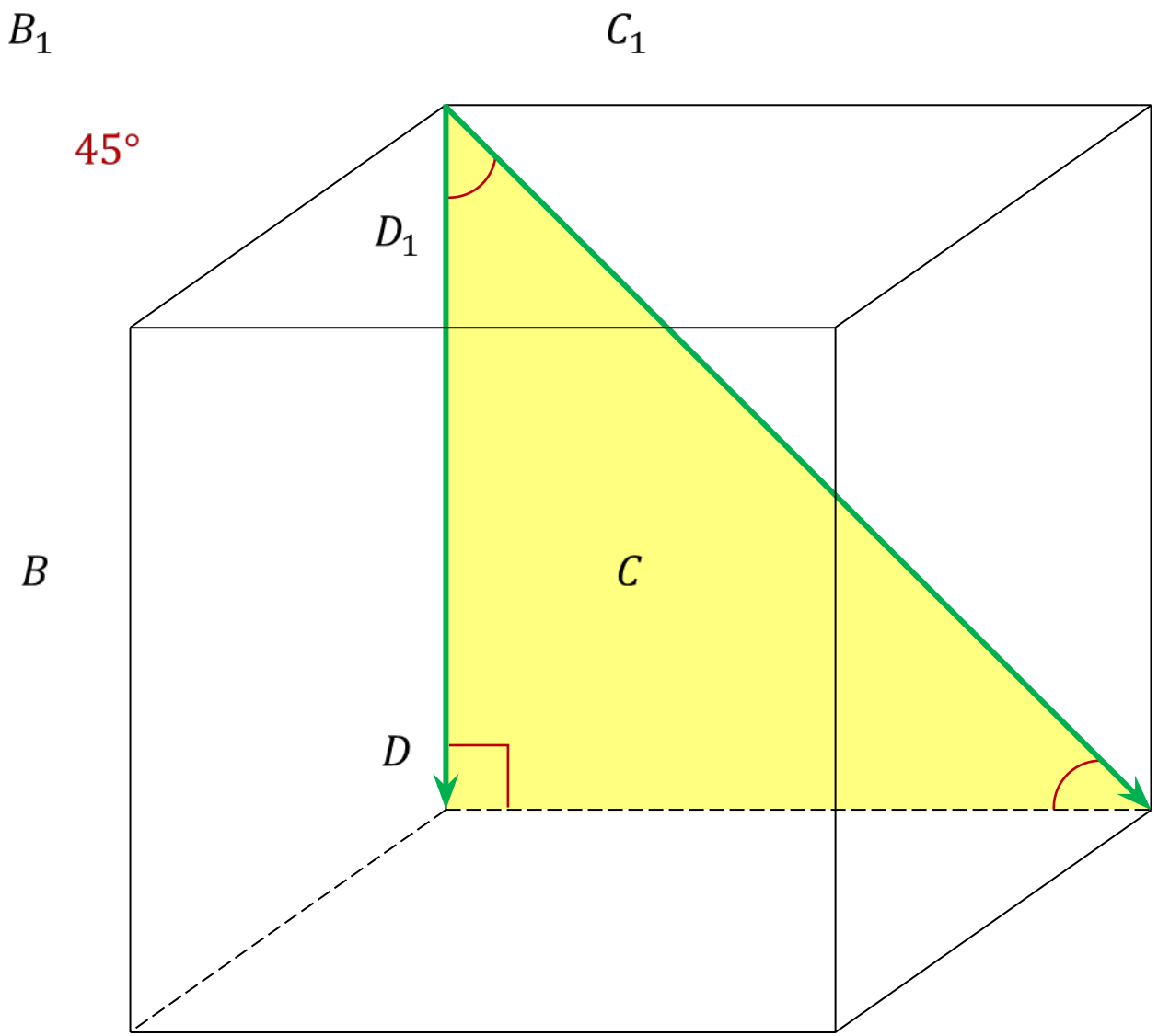
г) $\widehat{\overrightarrow{BC}\ \overrightarrow{AC}}$

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

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

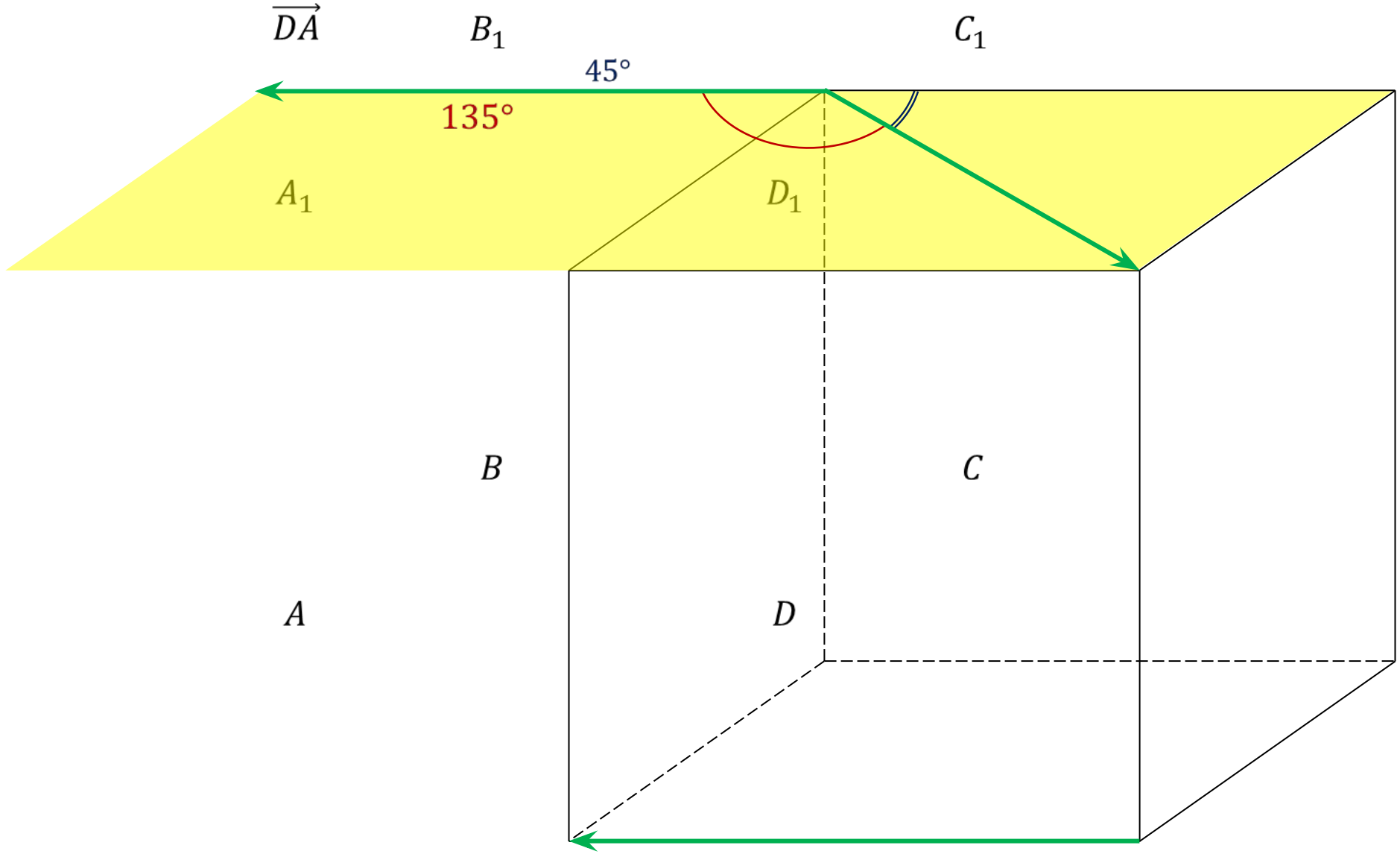
ж) $\widehat{\overrightarrow{A_1D_1}\ \overrightarrow{BC}}$

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



а) $\widehat{\overrightarrow{B_1B}\ \overrightarrow{B_1C}} = 45°$

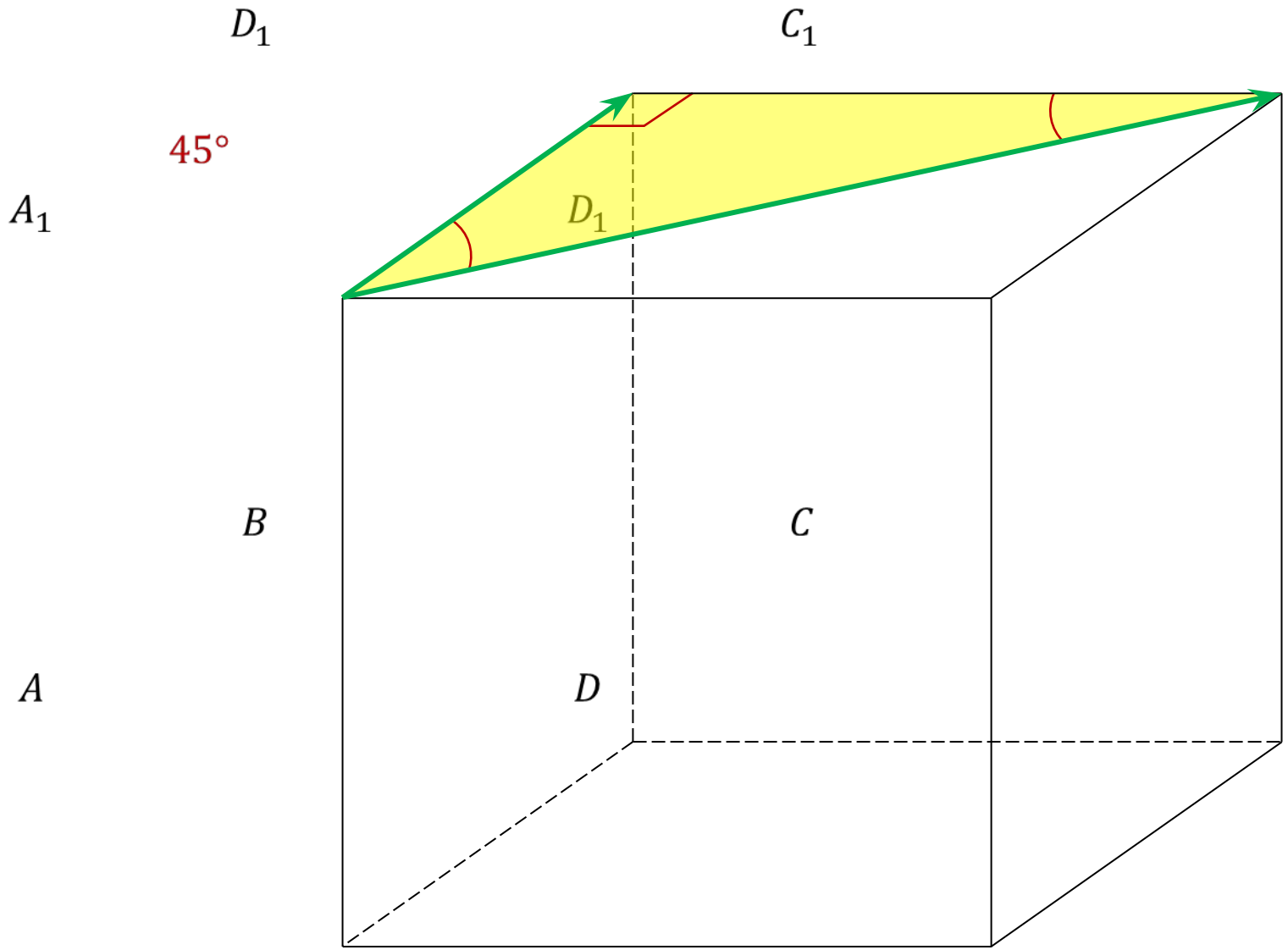
б) $\widehat{\overrightarrow{DA}\ \overrightarrow{B_1D_1}} = 135°$



а) $\widehat{\overrightarrow{B_1B}\ \overrightarrow{B_1C}} = 45°$

б) $\widehat{\overrightarrow{DA}\ \overrightarrow{B_1D_1}} = 135°$

в) $\widehat{\overrightarrow{A_1C_1}\ \overrightarrow{A_1B_1}} = 45°$

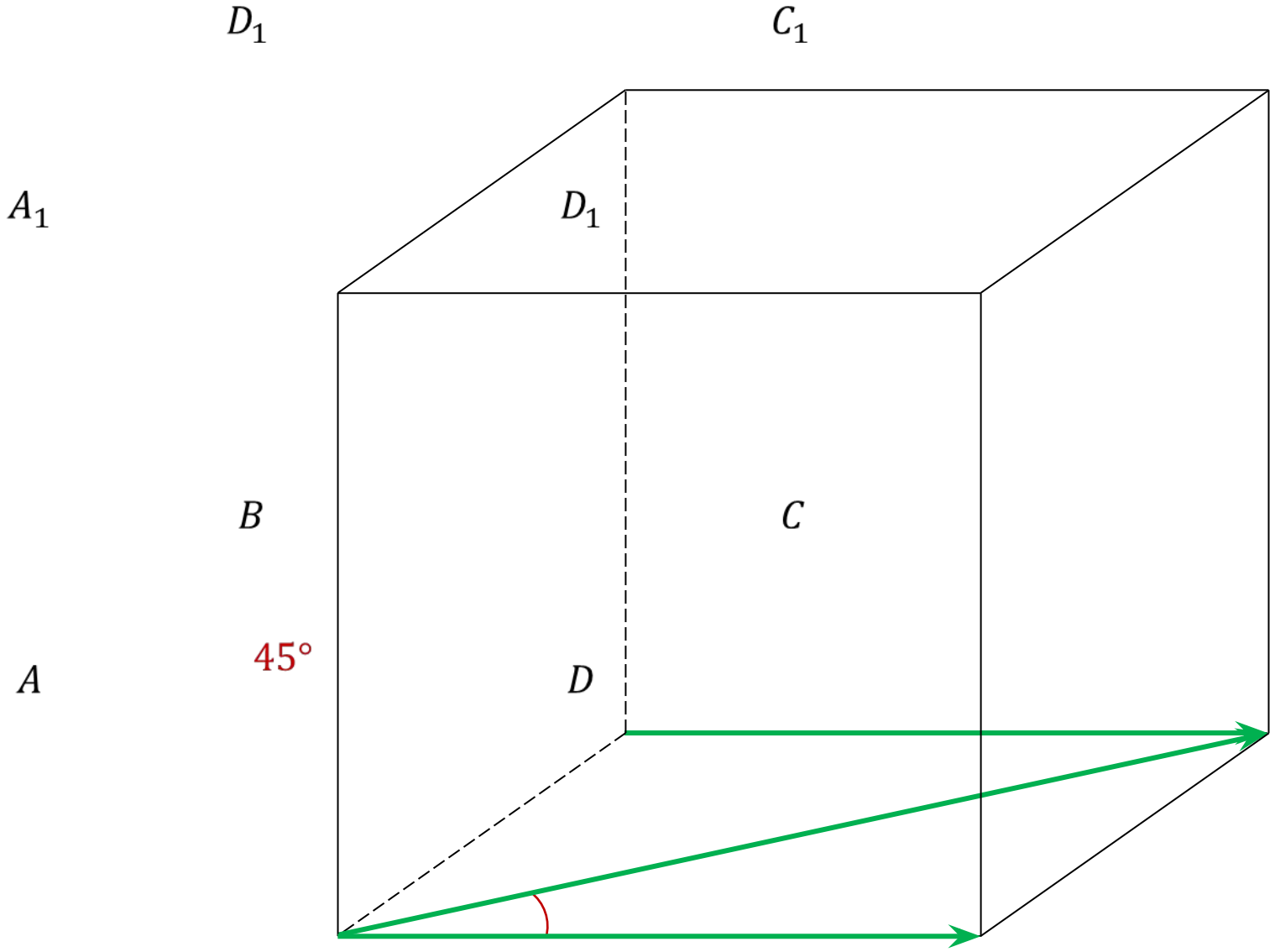


а) $\overrightarrow{B_1B}\ \overrightarrow{B_1C} = 45°$

б) $\overrightarrow{DA}\ \overrightarrow{B_1D_1} = 135°$

в) $\overrightarrow{A_1C_1}\ \overrightarrow{A_1B_1} = 45°$

г) $\overrightarrow{BC}\ \overrightarrow{AC} = 45°$



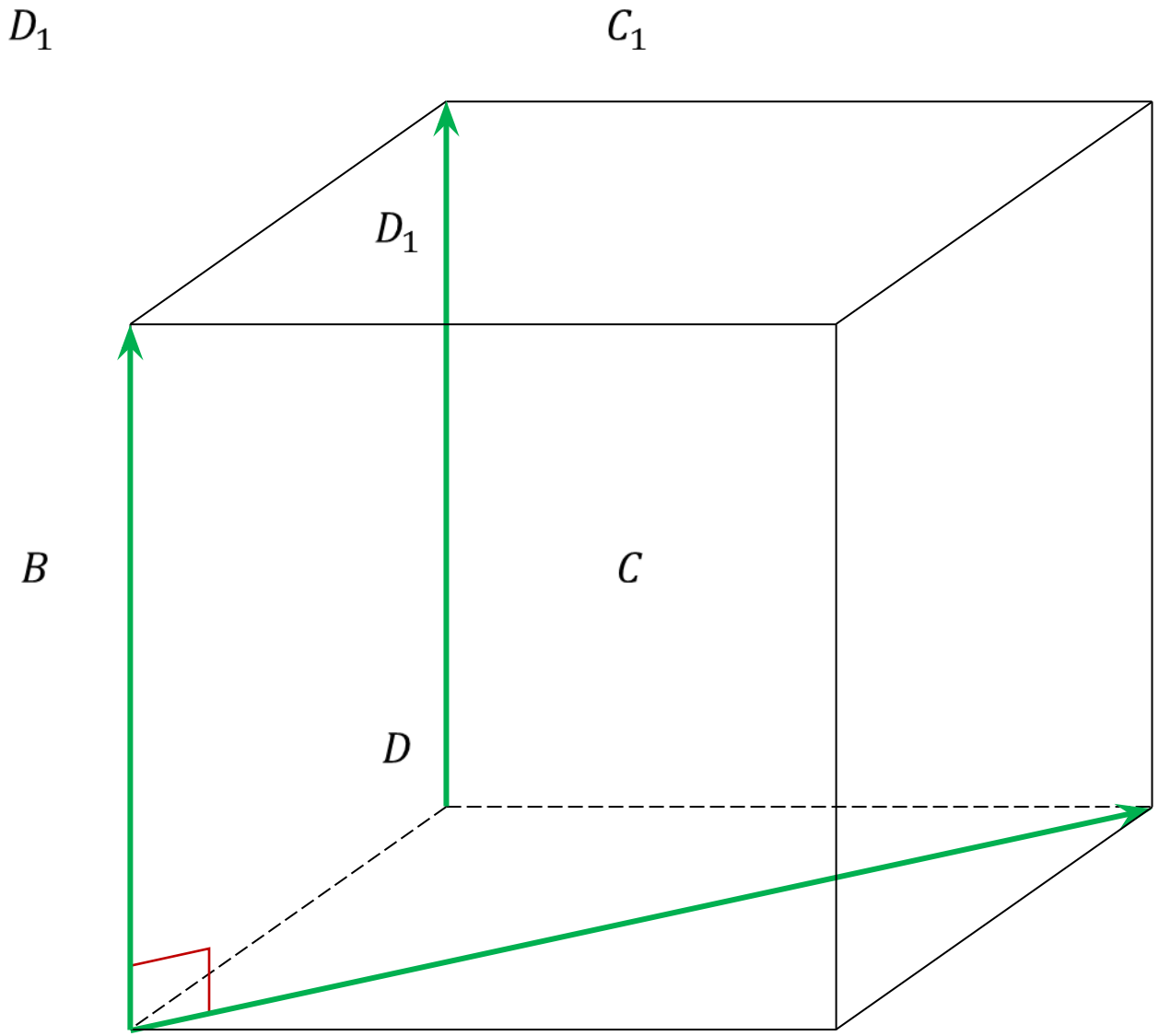
а) $\widehat{\overrightarrow{B_1B}\ \overrightarrow{B_1C}} = 45°$

б) $\widehat{\overrightarrow{DA}\ \overrightarrow{B_1D_1}} = 135°$

в) $\widehat{\overrightarrow{A_1C_1}\ \overrightarrow{A_1B_1}} = 45°$

г) $\widehat{\overrightarrow{BC}\ \overrightarrow{AC}} = 45°$

д) $\widehat{\overrightarrow{BB_1}\ \overrightarrow{AC}} = 90° \implies \overrightarrow{BB_1} \perp \overrightarrow{AC}$



а) $\widehat{\overrightarrow{B_1B}\ \overrightarrow{B_1C}} = 45°$

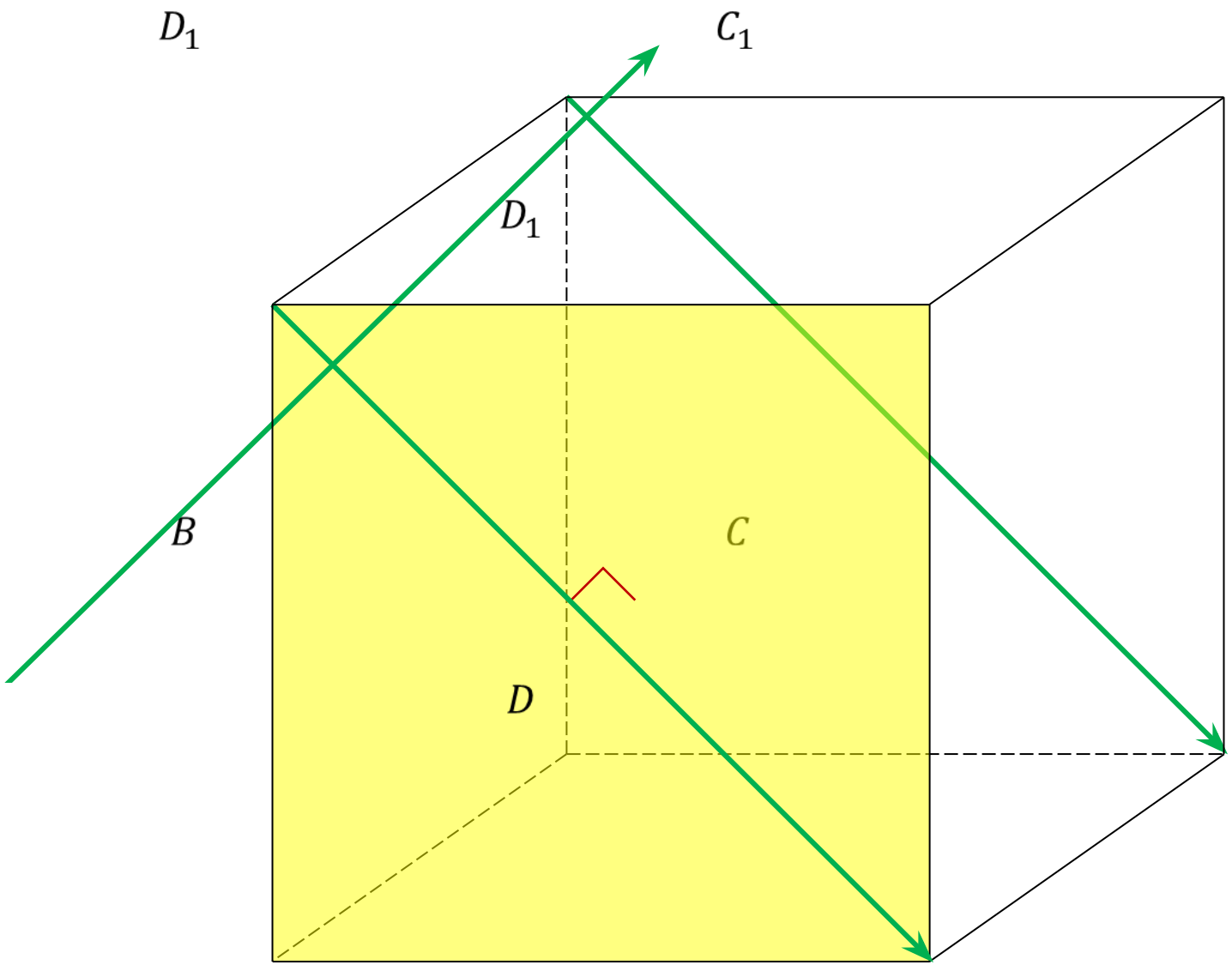
б) $\widehat{\overrightarrow{DA}\ \overrightarrow{B_1D_1}} = 135°$

в) $\widehat{\overrightarrow{A_1C_1}\ \overrightarrow{A_1B_1}} = 45°$

г) $\widehat{\overrightarrow{BC}\ \overrightarrow{AC}} = 45°$

д) $\widehat{\overrightarrow{BB_1}\ \overrightarrow{AC}} = 90° \implies \overrightarrow{BB_1} \perp \overrightarrow{AC}$

е) $\widehat{\overrightarrow{B_1C}\ \overrightarrow{AD_1}} = 90° \implies \overrightarrow{B_1C} \perp \overrightarrow{AD_1}$



а) $\widehat{\overrightarrow{B_1B}\ \overrightarrow{B_1C}} = 45°$

б) $\widehat{\overrightarrow{DA}\ \overrightarrow{B_1D_1}} = 135°$

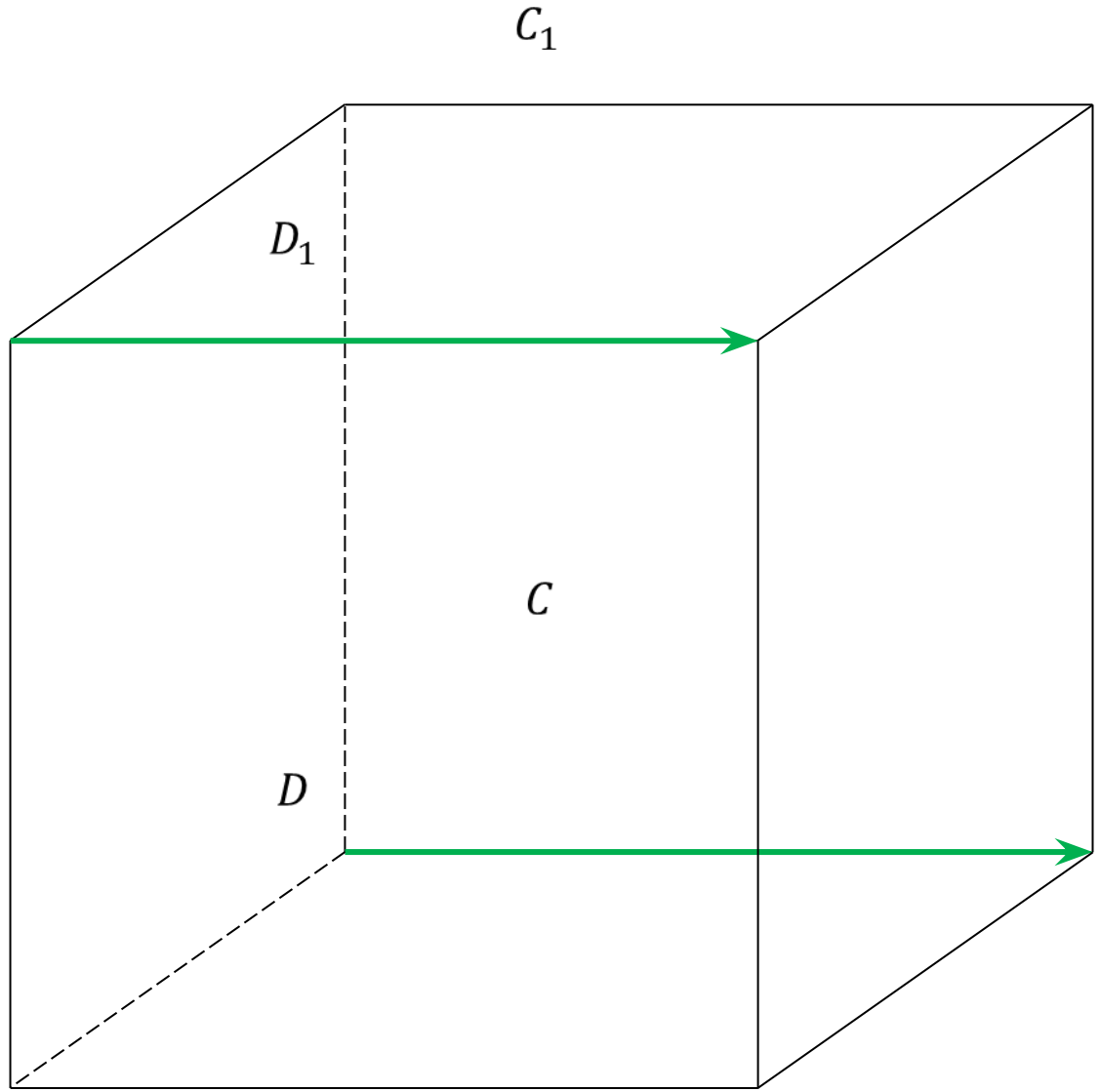
в) $\widehat{\overrightarrow{A_1C_1}\ \overrightarrow{A_1B_1}} = 45°$

г) $\widehat{\overrightarrow{BC}\ \overrightarrow{AC}} = 45°$

д) $\widehat{\overrightarrow{BB_1}\ \overrightarrow{AC}} = 90° \implies \overrightarrow{BB_1} \perp \overrightarrow{AC}$

е) $\widehat{\overrightarrow{B_1C}\ \overrightarrow{AD_1}} = 90° \implies \overrightarrow{B_1C} \perp \overrightarrow{AD_1}$

ж) $\widehat{\overrightarrow{A_1D_1}\ \overrightarrow{BC}} = 0°$, так как $\overrightarrow{A_1D_1} \uparrow\uparrow \overrightarrow{BC}$



а) $\widehat{\overrightarrow{B_1B}\ \overrightarrow{B_1C}} = 45°$

б) $\widehat{\overrightarrow{DA}\ \overrightarrow{B_1D_1}} = 135°$

в) $\widehat{\overrightarrow{A_1C_1}\ \overrightarrow{A_1B_1}} = 45°$

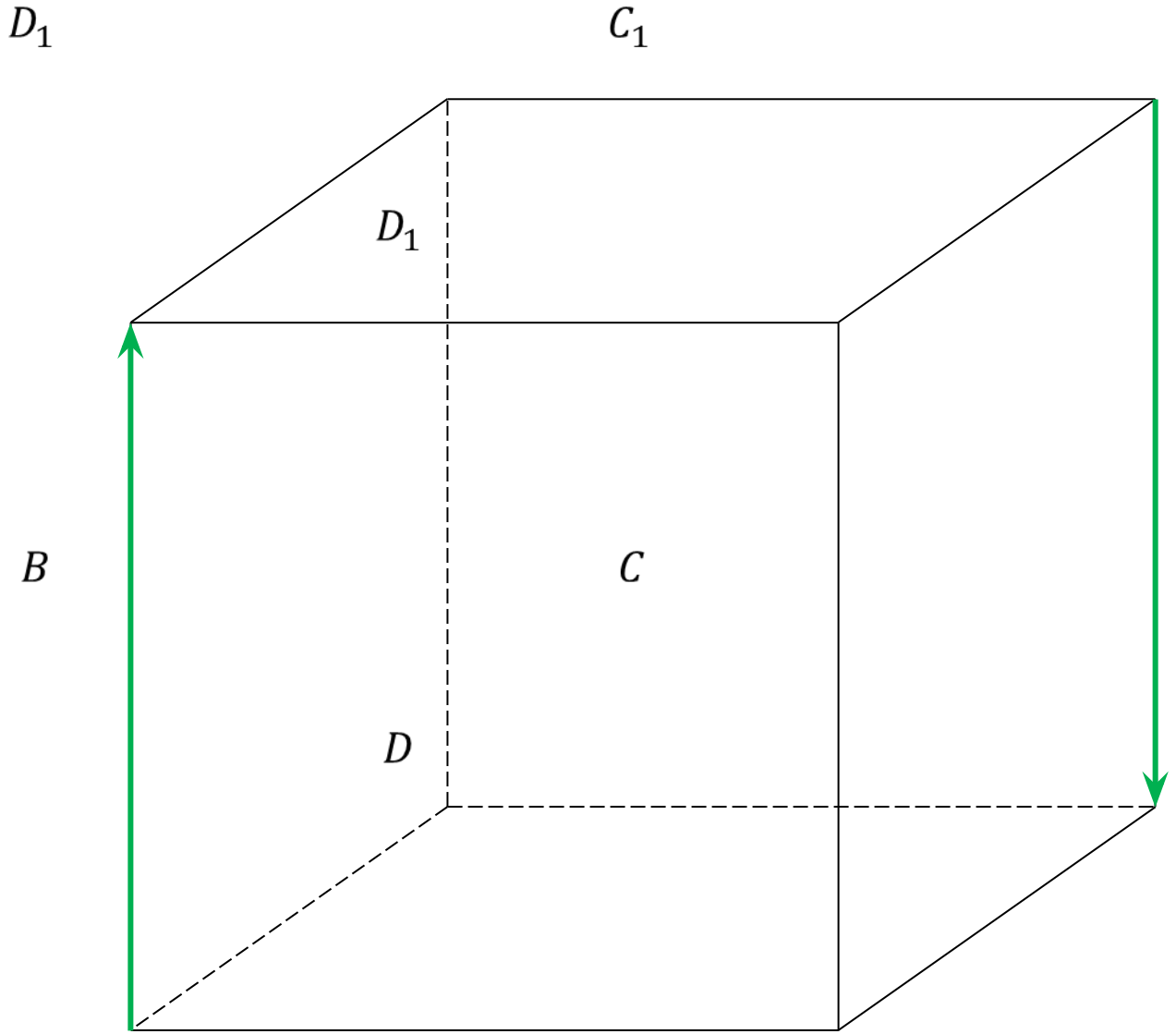
г) $\widehat{\overrightarrow{BC}\ \overrightarrow{AC}} = 45°$

д) $\widehat{\overrightarrow{BB_1}\ \overrightarrow{AC}} = 90° \implies \overrightarrow{BB_1} \perp \overrightarrow{AC}$

е) $\widehat{\overrightarrow{B_1C}\ \overrightarrow{AD_1}} = 90° \implies \overrightarrow{B_1C} \perp \overrightarrow{AD_1}$

ж) $\widehat{\overrightarrow{A_1D_1}\ \overrightarrow{BC}} = 0°$, так как $\overrightarrow{A_1D_1} \uparrow\uparrow \overrightarrow{BC}$

з) $\widehat{\overrightarrow{AA_1}\ \overrightarrow{C_1C}} = 180°$, так как $\overrightarrow{AA_1} \uparrow\downarrow \overrightarrow{C_1C}$

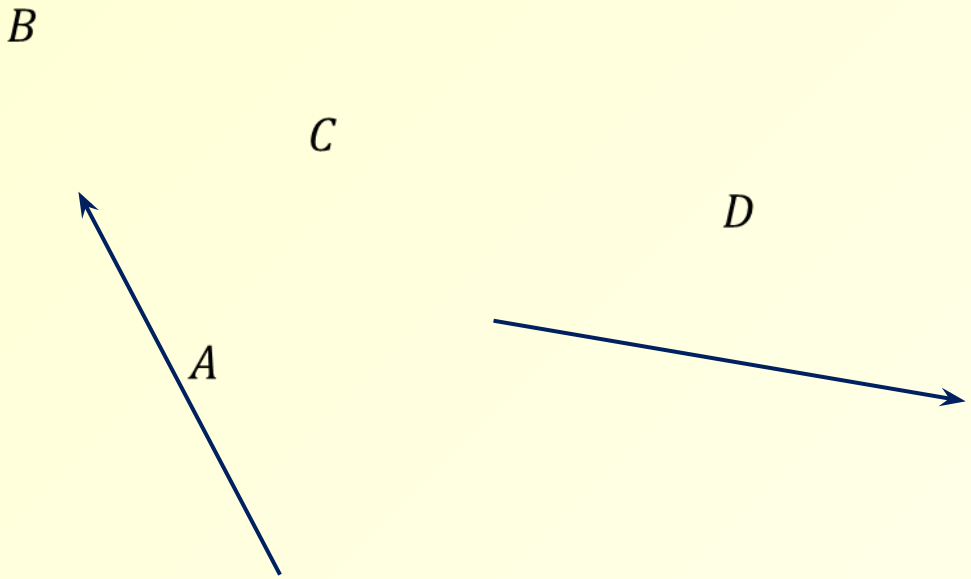


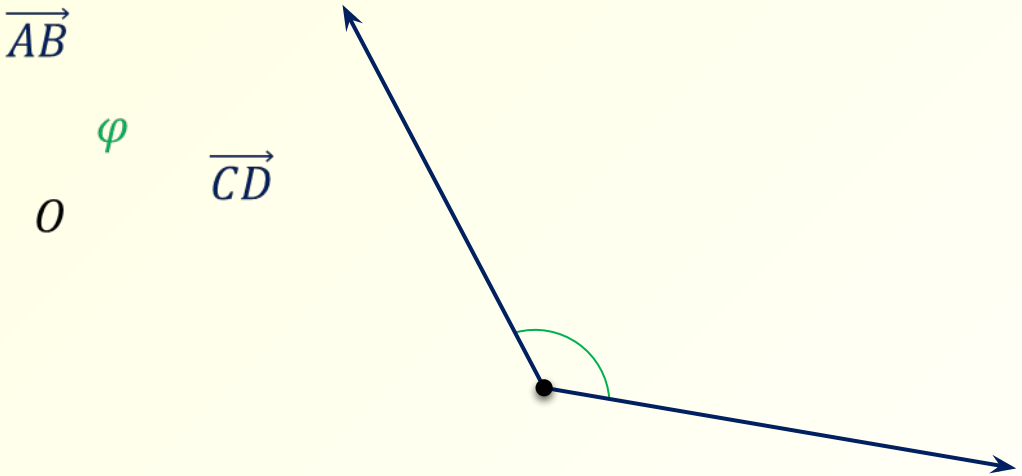
$\widehat{\overrightarrow{AB}\ \overrightarrow{CD}} = \varphi$

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

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

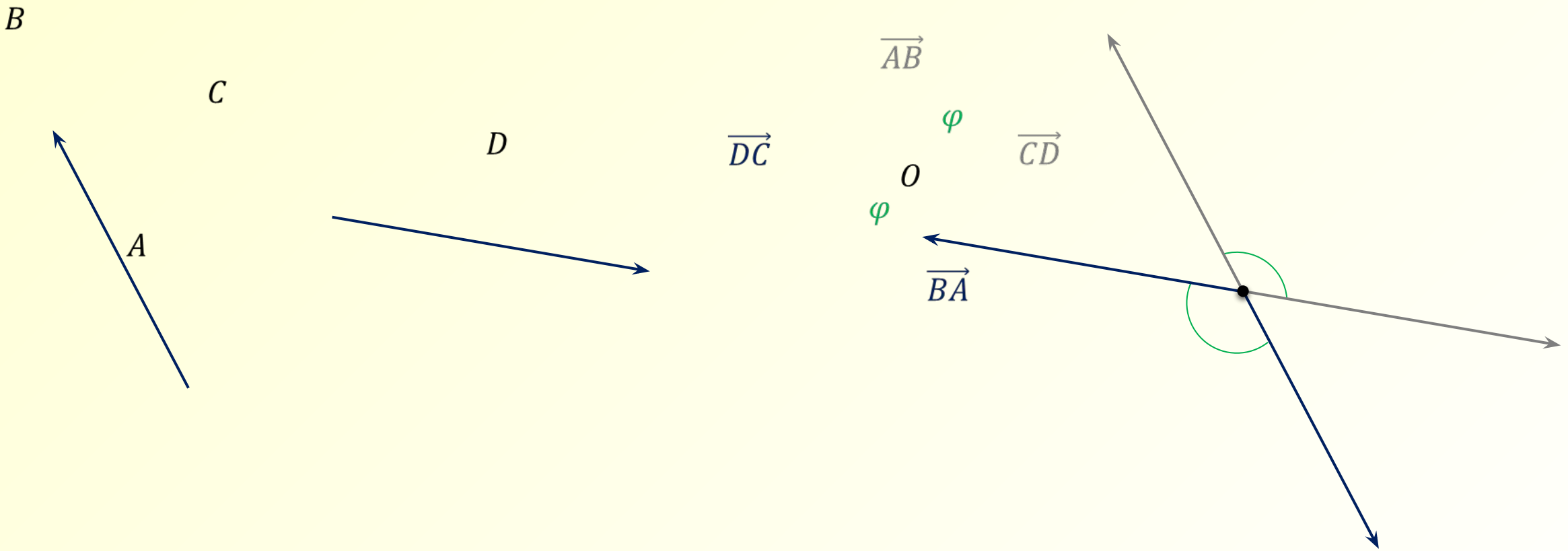
$\widehat{\overrightarrow{AB}\ \overrightarrow{DC}}$





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

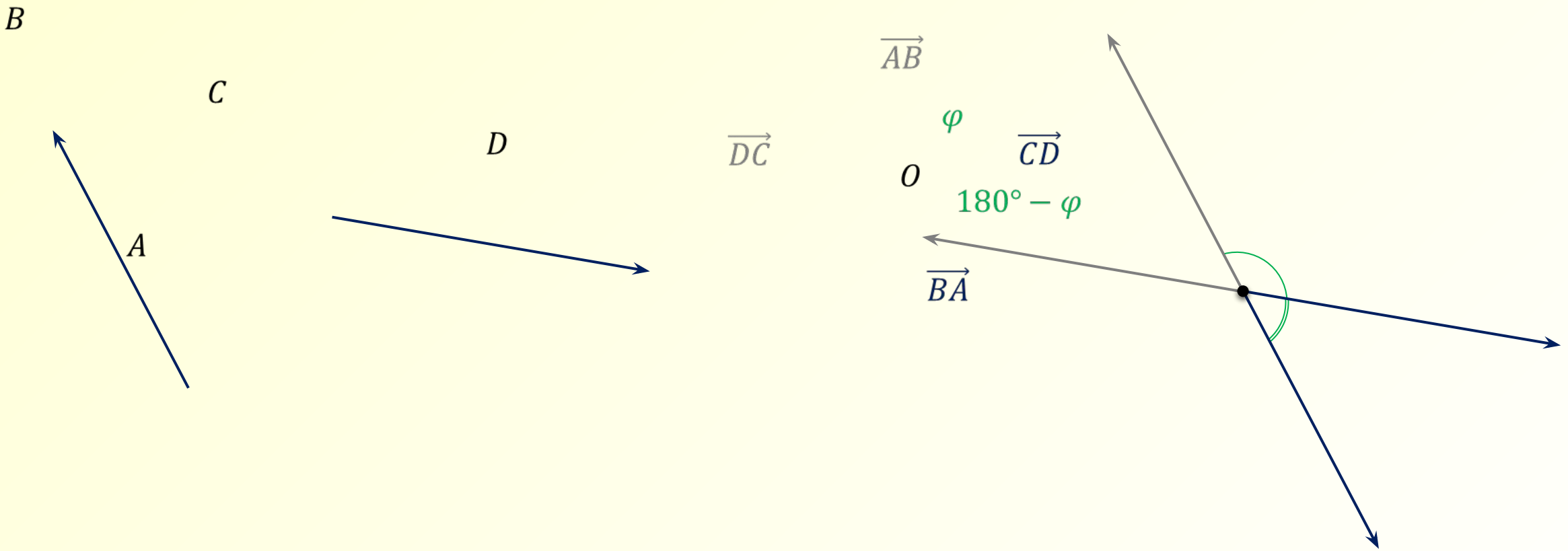
$\overrightarrow{BA}\ \overrightarrow{DC} = \varphi$



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

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

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

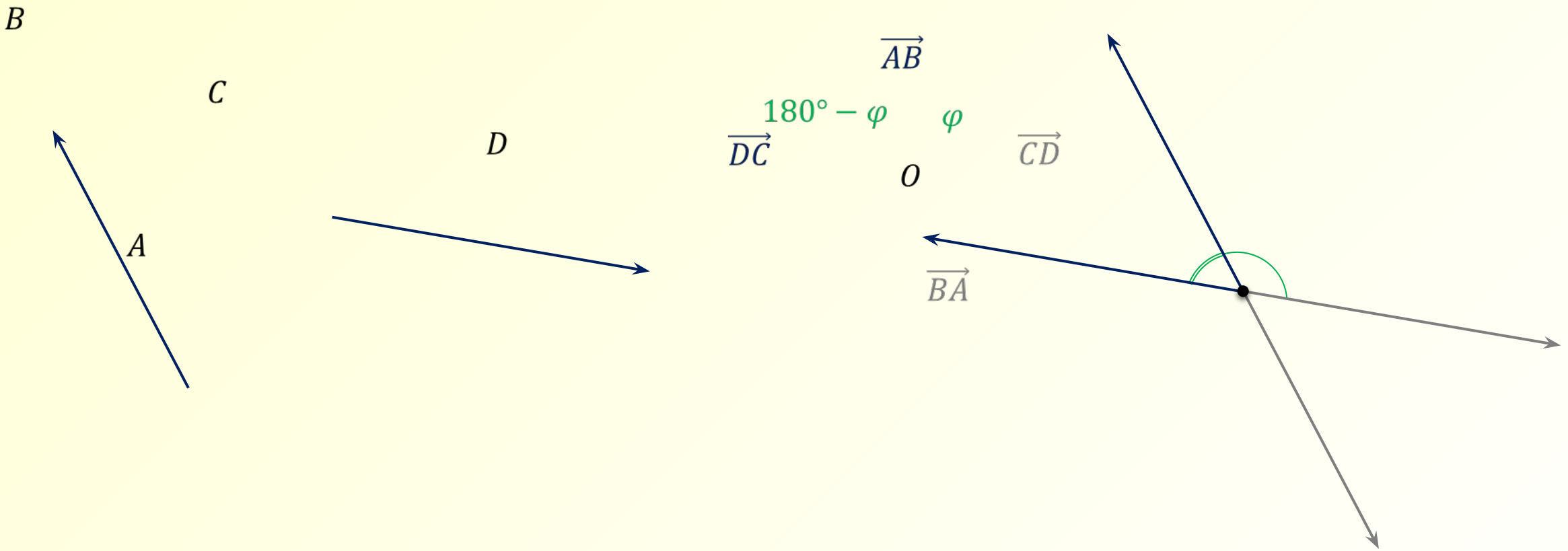


$\overrightarrow{AB}\ \overrightarrow{CD} = \varphi$

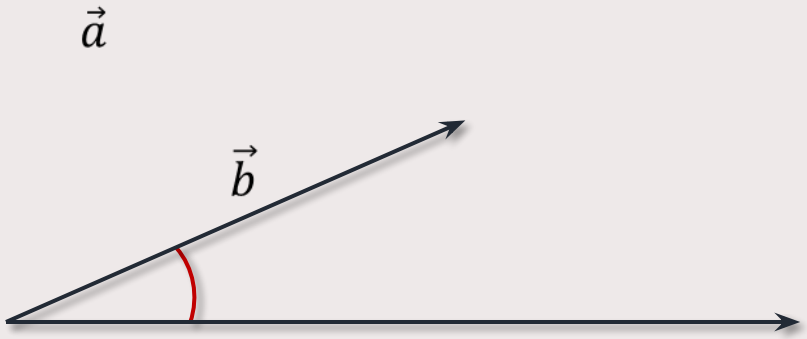
$\overrightarrow{BA}\ \overrightarrow{DC} = \varphi$

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

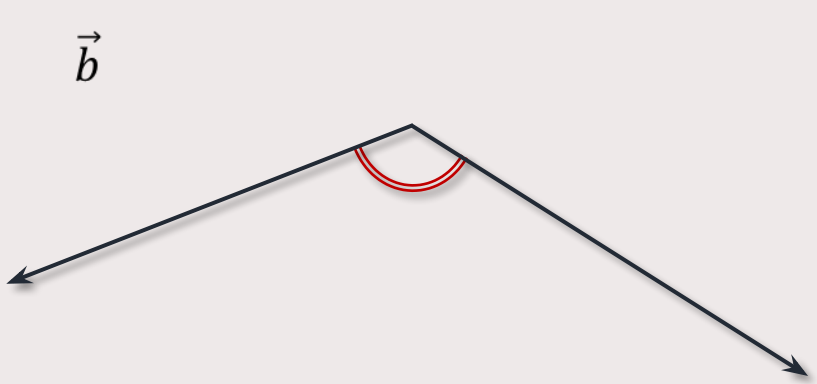
$\overrightarrow{AB}\ \overrightarrow{DC} = 180° - \varphi$



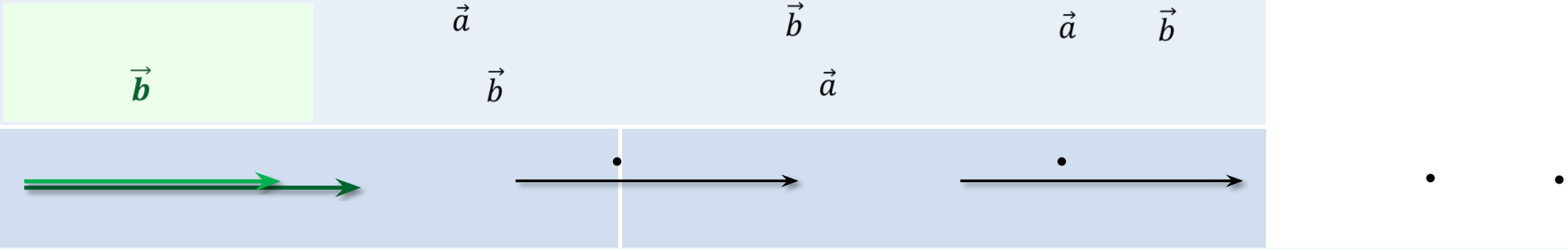
Угол между векторами

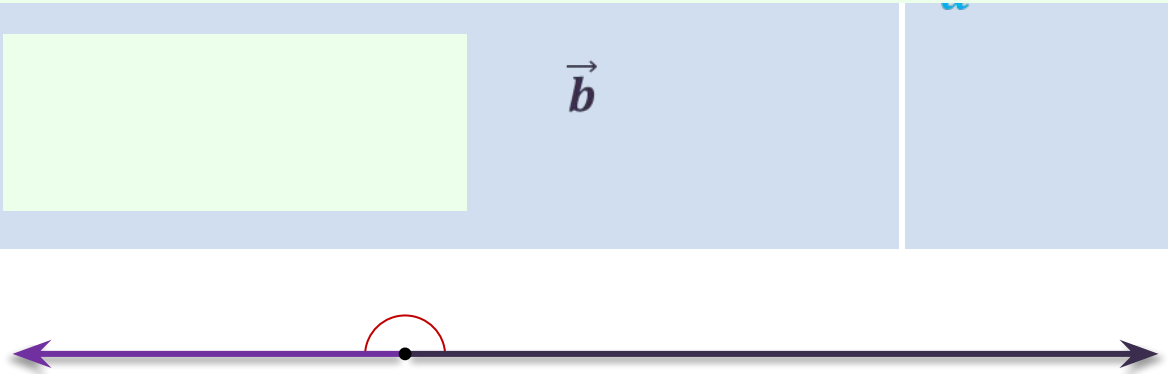


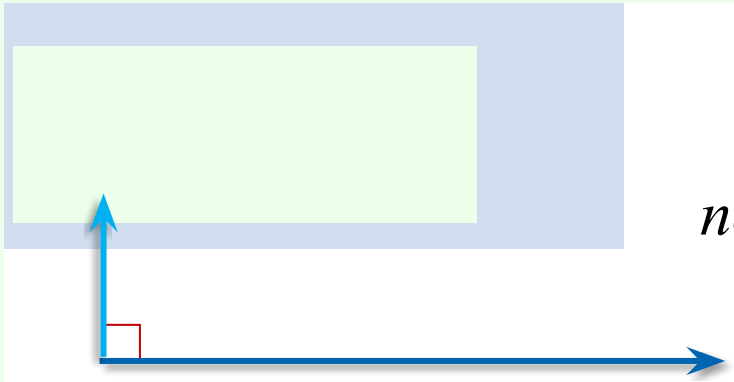
$$0° \le \widehat{\vec{a}\ \vec{b}} \le 180°$$



Угол между векторами







перпендикулярные векторы