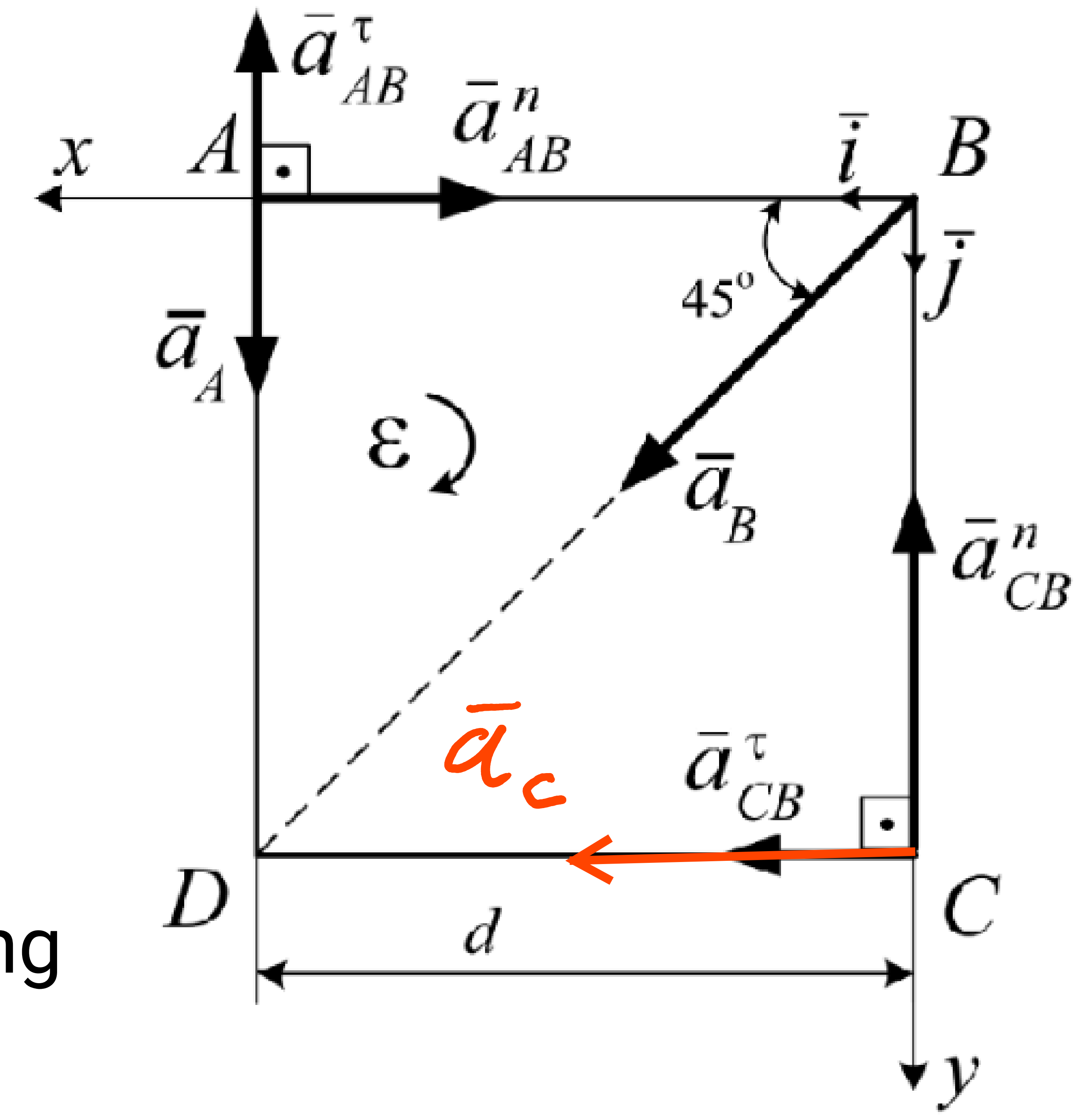
The square $ABCD$ ($d = 2$ — side length) performs a planar motion. $a_A = 2$, $a_B = 4\sqrt{2}$. The acceleration directions are also known.

It is needed to find $\vec{a}_C$.




Quiz 3

The main goal of this task to check your understanding how to switch from angular components to linear

1) We need to find $\omega$, $\varepsilon$ at the time. Because they are pseudovectors, we can put them in any point of the body and the result will be the same (not working with linear component!)

$$a^n_{AB} = \omega^2 AB$$

We know $\bar{a}_B$ and $\bar{a}_A$. Let's write an equation with them

$$\bar{a}_A = \bar{a}_B + \bar{a}^{\tau}_{AB} + \bar{a}^{n}_{AB}$$

$$\Downarrow$$

$$a^{\tau}_{AB} = \varepsilon AB$$

2) Let's make an assumption that the angular acceleration has clockwise direction. Then we can assume tangent acc. direction (if we receive negative value, swap the direction). Normal acceleration of AB always point to a pole.

3) Using projection on a basis, we are finding all components of acceleration AB

$$x: 0 = a_B \cos 45^\circ - a^n_{AB} \quad \Rightarrow \quad a^n_{AB} = 4$$

$$y: a_A = a_B \sin 45 - a^{\tau}_{AB} \quad \Rightarrow \quad a^{\tau}_{AB} = 4$$

$$\omega = \sqrt{\frac{a^n_{AB}}{AB}} = \sqrt{2}$$

$$\varepsilon = \frac{a^{\tau}_{AB}}{AB} = 1 > 0$$ We chose right direction

4) We know everything for finding the acceleration of point C. On guard!

$$\bar{a}_c = \bar{a}_B + \bar{a}^{n}_{CB} + a^{\tau}_{CB}$$ A pole might be different (for instance A point)

$$\bar{a}^n_{CB} = \omega^2 CB = 4; \quad \bar{a}^{\tau}_{CB} = \varepsilon CB = 2$$

$$\begin{cases} x: a_{Cx} = a_B c45 + a^{\tau}_{AB} = 6 \\ y: a_{Cy} = a_B s45 - a^n_{CB} = 0 \end{cases}$$

$$a_c = \sqrt{a^2_{cx} + a^2_{cy}} = 6$$