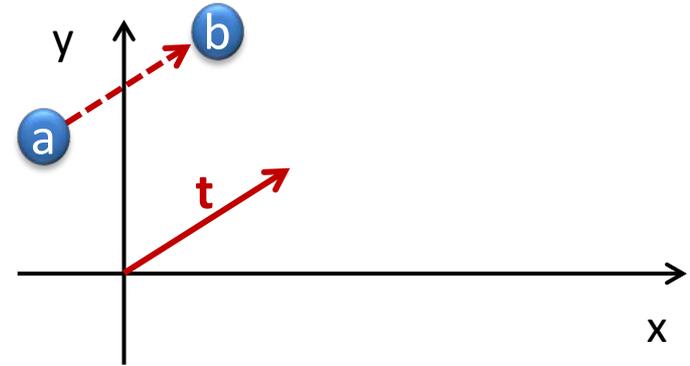


2D-Transformation von Punkten $a = \{a_x, a_y\}$

- **Translation** um $t = \{t_x, t_y\}$:

$$b = a + t$$

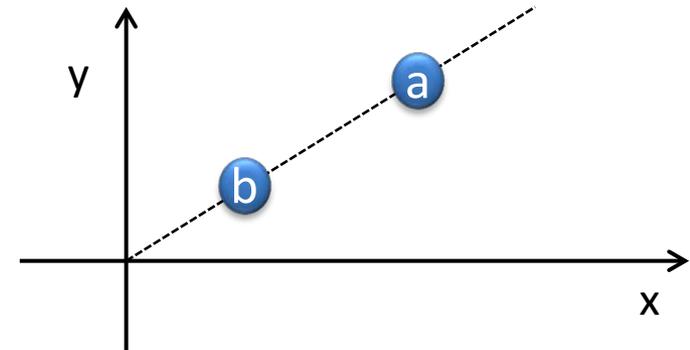
$$b = \{a_x + t_x, a_y + t_y\}$$



- **Skalierung** um s (Skalar)

$$b = s \cdot a$$

$$b = \{s a_x, s a_y\}$$



(Beispiel: $s=0.4$)

2D-Transformation von Punkten $a = \{a_x, a_y\}$

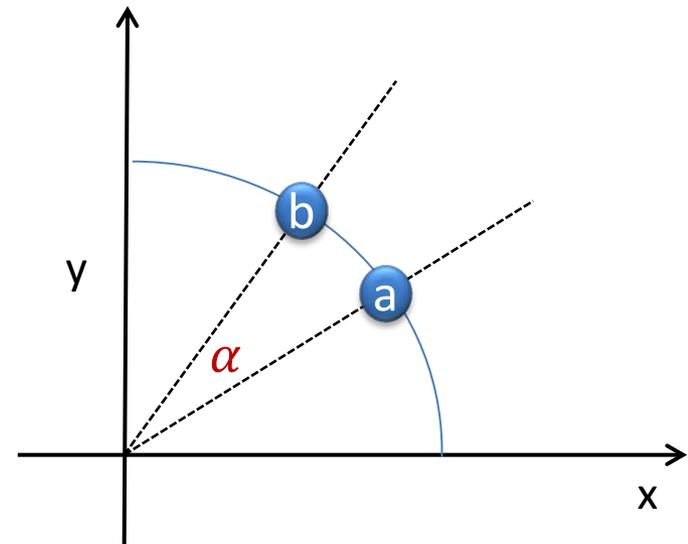
- **Rotation** (Drehung) um α (um den Nullpunkt $\{0,0\}$):

$$b = \underbrace{\begin{pmatrix} \cos \alpha & -\sin \alpha \\ \sin \alpha & \cos \alpha \end{pmatrix}}_{R_\alpha} a$$

R_α Drehmatrix

$$b_x = a_x \cos \alpha - a_y \sin \alpha$$

$$b_y = a_x \sin \alpha + a_y \cos \alpha$$



x

x