



World matrix = translation matrix * rotation matrix * scaling matrix

$$= \begin{bmatrix} 1 & 0 & 0 & t_x \\ 0 & 1 & 0 & t_y \\ 0 & 0 & 1 & t_z \\ 0 & 0 & 0 & 1 \end{bmatrix} * \begin{bmatrix} \cos\theta & -\sin\theta & 0 & 0 \\ \sin\theta & \cos\theta & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} * \begin{bmatrix} a & 0 & 0 & 0 \\ 0 & a & 0 & 0 \\ 0 & 0 & a & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} a\cos\theta & -a\sin\theta & 0 & t_x \\ a\sin\theta & a\cos\theta & 0 & t_y \\ 0 & 0 & a & t_z \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

now to show the order is important, if a different order is used:

World matrix = rotation * translation * scale

$$= \begin{bmatrix} -a\cos\theta & -a\cos\theta\sin\theta & a\sin\theta & tx\cos\theta - ty\sin\theta \\ a\sin\theta & a\cos\theta & 0 & tx\sin\theta + ty\cos\theta \\ 0 & a\sin\theta & a\cos\theta & tz \\ 0 & 0 & 0 & 1 \end{bmatrix}$$