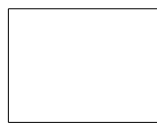


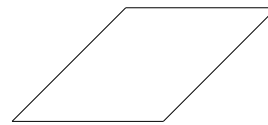
# Exercise Computer graphics – (till May 19, 2009)

## Rotations

- Exercise 18: a) It is possible to decompose rotations into a number of shears. What is the least number of shears a rotation in 2D can be decomposed into? Explicitly state which shears you need.
- b) In which way does an image manipulation program benefit from the decomposition you suggested above?



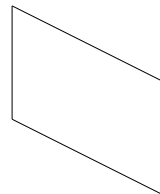
horizontal shear =>



$$\begin{pmatrix} 1 & s \\ 0 & 1 \end{pmatrix}$$



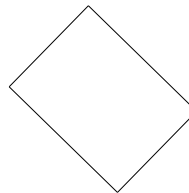
vertical shear =>



$$\begin{pmatrix} 1 & 0 \\ t & 1 \end{pmatrix}$$



rotation =>



$$\begin{pmatrix} \cos(\alpha) & -\sin(\alpha) \\ \sin(\alpha) & \cos(\alpha) \end{pmatrix}$$