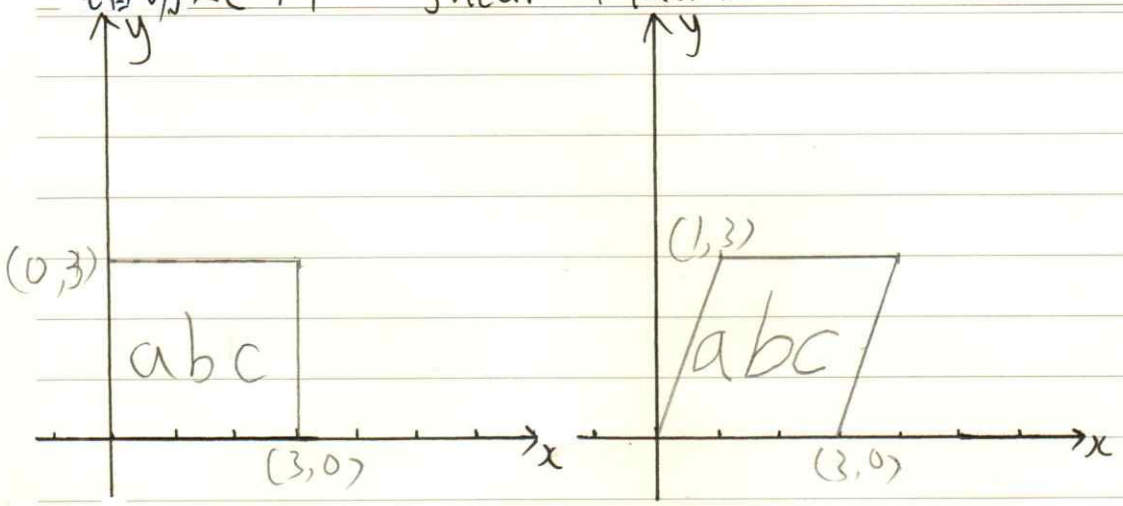
# 错切矩阵 Shear Matrix




$$\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} A & B \\ C & D \end{bmatrix} \times \begin{bmatrix} x \\ y \end{bmatrix}$$

e.g. $\begin{bmatrix} 1 \\ 3 \end{bmatrix} = \begin{bmatrix} A & B \\ C & D \end{bmatrix} \times \begin{bmatrix} 0 \\ 3 \end{bmatrix}$

$$\begin{bmatrix} 3 \\ 0 \end{bmatrix} = \begin{bmatrix} A & B \\ C & D \end{bmatrix} \begin{bmatrix} 3 \\ 0 \end{bmatrix}$$

$\therefore \begin{cases} 1 = A\times 0 + B\times 3 & ① \\ 3 = A\times 3 + B\times 0 & ② \end{cases}$

由①得：$1 = 3B$

$B = \frac{1}{3}$ ③

将③代入②，得：$3 = 3A$

$A = 1$

$\therefore \begin{cases} A = 1 \\ B = \frac{1}{3} \end{cases}$

$\therefore \begin{cases} 3 = C\times 0 + D\times 3 & ④ \\ 0 = C\times 3 + D\times 0 & ⑤ \end{cases}$

由④得：$3 = 3D$

$D = 1$ ⑥

将⑥代入⑤，得：$0 = C\times 3$

$C = 0$

$\therefore \begin{cases} C = 0 \\ D = 1 \end{cases}$

∴ 该矩阵为 $\begin{bmatrix} 1 & \frac{1}{3} \\ 0 & 1 \end{bmatrix}$，推广到一般场景 $\begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix}$.