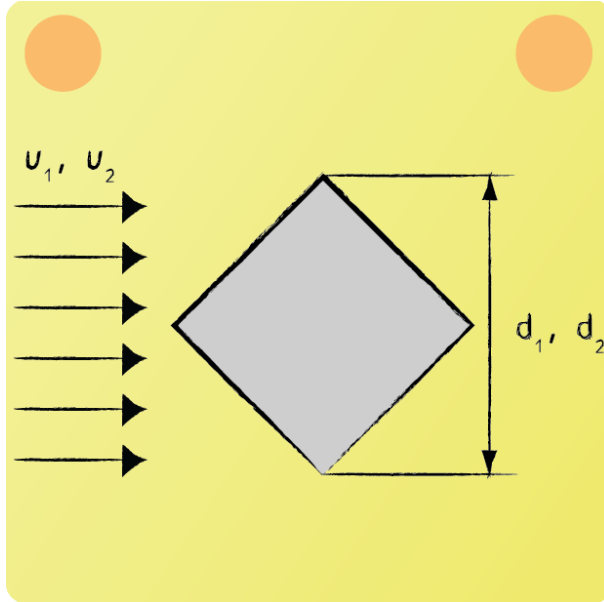


## Exam Preparation Convection 01



Air flows over a rectangular rod with a crosswise width  $d_1$ . A flow velocity of  $u_1$  results in an average heat transfer coefficient of  $\bar{\alpha}_1$ . Determine  $\bar{\alpha}_2$  for  $d_2$  and  $u_2$ .

Mean heat transfer for non circular cylinders and forced convection (HTC.9):

$$\overline{Nu_d} = C \cdot Re_d^m Pr^{0,4}$$

with

$$Re_d = \frac{u \cdot d}{\nu}$$

and

$$\overline{Nu_d} = \frac{\bar{\alpha} \cdot d}{\lambda}$$

using the given restriction for the Reynolds number:

$$5 \cdot 10^3 < Re_d < 10^5$$

with table 5.2 follows:

$$\frac{\bar{\alpha}_2 \cdot d_2}{\bar{\alpha}_1 \cdot d_1} = \left( \frac{u_2 \cdot d_2}{u_1 \cdot d_1} \right)^{0,588}$$

Thus  $\alpha_2$  can be determined:

$$\bar{\alpha}_2 = \bar{\alpha}_1 \cdot (2)^{0,588} \cdot \left( \frac{1}{4} \right)^{1-0,588} = 0,85 \cdot \bar{\alpha}_1$$