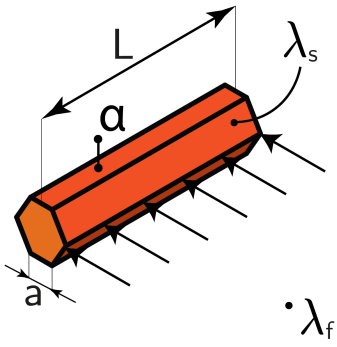
Nusselt Number 04

Give an expression for the Nusselt number in terms of given variables.

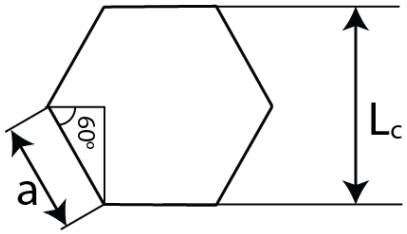


The standard expression for the Nusselt number is:

$$\mathrm{Nu} = \frac{\alpha L_c}{\lambda_{\mathrm{fluid}}}$$

The characteristic length has to be determined. For transverse flow along a cylinder, this is the height of the cylinder from top to bottom.

Which in the given situation can be determined by the use of trigonometry:



$$\sin(60^\circ) = \frac{0.5 L_c}{a}$$

$$L_c = 2a \sin(60^\circ) = a\sqrt{3}$$

And therefore the Nusselt number can be expressed as:

$$\mathrm{Nu} = \frac{\alpha a \sqrt{3}}{\lambda_f}$$