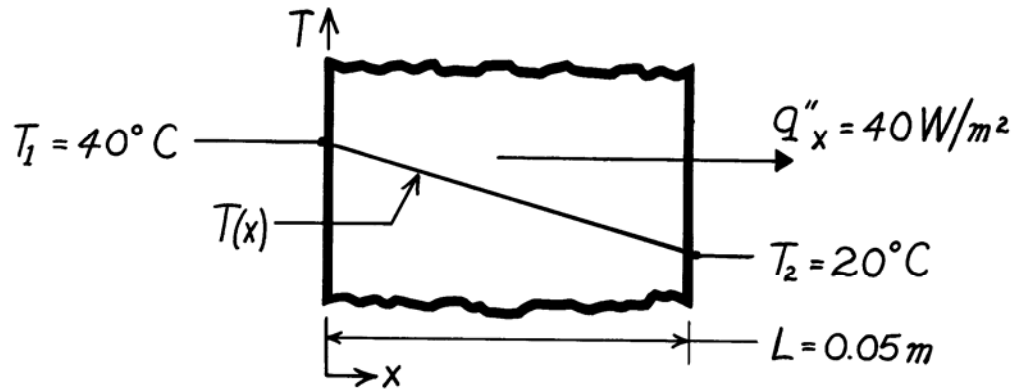


### PROBLEM 1.6

**KNOWN:** Heat flux and surface temperatures associated with a wood slab of prescribed thickness.

**FIND:** Thermal conductivity,  $k$ , of the wood.

**SCHEMATIC:**



**ASSUMPTIONS:** (1) One-dimensional conduction in the  $x$ -direction, (2) Steady-state conditions, (3) Constant properties.

**ANALYSIS:** Subject to the foregoing assumptions, the thermal conductivity may be determined from Fourier's law, Eq. 1.2. Rearranging,

$$k = q''_x \frac{L}{T_1 - T_2} = 40 \frac{\text{W}}{\text{m}^2} \frac{0.05 \text{ m}}{(40 - 20)^\circ \text{C}}$$

$$k = 0.10 \text{ W/m} \cdot \text{K}.$$

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**COMMENTS:** Note that the  $^\circ \text{C}$  or  $\text{K}$  temperature units may be used interchangeably when evaluating a temperature difference.