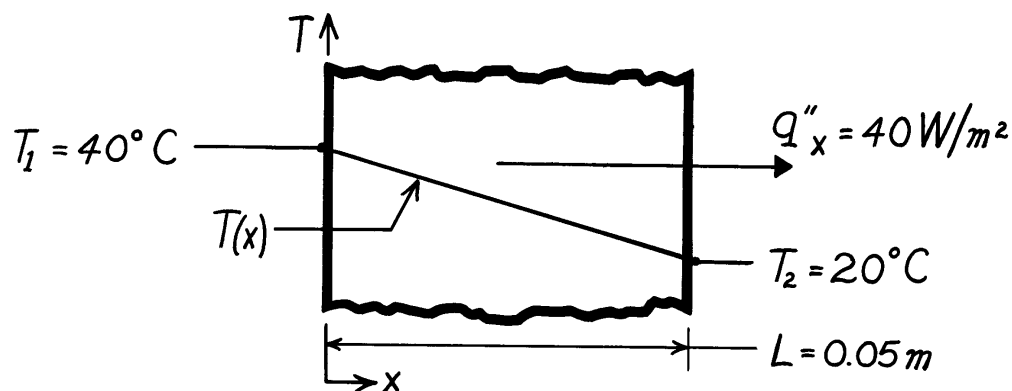


PROBLEM 1.6

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 K temperature units may be used interchangeably when evaluating a temperature difference.