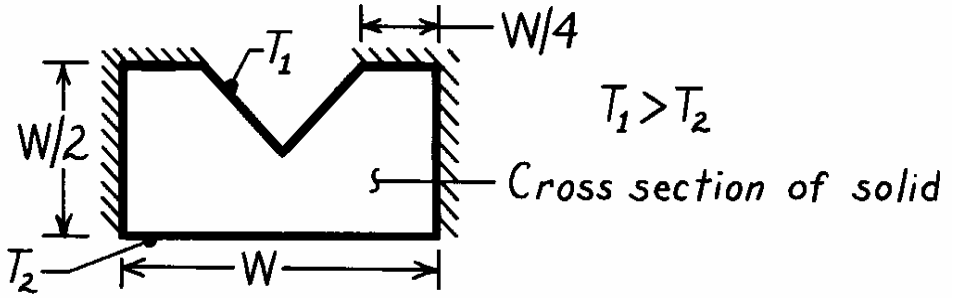
PROBLEM 4S.4

KNOWN: Relative dimensions and surface thermal conditions of a V-grooved channel.

FIND: Flux plot and shape factor.

SCHEMATIC:



ASSUMPTIONS: (1) Two-dimensional conduction, (2) Steady-state conditions, (3) Constant properties.

ANALYSIS: With symmetry about the midplane, only one-half of the object need be considered as shown below.

Choosing 6 temperature increments (N = 6), it follows from the plot that M ≈ 7. Hence from Equation 4S.7, the shape factor for the half section is

$$S = \frac{M}{N}\ell = \frac{7}{6}\ell = 1.17\ell.$$

For the complete system, the shape factor is then

$$S = 2.34\ell.$$ <