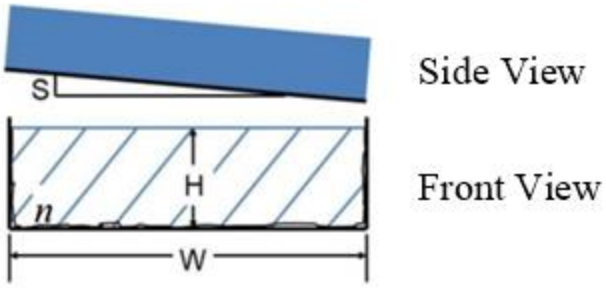
ME 2004: Manning's Equation

A common problem in fluid mechanics is determining the velocity of a water stream flowing down a rectangular channel of width W (m), height H (m), and roughness n (unitless). The channel is tilted at a slope of S (unitless).



Manning's Equation can be used to compute the water velocity V $\left(\frac{m}{s}\right)$:

$$V = \frac{\sqrt{S}}{n}\left(\frac{WH}{W+2H}\right)^{\frac{2}{3}}$$

You want to calculate the water velocity for various channel heights and slopes.

a) Create an `H` vector ranging from 0.1 m to 1 m in steps of 0.1 m. Also create a `S` vector ranging from 0.012 to 0.018 in steps of 0.003.
b) Write one expression to compute `V` for the various cases of `H` and `S`.
c) Plot `V` versus `H` for all cases of `S` (one curve for each `S`-value). In addition to the standard plot annotations (axis labels, etc.), add a legend. You might find the `num2str()` function handy.
d) Do your results make qualitative sense?