Given a liquid mixture of benzene and toluene to separate in a distillation column at 1.013 bar pressure. The feed of 100 kmol/h is a subcooled liquid ($q = 1.195$) containing 45 mol% benzene and enters at 327.6 K.

It is desired to obtain a distillate containing 95 mol% benzene and a bottoms product containing 90 mol% toluene. As a first guess, let's set the reflux ratio to 4. Below is a chart containing the equilibrium information at 1.013 bar pressure.

Determine the molar flowrates of the two product streams (distillate and bottoms) and the theoretical number of trays needed.