I will review recent advances in theoretical studies of the formation of the first stars. Results from state-of-the-art simulations are presented. The standard theory predicts that first cosmological objects are formed when the age of the universe is a few hundred million years. Recent theoretical works and numerical simulations consistently suggests that the first objects are very massive primordial stars. I introduce the key physics and explain why the first stars are likely very massive. A particular attention is paid to the possibility of gas cloud fragmentation. Feedback effects from the first stars are also summarized. There appear to be various paths to the formation of the so-called second generation stars. I introduce some of them in the context of early chemical evolution. I further discuss the relevance of dark matter physics to primordial star formation.