In this thesis, we are working with straight-line drawings of planar graphs with prescribed face areas. We employ a genetic algorithm to help with searching for graphs that likely cannot be drawn in a way that all their faces have equal areas. Then we pick one of these graphs and after solving a system of polynomial equations in several variables, we formally prove that the graph cannot be drawn in such a way. We continue by describing graphs that can be drawn with arbitrary prescribed face areas. We also try to verify a conjecture that all the planar triangulations with minimum degree greater than three cannot be drawn with arbitrary prescribed face areas. We investigate all such triangulations with ten vertices or less – we try to set areas of their faces at random and we verify that a drawing with such areas really exists. We disprove this conjecture at the end.