Time-optimal decompositions in SU(2) This work is motivated by applications to quantum mechanics and quantum computing. In quantum computing, an algorithm is an element of SU(N). An algorithm is realized using quantum controls, which are elements of some fixed 1-parametric subgroups. It is well-known that given a set of generators of the Lie algebra su(N), the corresponding 1-parametric subgroups generate the group SU(N). It is natural to ask how to find decompositions with the given set of generators that minimize the total time. We solve this problem for SU(2). The answer turns out to be non-trivial even in this simplest case.