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Konrad J Swanepoel* (konrad.swanepoel@gmail.com), Faculty of Mathematics, Chemnitz University of Technology, 09107 Chemnitz, Germany. *Outer linear measure of connected sets via Steiner trees.*

We give a definition of the length of a connected set in a metric space in terms of Steiner trees on its finite subsets. We show that this length coincides with the outer linear measure of Carathéodory (also known as 1-dimensional Hausdorff measure) restricted to connected sets. This approach yields simple proofs of theorems of Gołab, Bógnar and Fremlin, and answers an old question of Menger on the definition of arc length. The proofs employ, apart from a modicum of graph theory, only elementary properties of connectedness, and no measure theory apart from the definition of outer linear measure. (Received July 28, 2008)