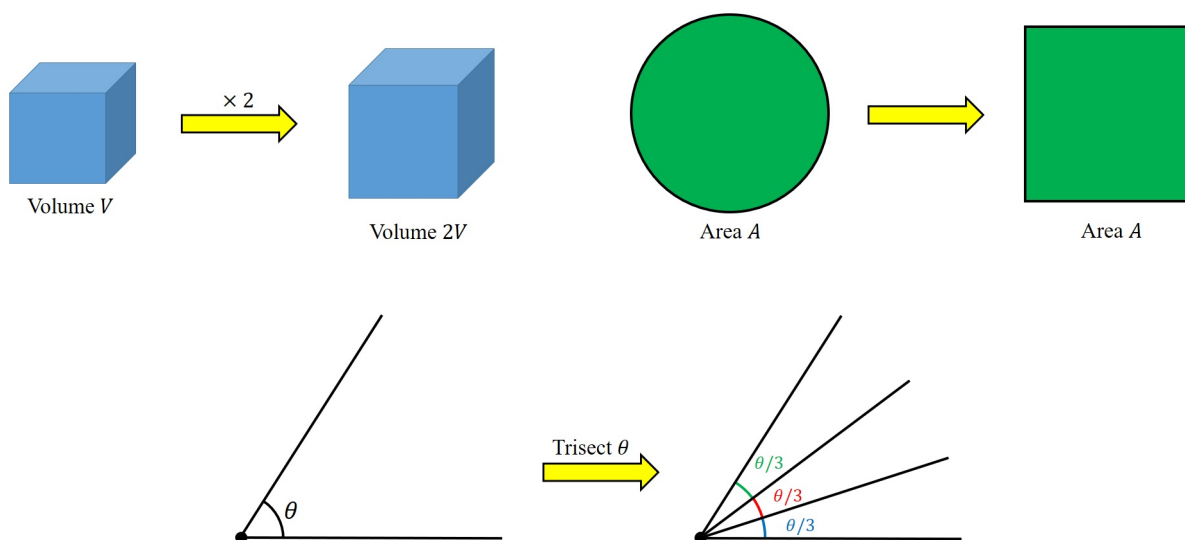


4.3. The Three Famous Problems

Note. In this section we state the three compass and straight edge constructions that remained unsolved for two millenia. No (correct) solutions to any of the three were ever found. The reason for this would become apparent in the 1800s with the development of field theory and *proofs* that the constructions could not be performed.

Note. The three famous problems are (as Eves states them on pages 109 and 110):

1. *The Duplication of the Cube*, or the problem of constructing the edge of a cube having twice the volume of a given cube.
2. *The Trisection of an Angle*, or the problem of dividing a given arbitrary angle into three equal parts.
3. *The Quadrature of the Circle*, or the problem of constructing a square having an area equal to that of a given circle.



Note. Eves states on page 110:

“The energetic search for solutions to these three problems profoundly influenced Greek geometry and led to many fruitful discoveries, such as that of the conic sections, many cubic and quartic curves, and several transcendental curves [emphasis added]. . . . The impossibility of the three constructions, under the self-imposed limitation that only the straightedge and compasses could be used, was not established until the nineteenth century, more that 2000 years after the problems were first conceived.”

Note. In [Section 4.4. The Euclidean Tools](#) we describe the precise meaning of “compass” and “straight edge” and consider some alternatives. We then explore the problems in the following three sections, [Section 4.5. Duplication of the Cube](#), [Section 4.6. Trisection of an Angle](#), and [Section 4.7. Quadrature of the Circle](#).

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