A geometrical formula for Right Triangles

Red thread for a research project

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Client: Government of Athens

Background

In order to fund several urban projects, the government of Athens needs new sources of income. Thus, it is planning to tax the goods sold on the markets. The amount of taxes should be proportional to the distance of the goods' origin.

Motivation

Sometimes these distances (e.g. Sparta-Athens) pass bodies of water and therefore can't be measured by pacing; these distances have to be estimated. The merchants refuse to pay taxes based on estimates as they fear manipulation.

Goal

For that reason, the result of this project should be a method of calculating distances that can't be measured directly.

Basics

The calculation method is based on known geometrical methods used by the Babylonians. They are based on the assumption that a third location can be found that is accessibly by land from both the starting city and the target city and forms a right triangle with them (e.g. Sparta-Athens-Stymfalia).

Own contribution

Based on this foundation, a mathematical formula is found that will calculate the unknown length of one side of a right triangle given the two other sides' known lengths.

Experiments

The correctness of the formula is tested by using it on cities that form a right triangle, where all three distances can be measured by pacing. The measured distances can be compared with the results of the calculation. Additionally, the data will be used to measure the result accuracy in relation to the divergence of the triangle from a true right angle.

Usefulness

By using the validated formula, the distance between cities can be computed accurately for the first time, and the taxation of goods on Athens markets can be achieved fairly and transparently. Furthermore, the formula has various other application areas, for example in architecture or measurement of agricultural land.