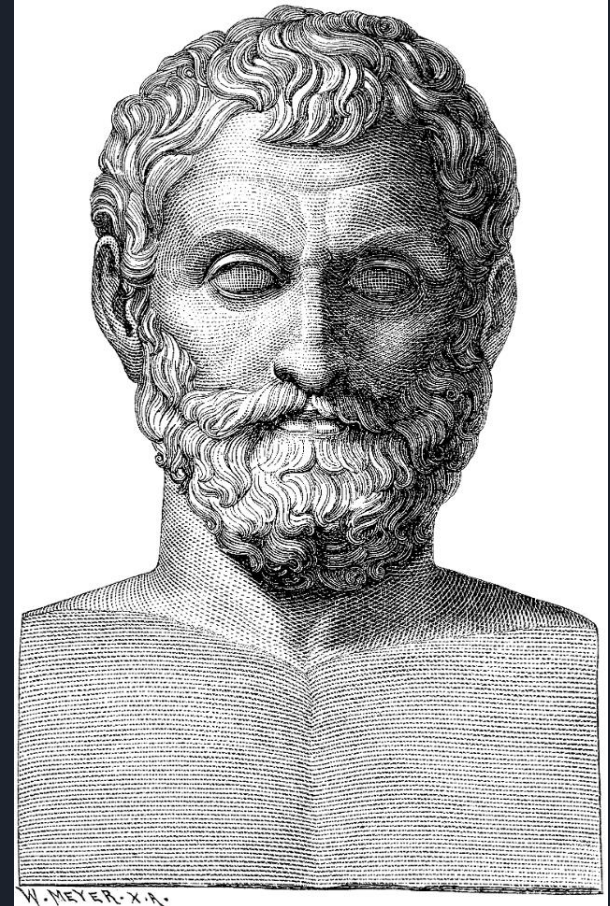


Practical usage of the Tales method

by Michał Gawda

Who was Tales

- Tales of Miletus, was a very important person in the intellectual landscape of ancient Greece
- He made notable contributions to philosophy, mathematics, and science
- One of his ideas is a method for estimating distances, colloquially known as "Tales Method" or "Tales Theorem"
- This approach, while lacking in detailed documentation, offers a glimpse into the nascent application of geometric principles in ancient scientific inquiry

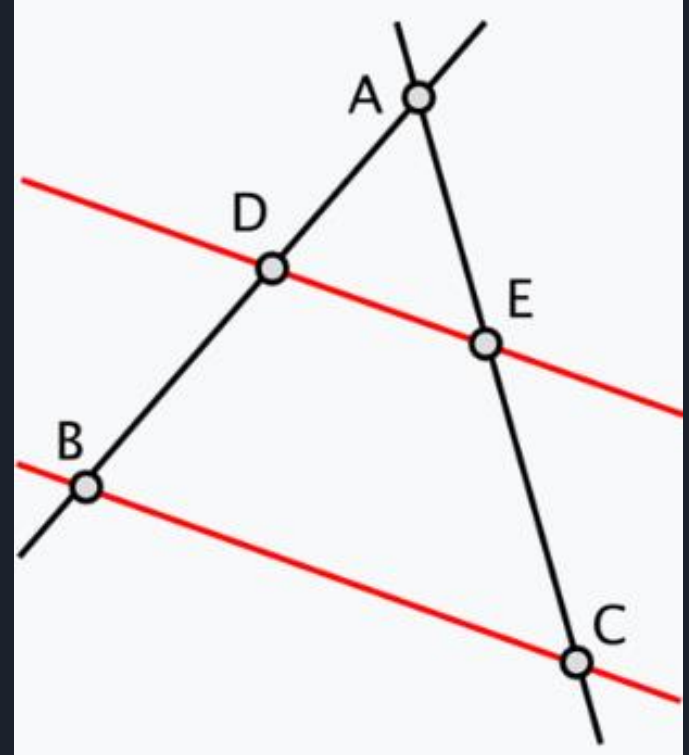


What is the Tales method?

“If the arms of an angle are cut by two parallel lines that do not pass through the vertex of the angle, then the corresponding segments defined by these lines on one arm of the angle are proportional to the corresponding sections defined by these lines on the other arm of the angle”

In my project I've used this proportion:

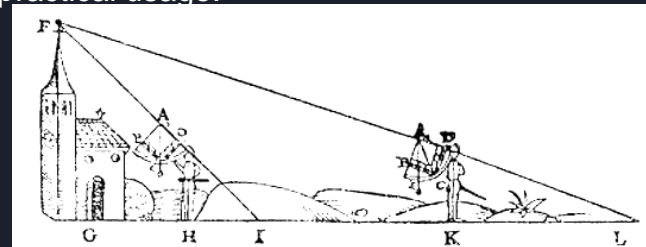
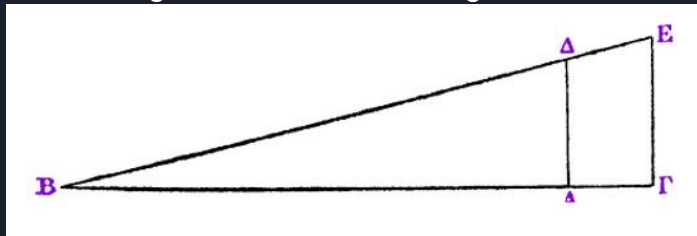
$$\frac{|AD|}{|DE|} = \frac{|AB|}{|BC|}$$



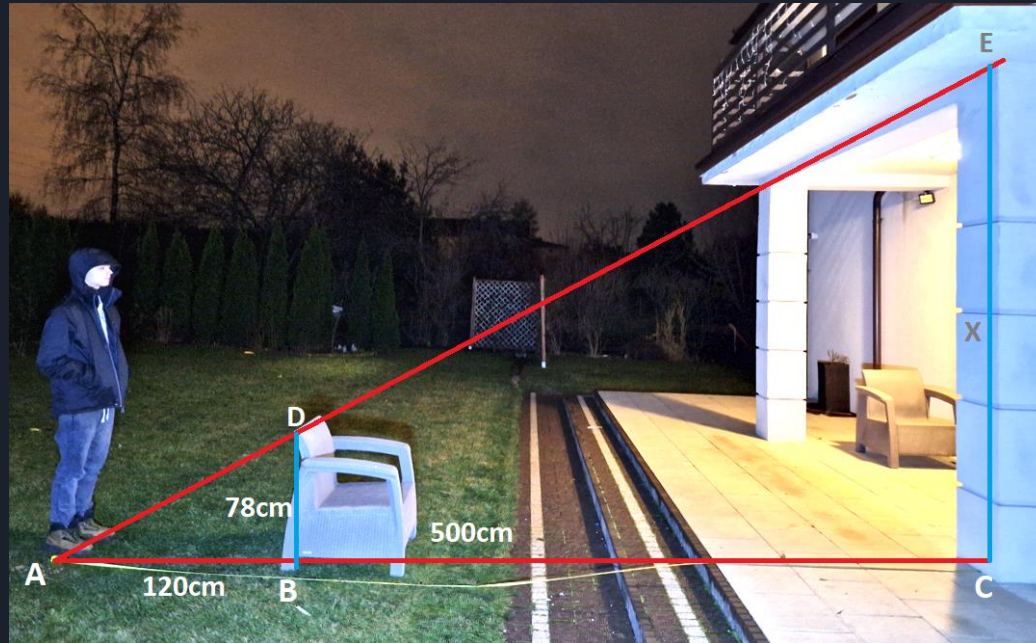
This method establishes a proportional equation:

$$\frac{\text{Distance to Object A}}{\text{Height of Object A}} = \frac{\text{Distance to Object B}}{\text{Height of Object B}}$$

- This mathematical relationship allows to calculate the unknown parameters like heights and distances
- Implementation of Tales' Method involves meticulous object selection, precise angle measurements, and the solution of the proportionality equation through trigonometric reasoning
- While Tales' Method may be considered rudimentary compared to contemporary measuring techniques, it exemplifies an early attempt to harness mathematical principles for practical problem solving
- The importance of understanding the relationships between angles and side lengths in triangles, a cornerstone of Tales approach, anticipates the later development of more sophisticated trigonometric methodologies in science and practical usage.



Measuring height of balcony using Tales method





Tools needed:

Measuring tape

Protractor or other angle-measuring tool (optional)

Any kind of noting device - phone, paper etc.

Procedure:

Selection of Objects:

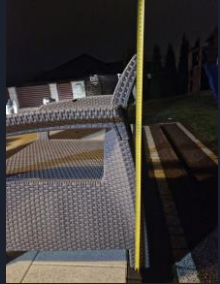
- Choose a vertical object as the chair with measurable height and other vertical structure, such as the balcony which you can't measure.

Positioning:

- Stand at a location where you have a clear line of sight to both the top and bottom of the chair and the balcony. Ensure that you are on ground level.

Measurement:

- Using the measuring tape, measure the height of the chair (BD), the distance from you to the chair (AB), and the distance from you to the bottom of the balcony. Record these measurements.



Identification of Similar Triangles:

- Consider the triangles formed by the observer's line of sight, the tops, and bottoms of the chair and the balcony. Recognize that the lines connecting the tops and bottoms of the structures are parallels.

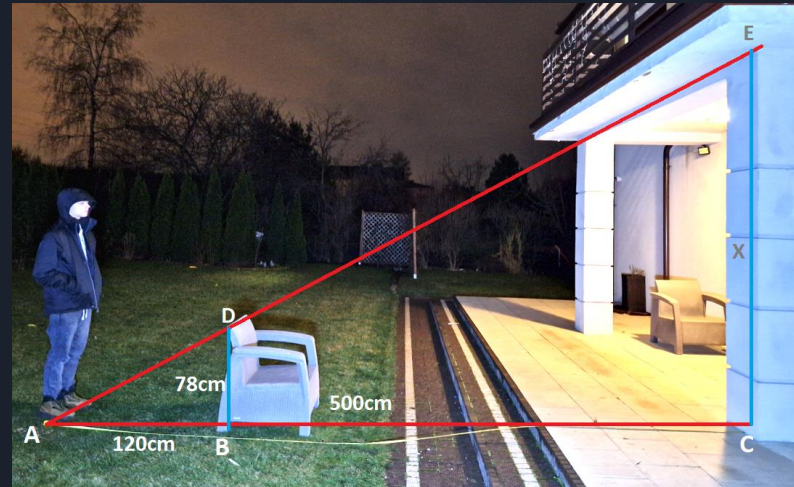
Set up the proportionality equation based on Tales' method:

$|BD|$ - Height of the chair - 78cm

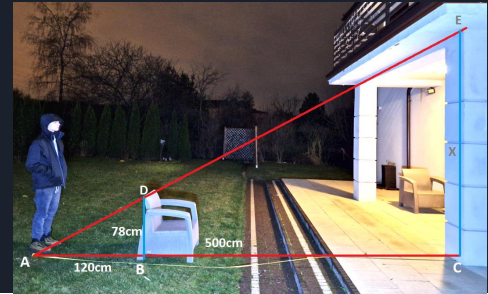
$|AB|$ - Distance to the chair - 120cm

$|AC|$ - Distance to the balcony - 5M = 500cm

$|CE|$ - Height of the balcony - X



Resulting equation:



$$\frac{|AB|}{|BD|} = \frac{|AC|}{x}$$

$$x = \frac{500 \cdot 78}{120}$$

$$x = 325 \text{ cm}$$

$$|AB| \cdot x = |AC| \cdot |BD| \quad / : |AB|$$

$$x = \frac{|AC| \cdot |BD|}{|AB|}$$

What can we use the Tales method for?

The Tales method showed before is mostly used to measure the heights that we can't measure with standard tools or its measurement is difficult, for example measuring heights of buildings or trees. Sometimes using this method might be easier than direct methods.





Literature:

https://pl.wikipedia.org/wiki/Tales_z_Miletu

https://penelope.uchicago.edu/Thayer/E/Journals/ISIS/12/3/Determinations_of_Heights_of_Mountains*.html

“Matematyka podręcznik do liceów i techników zakres rozszerzony 1” Marcin Kurczab



Thanks for your attention