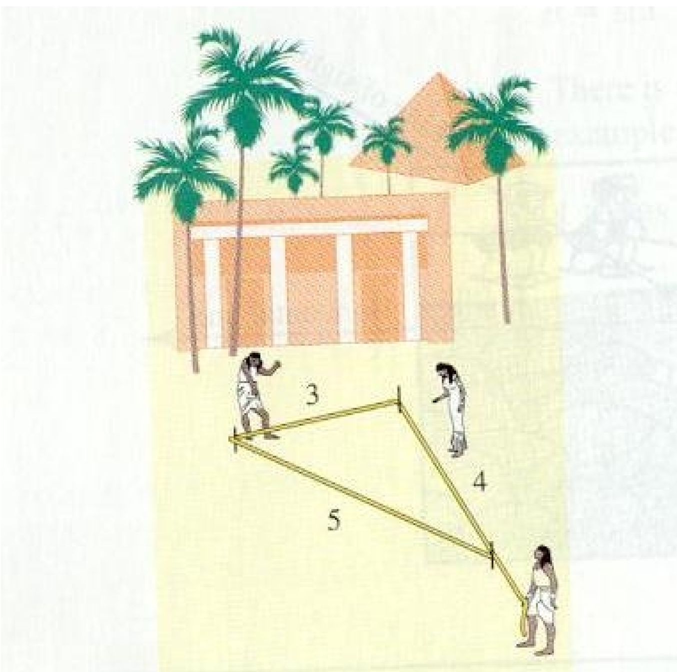
Measuring the Hypotenuse of a Triangle

Milton W. Pythagorus
with Dionysus Epimenides, Sisyphus Eugenides
Athens Community College

Abstract The measurement of a line that extends at an angle has been a puzzle for centuries. Now, using a simple formula, it is possible to determine the length of such a line based on the lengths of the vertical and horizontal lines that define a triangle for which the slanted line is the hypotenuse. It is believed that the formula may be extendible to higher dimensions. Several examples are presented illustrating the main ideas.

Slanted Lines

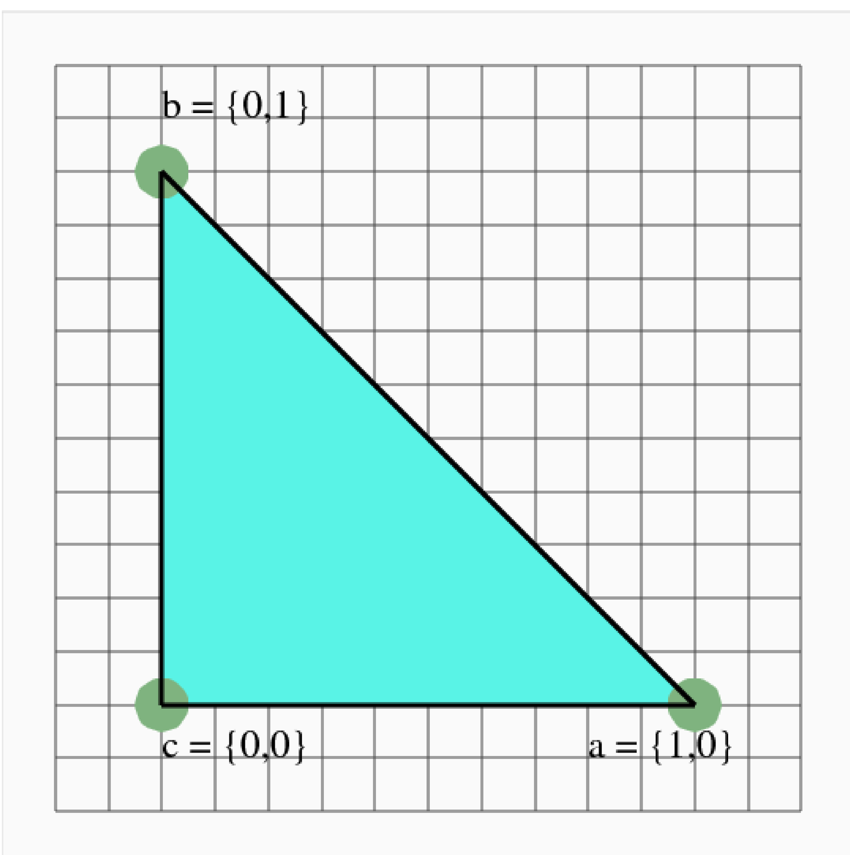
Our colleagues at the Alexandria Institute of Geodesy have made great efforts to systematize the measurement of land using the 345 rope triangle. To the limits of scientific precision, the long side or hypotenuse of this right triangle seems to be exactly 5 units.



However, to date, no scientific explanation has been given, nor has this result been extended to triangles of other dimensions.

Triangles

For our simple example, the line extends from the point $(0, 1)$ to $(1, 0)$. To create a triangle, we construct the point $(0, 0)$, which uses the x coordinate of the first point, and the y coordinate of the second. The triangle looks like this:



For this example, we may label the three sides of the triangle as follows:

- **A**: the vertical line from $(0, 1)$ to $(0, 0)$;
- **B**: the horizontal line from $(0, 0)$ to $(1, 0)$;
- **C**: the slanted line from $(0, 1)$ to $(1, 0)$;

The New Formula

Using the notation suggested in the previous section, it is easy to see that we can determine the length of the vertical line **A** and the horizontal line **B** because in each case only one coordinate changes, so the length is simply the change in that coordinate.

My theorem claims that, if the lengths of sides **A** and **B** can be computed, then so can side **C**, because:

$$C^2 = A^2 + B^2$$

Examples

In the following table, we list values of A and B for a given slanted line, as well as the length C determined from the new formula. In each case, the computed result matched the result determined from a measurement with a really good measuring stick.

A	B	C
3	4	5
5	12	13
7	24	25
8	15	17

References

- Euclid, *The Pop-Up Geometry Book*, Alexandria, 321 BC;
- Hermes Trismegistus, *The Hermetic Corpus*, Memphis, 503 BC;