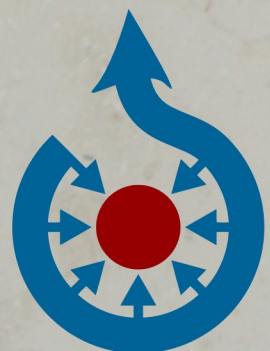# Open
Trigonometry
Basic to advanced

Introduction

A painting of the famous Greek geometrist, and "father of measurement", Euclid. In the times of the Greeks, trigonometry and geometry were important mathematical principles used in building, agriculture and education.

It is easy to explain what in word-terms, what trigonometry means, but it is more important to understand what exactly we use trigonometry for, and why exactly it is not easier to just do something practically.

The most important thing when understanding algebra, calculus, mechanics, or other things in mathematics, is not just to know who created it and it's history, but to perhaps **think** about why, and for what reason it was created.

Euclides at the commons; ancient Greeks would revel in the accuracy of figures gotten from geometry and trigonometry

The definition of trigonometry is that it is the study of triangles; "Tri" is Ancient Greek word for three, "gon" means side, "metry" measurement: together they make "measuring three sides". Giving it such a solid definition does not give you an introduction as to why trigonometry is important, but rather gives you a history primer on why it was called "trigonometry".

More poignantly, **why** it's discoverers and contributors performed their actions, and how they came to the conclusions they did is an important quasi-history lesson, as it gives you an understanding of what logic they applied to the situation so then, you too, can learn different mechanisms of thinking, which will help you understand not only trigonometry, but everything in life in a much more vivid way.

In mathematics, trigonometry is an important set of disciplines which relate to two and three dimensional objects; practically anything that you can see around you can be related to the principles of trigonometry and algebra -- in the real-world, it is very useful in engineering and construction, where it's principles are important in accurately determining the lengths, sizes and areas of objects without having to actually create them first. Imagine the need to build a structure with only the basic land-area given to you.. through trigonometry, you can easily use principles to calculate with high accuracy, the geometric properties of objects you are given, and save masses of resource because we know that through several trigonometric and algebraic principles that these entities can be calculated to an unerring degree of accuracy.

Trigonometry, however, isn't just about using formulae to find the correct angle or size in school. Itself, it describes the relationships that occur naturally between objects and their similarity in structure. When we compare them using a similar set of ideas, it gives us a lot of power to understand the basis of other things in life beyond that of just their

appearance. Even though we can look at a circle, an oval, square or rectangle, we can know that there are principles we can apply to their shape, which can be expressed through one entity, a triangle.

A brief history of trigonometry

Originally, the Babylonians were the first to discover the measures of the angle, but it was not until the onset of the Greeks, who were the original pioneers in the field of trigonometry, and the inventors of a measure known as the "sexagesimal". In 2BC, a Greek man known as Hipparchus was thought to be the first person who devised a more complete idea of a trigonometric triangle.

He produced a table of reference for solving a triangle's lengths and angles, by making a reference table of the lengths of the sides of the triangles for angles between 71° and 180°. This was what could be called the equivalent of a "sine table"; the basis of the modern sin function, which has become a crucial tool in the calculations for modern living, construction and manufacture.

Sine tables were once used in some school systems in Europe and America, but have now been dropped for the use of the sin function on modern calculators, opting to focus more on the principles of trigonometry, rather than trigonometric values.

Illustration 2: The moon; the natural circle which was thought to be the spark which started the determination of the nature of the circle, the angle, and trigonometry.

In his research, however, a crucial entity in recording was either lost, or not recorded simply because it may not have been thought of as important, or even thought of at all. This entity was known as the radius; half the length of the width of the circle, when measured from one side to another. Over 300 years later, Greeks adapted upon this measure by using the sexagesimal measure, and saying that the radius should be a fixed length of 60; $r = 60$.

An important figure, too, in geometry and trigonometry was Euclid. Euclid was a Greek mathematician, whom almost nothing was known about other than the works that he produced. Surprisingly, the work he is most renowned for, Elements, is an amazingly in-depth work for the time, as it covers in some detail, the basic and more advanced aspects of geometry and trigonometry.

There is some uncertainty to if every concept in the book, elements is one that he alone invented, but it is sure that Euclid is a very important figure in the discovery of trigonometric principles, because so much of what is known about geometric measure in trigonometry is comparable to his work.

Similarly, another figure, Pythagoras was an important figure in the contribution to

trigonometry. Although there was another scholar whom was attributed with the discovery of his theorem, Tschou-gun, he is still given his due as an influential person in the field of mathematics and trigonometry; particularly in Greece, where he was a renowned teacher and influential person.