Q. Is mathematics invented or discovered?

Mathematical rigor is not very often needed, or can be even undesirable in situations of our daily lives. Yet almost all of us, humans, possess the ability to understand, albeit through strict disciplines and rigorous thought, the logical process of mathematics, somewhat treating it as a work of bringing order to the seemingly chaotic world that we live it. We often, therefore, attribute maths to a characteristic unique to humans; a set of rules and disciplines that humans have invented.

However, the works of natural and human scientists show that mathematics is surprisingly good at explaining various phenomena of the universe. The studies of the real world, reveal that the natural world is built upon a fundamentally mathematical foundation. We, therefore, ask the following question: "Is mathematics invented or discovered?"

The extent to which we limit the definition of maths determines the validity of this question. Therefore, it is important to limit the meaning of mathematics so something that we can agree on. We can consider maths to have two components: the symbols and expressions as well as the way of organizing them to express a thought, and the underlying idea that the symbols describe. In equation such as $a^2 + b^2 = h^2$, we, as good mathematicians, promise that "a" and "b" represents a number, that the small 2 on the top-right corner means to multiply that number by itself, and that the "=" symbols denotes that what is on the left, is equal to what is on the right. But, by interpreting the symbols "a" and "b" as each side of a right triangle, with "h" as the hypotenuse, we describe a fact of the universe; the fact that the sum of the squared sides of a triangle equals the square of its hypotenuse. This fact does not necessarily need to be described by a mathematical equation; the idea is just as well expressed in words, or by a diagram.

If mathematics is just the symbols that we use to describe, it would be reasonable to say that mathematics is invented, as the symbols have no significance without humans to interpret them. However, if we include the underlying laws that it describes as a part of mathematics, it is possible to consider the alternative choice; that maths a set of rules of the universe that humans have only discovered. Therefore, in this essay, the meaning of maths is defined as the second; the "ideas", a thought that that can be expressed in various ways, but that describes an objective fact about the universe.

Most people agree that scientific facts are discovered. The scientific process uses techniques like experiments or theorizing, to come up with a "logical" rule that explains something about the world. Often, this rule is described using mathematical expressions, and surprisingly, obey the same rules that mathematicians use in their abstract theorems. Therefore, science can be thought of as the link between mathematics and the real world.

If such a link is to be trusted, we can say that mathematics, in s similar sense, describes the real world. Some, such as the Pythagoreans, went as far to say that the real world is simply a manifestation, an application of maths. In such a viewpoint, mathematics is only discovered; the real world is not a human invention, and therefore, its components, the mathematical rules, must exist whether or not humans realize them or not. We simply discover these equations, and mathematics deals with uncovering these building blocks of the universe.