



Thank You for Algebra: Muhammad Ibn Musa al-Khwarizmi

By Bennett Sherry

The Muslim mathematician Al-Khwarizmi offered new approaches to mathematics by building on ancient ideas. We still use his ideas today.

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Translating the heavens

Muhammad Ibn Musa Al-Khwarizmi was a scholar at the House of Wisdom in the ninth century. The institution was in Baghdad (see Figure 1). He was part of a community of scholars from across the world. They translated ancient manuscripts on science, math, medicine, history, and philosophy. Al-Khwarizmi did more than translate ancient books. He improved mathematical concepts from ancient Babylonian, Greek, and Hindu scholars.

Al-Khwarizmi was invited to the House of Wisdom by the Abbasid caliph (ruler). Al-Khwarizmi was a Persian man. He was probably born in Central Asia. He made important contributions to geography, astronomy, geometry, and calendar systems. His most important contributions were in mathematics.

Algebra. Wow. Thanks. You shouldn't have...

Al-Khwarizmi revolutionized algebra and arithmetic. Algebra had already been invented. Al-Khwarizmi improved upon its techniques. His book is where we get the word "algebra." It comes from the Arabic word "al-jabr" or "balancing." The book offered detailed instructions for solving linear and quadratic equations.¹ This earned him the title "father of algebra."

Algebra can help solve complicated problems in a simple way. It allows us to use symbols (like x and y) in equations to find unknown numbers. Quadratic equations are important if you want to fly a plane or plot a course to Mars.

Al-Khwarizmi's book offered solutions for everyday problems, too. For example, his book explained how to use equations to split an inheritance. There were also explanations for splitting up a plot of land and how to find measurements for large structures. He was the first to provide algorithms for solving these equations. Algorithms are sets of rules to solve a problem. They are the basis of computing machines. Computers or phones would not exist without algorithms. The English word "algorithm" comes from the Latinized spelling of his name.

Al-Khwarizmi explained how to solve equations in words. He also encouraged mathematicians to adopt the Hindu numbering system. This system was developed in ancient India. The numerals are now called Hindu-Arabic numerals. Al-Khwarizmi helped the Hindu-Arabic numeral system become popular in the Islamic world. His book is responsible for Europe adopting the Hindu-Arabic numeral system 500 years later.

This numbering system made math a lot easier. It introduced the number zero. It also introduced positional notation. This is the idea that the position of numbers determines their value. Consider the number 503. The five is in the third place to the left, which means it symbolizes units of a hundred. Using this number system is much faster than trying to add Roman numerals.

Adding to human knowledge

Al-Khwarizmi's work in mathematics revolutionized many fields. Al-Khwarizmi made some of these innovations himself. He improved on Ptolemy's world map. He wrote a new calendar and calculation systems for tracking the movement of planets. In 1202 CE, the Italian mathematician Fibonacci introduced the Hindu numbering system to Italy. Within 200 years, these numerals became standard across Europe.

Islamic scholars translated and improved the ancient works of Greek, Hindu, Babylonian, and Roman scholars. Their works were spread throughout the Islamic world. Carried by scholars from across Afro-Eurasia, these works were translated into new languages. Their work influenced other great minds throughout history.

¹ Listen, explaining these equations can get complicated. Thankfully, this is a history class. All you need to know right now is that linear equations help mathematicians solve problems with a straight line, and quadratic equations involve curved lines, which makes things more complicated.

The House of Wisdom

The House of Wisdom was the famous institution of learning. It was founded in the 700s or 800s in Baghdad (present-day Iraq). The House of Wisdom welcomed scholars from across Afro-Eurasia. Persian, Indian, Central Asian, Chinese, East African, and other scholars all traveled there. They studied mathematics, history, chemistry, astronomy, medicine, and philosophy.

The House of Wisdom contained a huge library of ancient texts. Scholars there translated ancient texts into Arabic. This preserved ancient knowledge that might have otherwise been lost. But these scholars did more than translate and preserve. They also interpreted, analyzed, and challenged ancient ideas. They advanced scientific knowledge in many fields.

A lot of important scholarship emerged from the House of Wisdom. We don't know much about its founding. That's because, in 1258, the army of the Mongol Empire conquered Baghdad. They destroyed the city, including the House of Wisdom and most of its books. Yet the 500 years of knowledge that had been worked on by scholars was not lost. Their work had already spread across the Islamic world and beyond. Later, those same works would help launch the Renaissance and Scientific Revolution in Europe.



The House of Wisdom. By BHP and Peter Quatch, CC BY-NC 4.0.

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Image credits

Cover image: Illustration of Muhammad Ibn Musa al-Khwarizmi working on algebraic calculations, with the scholars and discoveries who influenced him on the right, and the innovations he would influence on the left. By BHP and Katie Haseeb, <https://www.katiehaseeb.com>, CC BY-NC 4.0.

Illustration of scholars at the House of Wisdom in Baghdad (present-day Iraq). By BHP and Peter Quatch, <http://peterquach.com>, CC BY-NC 4.0.



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