

Al-Khwarizmi – The “Father” of Algebra

Arabian Mathematician: Born in Khawarizm (now Khiva, Uzbek, SSR) about 780 AD. Died about 850 AD

Al-Khwarizmi’s great work was titled, “ilm al-jabr wa’l muqabalah”. Translated, this means “ the science of transposition and cancellation”. The Arabic word “al-jabr”, (transposition), when translated into Latin became “algebra”. Al-Khwarizmi’s book was an extension of the works of Diophantus, and “algebra” became the name of an entire branch of mathematics, the solution of equations. Al-Khwarizmi’s name became distorted into “algorism” and then “algorithm”.

Al-Khwarizmi’s most important contribution was to publish works of both Hindu and Greek sources including the Hindu’s numerals and the use of “ 0 “ (the zero). This work was eventually introduced by Fibonacci (1170 AD – 1230 AD) to Europe, where it was slowly accepted. Using these “Arabic numerals”, and of course the concept of a place value, long division could be done by people other than experts.

The above information was found in Isaac Asimov’s *Biographical Encyclopedia of Science and Technology*.

After the Byzantine Emperor Justinian ordered the closing of all Greek schools, including Plato’s Academy, in 529 AD, the Dark Ages followed and, in Europe, mathematics virtually came to a stand-still. I often wonder if people at that time knew they were in the “Dark Ages”. Did they say to each other, “Boy, these are sure the Dark Ages, aren’t they?”. Maybe 2 000 years from now people will call the 20th and 21st centuries, “The Dark Ages”. But I digress...

The whole growth of science and mathematics shifted to India and the Arab world. With the ascendancy of Islam, the Muslim world became an important area of mathematical study and new knowledge. If this had not been happening, much of the ancient writings would have been lost. The Caliph al-Mamun (786 AD – 833 AD) established in Baghdad the “Beit al-hikma” (House of Wisdom). The Caliph decided to have all the ancient Greek works translated.

One of Al-Khwarizmi’s problems from this time was: “I have divided 10 into 2 parts; I have multiplied the one by ten and the other by itself, and the products were the same”. The resulting equation is $10x = (10 - x)^2$, which is solved as follows:

$$10x = (10 - x)^2$$

$$10x = 100 - 20x + x^2$$

$$0 = x^2 - 30x + 100$$

$$x = \frac{30 \pm \sqrt{(-30)^2 - 4(1)(100)}}{2(1)}$$

$$x = \frac{30 \pm \sqrt{500}}{2(1)} = \frac{30 \pm 10\sqrt{5}}{2(1)}$$

$$x = 15 \pm 5\sqrt{5}, \text{ or } x = 5(3 \pm \sqrt{5})$$

This yields answers of $x = 26.18033989$ and $x = 3.819660113$. For those who have been following our work in the past weeks on the Golden Ratio ($\Phi = 1.618033989$), you’ll notice that one value above is $10(\Phi + 1)$ or $10\Phi^2$. Isn’t it amazing how often this number keeps popping up?

This information came from *The Golden Ratio* by Mario Livio.