Islamic Impact in Mathematics

1. The rise of the Islamic empire began to spread by Prophet Mohammed (570-632 AD) spreading the religious beliefs of Islam throughout the Middle East. After his death, the Islamic empire stretched from India to the Middle East, across North Africa and into southern Spain.
   a. The Islamic civilization began to assimilate the knowledge of many civilizations which they came in contact with, like the Greeks, Romans, Byzantine Empire, Persians and Indian civilizations.
   b. The Five Pillars of Islam
      i. Declaration of faith (Kalima)- there is only one god, Allah, and Muhammad is his messenger.
      ii. Daily Prayer(salat) -5 times per day
      iii. Fastening (For Ramadan)
      iv. The practice of charitable giving (Zakat)
      v. Hajji- Pilgrimage to Meeca
2. Early 800's AD, the Arabs started to translate Greek classics such as Euclid's Elements.
   a. A decade later, the Arabs translated Ptolemy's *Syntaxis Mathematica,* which composed of 13 books that mimic Euclid's Elements.
3. Tậbit ibn Qorra (826-901 AD) translated Archimedes and Apollonius work and rendered a new translation of the *Elements*.
   a. "He was a pioneer in the application of arithmetic operation to ratios of geometric quantities, which is the essence of the idea of a real number" (Cooke 56)
   b. He also wrote on mechanics, geometry and number theory.
4. The center of the mathematical world shifted from Plato's Academy and the Library of Alexandria to Baghdad called "The House of Wisdom," which Al-Mamun founded.
   a. "A place of scholarship analogous to a modern research institute." (Cooke 54).
5. Islamic scholar Abu'l Raihan Muh al Biruni credits Archimedes instead of Heron for Heron's formula for triangular areas: If K is the area of a triangle having sides of length a, b, and c, then
   $K = \sqrt{s(s-a)(s-b)(s-c)}$, where $s = \frac{1}{2}(a+b+c)$.
   a. There's no support for this claim but was certainly in Archimedes reach.
6. Muhammed ibn Mûsậ al-khwậrizmî (825 AD), an Arab scholar who translated a number of Greek works to Arabic. He borrowed ideas from both East and West, which allowed him to produce a treatise on algebra and arithmetic. This allowed the transition from Geometry to an arithmetic perspective.
   a. Brought back to the Islamic empire the the Indian system of numeration (Arabic numerals
   b. His best known for his book/major treatise was called Hisậb al-jabr w' al muqậbalb, which later translated to algebra. In translation, the book title means Book of the Calculation of Restoration and Reduction. "Balance equations from

one side to the opposite side with the opposite sign" and "the cancellation of like terms or factors from both sides of an equation" (Cooke 56).

    i. His name, Al-Kwarizimi, also gave rise to the term, "Algorithm."

c. Today, Algebra is the generalization of arithmetic where numbers are represent by variables.

d. Al-Khwarizmi had used the Arabic word (shay) for thing, which translates to the letter x (xay). Later, the universal algebraic symbol stands for the unknown.

e. al-Khwarizmi, discovered the new process of reckoning with Hindu-Arabic numerals, called *algorithmus*, which is a step-by-step process for solving mathematical problems, *algorithm*.

f. "He found how to solve linear an quadratic systems. For an quadratic equation, he verbally presented the results $ax^2 + bx + c = 0$ and the solutions are

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, which was without concise algebraic symbolism.

7. Arabs didn't believe that proofs were the heart of mathematics. Thus, they put less emphasis on proof and no Arabic theorems appeared during their civilization.

8. Arab mathematics started a highly popular numbering system, which contributed to solving equations with various degrees.

9. Abu-Kamil- He was an author of certain books about algebra, geometry and number theory, which impacted both Islamic Mathematics and the recovery of mathematics in Europe.

10. Abu'l-Wafa, an astronomer mathematician who translated some Greek works and analyzed/critic their works. He also wrote books on practical arithmetic and geometry.

11. Omar Khayyam, a Persian mathematician devoted his time to advance algebra beyond the elementary linear and quadratic equations. He was thought to be the author of Rubaiyat, a famous skeptical and hedonistic poem.

12. Al- Tusi played a major role in the flow of mathematics ideas back into India after the Muslims invasion into India.

<div align="center">Work Cited</div>

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