# **Notes on A Brief History and Philosophy of Islamic Algebra PPT**

The PowerPoint has been designed to encapsulate elements from various perspectives and teaching styles to be as adaptable as possible. You are encouraged to add or remove slides to fit your teaching aims. Some of the slides allow for more of a group discussion or expansion on the key points stated in them. Others include a concrete idea that has been explained for the purpose of clarity and conceptual understanding.

**Slide 2:** Intended to begin from a mathematician’s perspective, this intro lays down some reasons why the history is important in our modern understanding. Intended as some conversation starters/food for thought for the presentation.

**Slide 3:** It is important to ask what mathematics means to us if we are to delve into how another society might’ve asked these questions. You might want your students to attempt to come to similar answers to get that inquisitive drive going.

**Slide 4:** Brainstorms are useful before attempting to define algebra after the historical context.

**Slide 5/6:** These slides break up classical algebra into conceptual and notational stages. Students are then able to understand where Islamic science fits into this description.

The next section of the presentation takes a short walk down a history up until the Islamic Golden Age. This has been included to begin to satisfy the questions we began to ask at the beginning. Diversity is not restricted to the inspirations and efforts of western science but rather a great deal of empires and notable scientific cultures. If interested solely in Islamic mathematics and culture, however, feel free to omit slides up until slide no. 13.

**Slide 7:** Ability to expand on the cuneiform notation. Make a note of the no practical use of certain problems, relating it to the reasons for modern mathematics.

**Slide 8:** This slide might be a central point for any philosophy teaching. Connecting the philosophy of science of the ancient Greek schools and the House of Wisdom makes for a very interesting conversation. A brief section on truth in Greek mathematics is included to challenge preconceptions of ancient mathematics and the idea of proof.

**Slide 9:** It is important to visualise what we mean by geometric reasoning with polynomials for both historians and mathematicians alike. Important to note that making use of various axioms to form a general method of solution for polynomials was alien to the ancient Greeks and Euclidian geometry.

**Slide 10/11:** A good expansion here would be the notational aspect of Diophantus’s work.

**Slide 12:** Brahmagupta is an incredibly influential mathematician and rightly deserves some rigour in diverging into his life and works. A slide that I have omitted for a more concise presentation is the one on Chinese methods including the Nine Chapters of the Mathematical Arts.

This next section on Islamic science assumes a basic understanding of the religion:

**Slide 13:** A brief description of the early Abbasid Caliphate.

**Slide 14:** This region is the general scope of what that lied within the control of the caliphate with modern international borders included. Within this, important mathematicians that have been named in this project are mapped according to the region they are most associated with. However, this is not to say that all of those named were alive under the caliphate (those from Alexandria and Samos). Included are the positions of ancient civilisations.

**Slide 15:** The House of Wisdom can be a presentation. Philosophers might want to expand on the culture of science.

**Slide 16/17:** As with the mathematics itself, it is important to try to understand the reasons for the creation of this institution.

**Slide 18/19/20:** Please refer to the paper on Islamic algebra to expand the analysis on al-Khwarizmi’s book on algebra. Including all the details on the solution to the polynomial on a PPT can be very messy. A suggestion would be to break out into reading translations of this book. Look at examples of the problems within, how the use of the ‘shay’ contributes to al-jabr and the six types of equations and how it is used in algorithms.

**Slide 21:** The translations were important in allowing eastern methods and traditions to transfuse across to Europe. This included al-Khwarizmi’s work on the number system. This is where the story of modern algebra begins.

**Slide 22:** Although separated into continued Muslim efforts and Late Middle Ages in the paper, this slide combines both. There is an opportunity to discuss intellectual rigour in the proof of induction and the cubic solution using conic sections for an in-depth view. An important note is how many mathematicians of the time were polymaths, with a good example being Khayyam’s poetry.

**Slide 23:** This slide has been left for you to complete. Include any questions that have come to light from your readings. Note which of these have answers after discussions throughout. Attempt to describe the motivations and efforts of civilisations to construct these new ideas. Which societies are similar and how do they differ? Asking students whether they think the development was a concurrent process or whether the invention of ‘algebra’ can be attributed to a single society at a single time makes for a fruitful discussion.