

Trigonometry: Milestones in Measurement and Astronomy

Trigonometry · Answer Key · 17 Questions

1. Who is widely credited with creating the first comprehensive table of trigonometric values, specifically the chord function, in his work Almagest around 150 CE?

- A) Archimedes
- B) Euclid
- C) Hipparchus
- D) Ptolemy**

2. The ancient Babylonian mathematical tablets, such as Plimpton 322, demonstrate an understanding of relationships between sides of right triangles. What specific mathematical concept, foundational to trigonometry, do these tablets hint at?

- A) The Pythagorean theorem**
- B) The golden ratio
- C) Irrational numbers
- D) Complex numbers

3. The development of trigonometry in India, particularly by Brahmagupta in the 7th century CE, was significantly influenced by which existing mathematical system, which introduced concepts like zero and place-value notation?

- A) Egyptian mathematics
- B) Greek mathematics
- C) Mesopotamian mathematics
- D) Indian mathematics**

4. Which Islamic scholar, in the 9th century CE, is often credited with introducing the sine function into trigonometry as a ratio, distinct from the chord function used by the Greeks?

- A) Al-Khwarizmi
- B) Omar Khayyam
- C) Abu al-Wafa' Buzjani**
- D) Ibn al-Haytham

5. The concept of radians for measuring angles, a crucial development for calculus and beyond, was formally introduced by whom in the early 18th century?

- A) Isaac Newton
- B) Gottfried Wilhelm Leibniz
- C) Roger Cotes**
- D) Leonhard Euler

6. The trigonometric functions we use today (sine, cosine, tangent, etc.) were originally developed and named over centuries. Which mathematician's work in the 17th century helped systematize and popularize the use of these functions with their modern names and notation?

- A) Johannes Kepler
- B) Galileo Galilei
- C) René Descartes
- D) Leonhard Euler**

7. The first known systematic study of trigonometry in Europe is attributed to whom in the 15th century, who wrote 'De triangulis omnimodis' (On the various kinds of triangles)?

- A) Nicolaus Copernicus
- B) Johannes Regiomontanus**
- C) Tycho Brahe
- D) Johannes Kepler

8. The development of spherical trigonometry, essential for astronomy and navigation, owes a significant debt to the Alexandrian mathematician who lived around the 2nd century CE and worked on the geometry of spheres. Who was this mathematician?

- A) Apollonius of Perga
- B) Ptolemy
- C) Theon of Alexandria
- D) Menelaus of Alexandria**

9. The Law of Sines and the Law of Cosines, fundamental laws in trigonometry for solving triangles, have roots in earlier mathematical works. However, their clear articulation and proof are often associated with which period of mathematical development?

- A) Ancient Babylonian period
- B) Classical Greek period
- C) Renaissance period
- D) Islamic Golden Age**

10. The invention of logarithms by John Napier in the early 17th century had a profound impact on trigonometric calculations. What was the primary benefit of logarithms for trigonometry at the time?

- A) Enabled the calculation of angles beyond 90 degrees.
- B) Greatly simplified complex multiplication and division, especially for trigonometric tables.**
- C) Provided a more accurate way to measure curved surfaces.
- D) Allowed for the direct computation of areas of irregular polygons.

11. The concept of the unit circle, a circle with radius one centered at the origin, is a cornerstone for understanding trigonometric functions in the modern sense. While implicit in earlier works, its explicit and systematic use in defining trigonometric functions is often attributed to which mathematician in the 18th century?

- A) Euler**
- B) Laplace
- C) Lagrange
- D) Fourier

12. The practical application of trigonometry for surveying and navigation was revolutionized by the development of precise instruments. The astrolabe, an early astronomical instrument used for measuring the altitude of celestial bodies, has origins tracing back to which ancient civilization?

- A) Roman
- B) Egyptian
- C) Greek**
- D) Chinese

13. The identity $\sin^2(\theta) + \cos^2(\theta) = 1$, a fundamental Pythagorean identity in trigonometry, can be geometrically derived from the properties of which shape?

- A) Equilateral triangle
- B) Isosceles triangle
- C) Right-angled triangle**
- D) Scalene triangle

14. The study of trigonometry extended to the heavens, with astronomers using it to calculate distances and positions of celestial objects. Which ancient civilization's astronomical observations and calculations, documented in texts like the Almagest, heavily relied on trigonometric principles?

- A) Mayan
- B) Babylonian
- C) Persian
- D) Greek**

15. The tangent and cotangent functions, as distinct entities from ratios of chords, gained prominence in trigonometry due to their utility in certain geometric problems. Which mathematician is recognized for introducing these functions and their tables in the 10th century CE?

- A) Al-Battani
- B) Ibn Yunus
- C) Abu al-Wafa' Buzjani**
- D) Al-Biruni

16. The concept of inverse trigonometric functions (arcsin, arccos, etc.) was essential for solving for angles when side lengths were known. Their formalization and development were largely a product of which era in mathematics, coinciding with the rise of calculus?

- A) Ancient Greek
- B) Medieval Islamic
- C) Renaissance

D) 17th and 18th centuries

17. The development of trigonometric series expansions, such as the Taylor series for sine and cosine, was a major breakthrough, allowing for the computation of trigonometric values without tables. This advancement is most closely associated with the work of which mathematician?

- A) Pierre de Fermat
- B) Blaise Pascal

C) Brook Taylor

D) Colin Maclaurin