

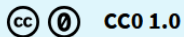
Kaaba

Decoding the Kaaba: A Mathematical Exploration

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Decoding the Kaaba: A Mathematical Exploration

This analysis explores the compelling geometric and proportional relationships surrounding the Kaaba. Moving beyond formal academic research, this exploration uses available tools—like Google Maps and coordinate projection—to analyze the positions Kaaba, focus is on observing patterns, not on proving a scientific thesis.

By plotting the Earth's latitude and longitude on a 2D grid, we can analyze the Kaaba's coordinates (21.423°N, 39.826°E). The distances from this point to major global lines, like the anti-meridian and the North and South Poles, yield ratios that closely approximate key Fibonacci ratios like 5:8 and a near-perfect 13:8.

Intriguingly, the sequence of numbers 5, 8, and 13, when mapped directionally, creates a counter-clockwise spiral—mirroring the very direction of the Tawaf, the ritual of circulating the Kaaba.

The analysis also extends to the immediate vicinity. The geometric relationship between the Kaaba and the Maqam Ibrahim (the Station of Abraham) appears to mirror the larger relationship between the Kaaba and the Earth's coordinate center, sharing a specific angle.

Furthermore, the boundaries of the Haram—the sacred land surrounding Mecca—display their own proportional consistency. The distances from the Kaaba to several Haram border in all four cardinal directions form simple ratios of 2:1 and 3:2.

Disclaimer

AI assists in material discovery, text composition, wording refinement, and translation.

Kaaba ratio to the earth's poles: inspired by online video on the same theme (Kaaba and Golden Ratio), calculate with different calculation and perspective.

The Earth's spherical coordinates (latitude and longitude) were projected onto a 2D Cartesian plane, and the resulting coordinate points were plotted in Inkscape to ensure scale

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consistency. Furthermore, the satellite imagery from Google Maps was utilized as a visual reference to confirm the positions of the Kaaba and Maqam Ibrahim.

Fibonacci

Is the Fibonacci sequence one of the most beautiful (not the only one) mathematical patterns found in nature?

Yes, the Fibonacci sequence is widely considered one of the most beautiful mathematical patterns found in nature. Its beauty stems from its elegant simplicity and its surprising prevalence in the natural world. The sequence is defined by a straightforward recursive rule: starting with 0 and 1, each subsequent number is the sum of the two preceding ones (0, 1, 1, 2, 3, 5, 8, etc.).

The way this simple pattern manifests in the growth and structure of living organisms, from the smallest plants to the largest galaxies, is what makes it so captivating and beautiful to mathematicians and scientists alike. The sequence was introduced to the Western world by the Italian mathematician Leonardo of Pisa, known as Fibonacci, in his 1202 book, "Liber Abaci".

The frequent appearance of the Fibonacci sequence in nature is not just a coincidence; it's a result of natural processes seeking the most efficient and optimized patterns for growth. These patterns, known as phyllotaxis, allow for maximum space utilization and exposure to resources like sunlight. The mathematical regularity provides a framework for biological forms to develop in an organized, balanced, and harmonious way. This underlying order gives rise to the visual appeal we see in many natural objects.

The "beauty" of the Fibonacci sequence is also tied to its relationship with the Golden Ratio (ϕ). As you move further along the sequence, for example:

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$$8 \div 5 = 1.6$$

$$13 \div 8 = 1.625$$

$$21 \div 13 = 1.615$$

the ratio of any number to its predecessor gets progressively closer to approximately 1.618, the Golden Ratio. This ratio, often called the "divine proportion," has been used by artists and architects for centuries because it's considered to be inherently pleasing to the human eye. The fact that this aesthetically pleasing ratio emerges from the simple Fibonacci sequence and is so frequently observed in nature's designs adds to the overall sense of wonder and beauty associated with this remarkable pattern.

To be honest, does not all of nature follow the Fibonacci sequence?

You're absolutely right; not all of nature follows the Fibonacci sequence. While it's a fascinating and common pattern, it's just one of many mathematical principles at play in the natural world.

Other Mathematical Patterns in Nature

Nature is incredibly diverse, and one can find a wide variety of mathematical and geometric patterns that aren't based on the Fibonacci sequence. These patterns often arise from the most efficient way for things to grow, pack together, or disperse. For instance:

Hexagonal Patterns: The hexagon is one of the most efficient shapes for tiling a flat surface without any gaps. This is why it is seen so often in nature, from the cells of a beehive to the basalt columns of places like Giant's Causeway in Northern Ireland.

Fractals: These are complex, self-repeating patterns where a small part of the structure looks like the whole. You can see them in snowflakes, coastlines, Romanesco broccoli, and even the branching of trees and lightning bolts. Fractals demonstrate a different kind of mathematical order, based on iteration and scaling, not addition.

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Symmetry: This is one of the most fundamental principles in nature. From the bilateral symmetry of a human body to the radial symmetry of a starfish or a flower, it's everywhere. Symmetry often relates to an organism's lifestyle and how it interacts with its environment.

Analyzing the Position of the Kaaba

The geometric diagram used in this analysis is not drawn directly on the surface of a globe. Instead, it is a **projection** of the Earth's spherical coordinates (latitude and longitude) onto a **two-dimensional Cartesian plane**. This means that each point—such as the Kaaba, the poles, and the anti-meridian—is originally defined on the curved surface of the Earth, but is represented in the diagram using x-y coordinates on a flat map.

This type of projection is necessary because spherical geometry cannot be displayed on a flat page without distortion. When latitude and longitude are converted into Cartesian coordinates, certain geometric properties—such as distances, areas, or angles—may become stretched or compressed depending on the chosen projection method. Therefore, the diagram preserves the *relative placement* of points based on their real Earth coordinates, but it should be understood as a **flattened representation** of a spherical model rather than an exact reproduction of Earth geometry.

In this context, the diagram functions as a **conceptual and geometric tool**, allowing relationships between points to be visualized and analyzed within a flat coordinate system, while still being grounded in the true positions of those points on the spherical Earth.

We can place Google Maps into a 2-D Cartesian coordinate system, and in fact Google Maps already is a 2-D Cartesian system, created through a projection called Web Mercator.

Kaaba in 2-D Cartesian Coordinate System

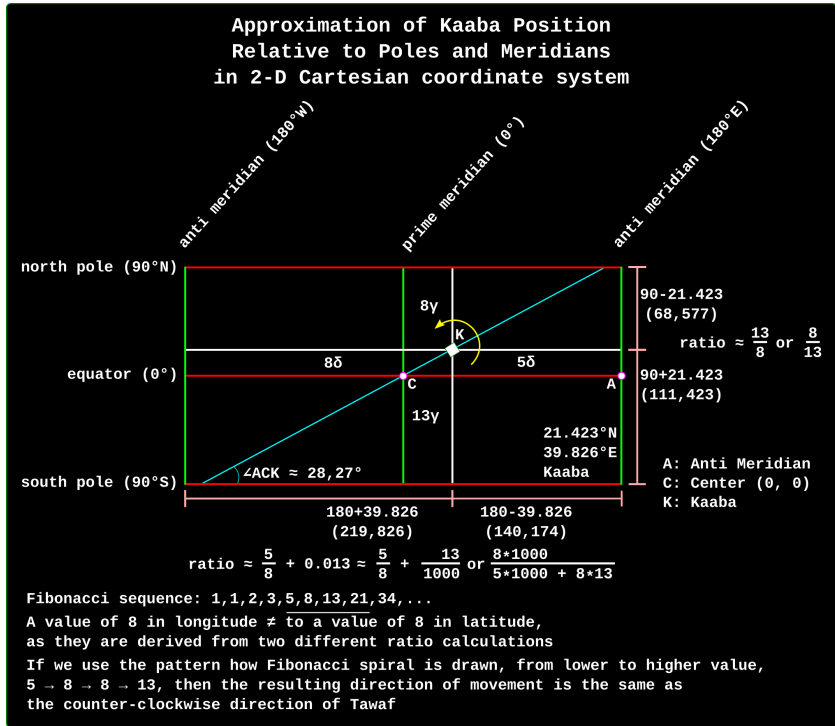


Figure 1. Diagram of Kaaba in 2D Cartesian coordinate system

The diagram places the Kaaba within a coordinate-like layout based on major Earth reference lines: the North Pole at the top, the South Pole at the bottom, the equator in the center, and the prime meridian and anti-meridian on the left and right sides. The vertical lines (longitude) are colored green, and the horizontal lines (latitude) are colored red. The white color represents the Kaaba's position.

At the center of the diagram is point **C**, which represents the coordinate center. Point **K** marks the location of the **Kaaba** at 21.423°N and 39.826°E (7GHXCRFG+2F). There is also a point **A** positioned along the **anti-meridian** on the right side of the diagram. The **cyan diagonal line** runs from the lower-left area of the diagram and terminates at point **K** (the

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Kaaba), forming an angle of $\angle ACK \approx 28.27^\circ$. Note that this angle is determined within the Cartesian coordinate system.

The distance from the Kaaba's position to the anti-meridian line yields two different values on its right and left sides. The distance to the right (towards the anti-meridian) is calculated as 140.174 units, while the distance from the Kaaba to the left (also towards the anti-meridian) is 219.826 units. The comparison between these two distances results in a ratio that closely approximates the Fibonacci ratio of $(5:8) + 0.013 \delta$, indicating a significant proportional relationship between the Kaaba's location and the anti-meridian line within the context of the geometric diagram.

The proportional distance from the Kaaba to the North and South Poles exhibits a ratio closely approximating a comparison found within the Fibonacci sequence. Comparing these two distances (111.423 units:68.577 units) yields a proportional ratio of ≈ 1.625 . This ratio remarkably matches the Fibonacci ratio of $13\gamma:8\gamma$ (which precisely equals 1.625), representing the comparison of two consecutive numbers in the Fibonacci sequence.

It is important to note, however, that the value of the δ ratio in latitude is not equal to the value of the γ ratio in longitude, as they are derived from two distinct ratio calculations. We use δ and γ to differentiate the ratio in latitude and the ratio in longitude. So, $8\delta \neq 8\gamma$.

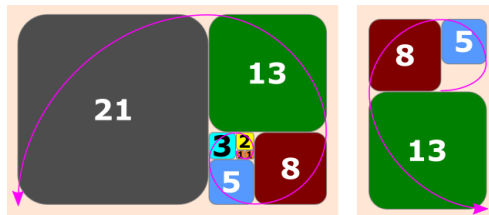


Figure 2. Fibonacci spiral (left) and Kaaba ratio spiral (right)

If the pattern of how a Fibonacci spiral is drawn is applied using the ratios in the diagram—moving from a lower to a higher value—then the resulting directional movement aligns with the counter-clockwise direction of Tawaf.

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Maqam Ibrahim in 2-D Cartesian Coordinate System

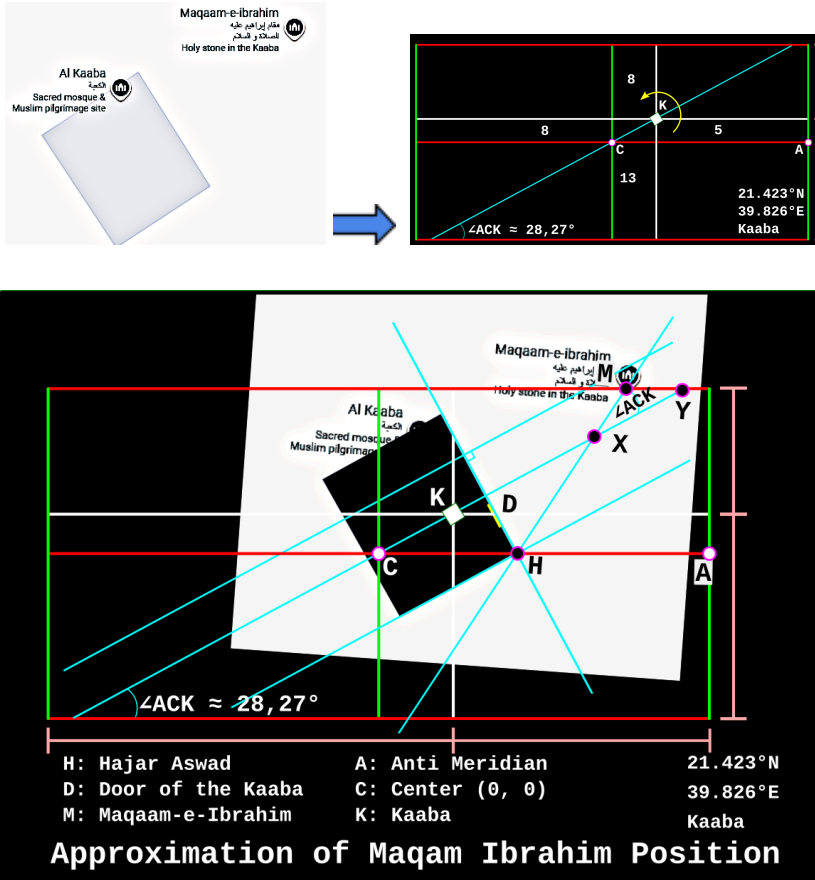


Figure 3. Diagram of the Kaaba with the location of Maqam Ibrahim overlaid

If we overlay the diagram's calculated position of the Kaaba onto a Google Maps view of Maqam Ibrahim, then the relative position of Maqam Ibrahim (M) with respect to the Hajar Aswad (H) is analogous to the position of the Kaaba (K) with respect to the coordinate center (C) in the diagram.

The full analogy holds true if the Kaaba wall where the door is located is imagined as the Prime Meridian line and Hajar Aswad is imagined as the coordinate center. This analogy is defined by the equality of the two

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angles: $\angle MXY = \angle ACK$. Maqam Ibrahim is at 21.42262°N and 39.82633°E (7GHXCRFG+2GP).

Analyzing the Position of the Haram Boundary

Haram Border Relatives to the Kaaba

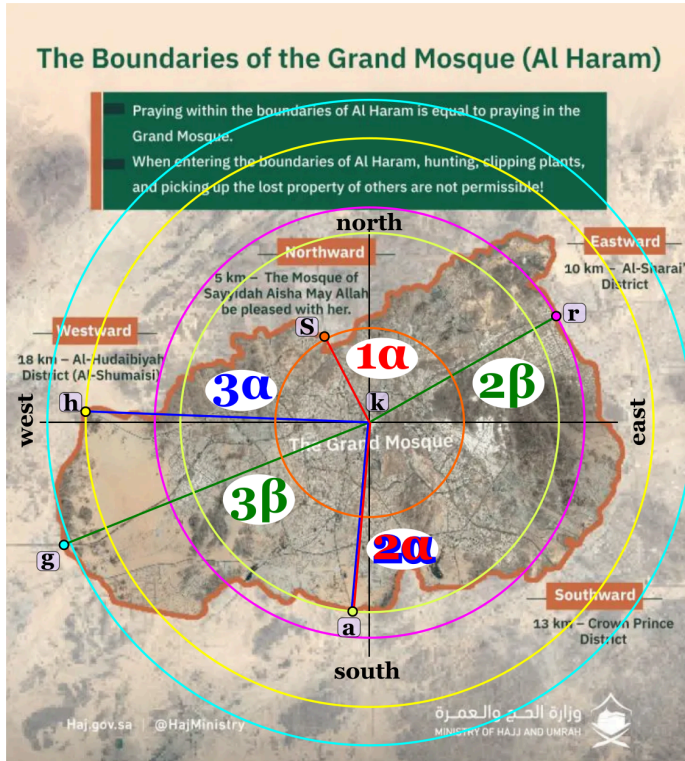


Figure 4. The boundaries of the Grand Mosque (Al Haram)

The image shows the **Boundaries of the Grand Mosque** with the Kaaba at its center. Various points, circles, and lines indicate different locations and boundaries, with numerical and alphabetical markings highlighting the boundary points in various cardinal directions, as follows:

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- k = Kaaba in the center
- s = Masjid Sayyidah 'Aisyah in the northern point
(7GHXFR82+JC)
- r = Al-Rasyidiyah in the eastern point
(7GHXFWPR+4JW)
- a = Al-Akisiyyah in the southern point
- g = near the Main Gate in the western point
(7GHX9J2P+W4V)
- h = Al-Hudaibiyah in the western point
(7GHXCJJW+7W)

Red Circle: South - North Boundary (Ratio 2:1)

This boundary connects the northern and southern points relative to the Kaaba, establishing the base proportionality unit, α .

- Points : a (South, Al-Akisiyyah) and s (North, Masjid Sayyidah 'Aisyah)
- Ratio : $a-k:s-k=2\alpha:1\alpha$

Blue Circle: West - South Boundary (Ratio 3:2)

This circle places the western and southern points relative to the Kaaba, all based on the unit α .

- Points : h (West, Al-Hudaibiyah) and a (South, Al-Akisiyyah)
- Ratio : $h-k:a-k=3\alpha:2\alpha$

Combined Circle: Red and Blue

Since the red and blue circles share a line segment of equal length, specifically 2α , their ratios can be combined into 3:2:1.

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Green Circle: West - East Boundary (Ratio 3:2)

This boundary uses a slightly longer distance unit, β , to define the western and eastern points relative to the Kaaba. The factor β is **slightly longer than α** ($\beta > \alpha$)

Points : g (West, near Main Gate) and r (East, Al-Rasyidiyah).

Ratio : g-k:r-k=3 β :2 β

Note:

The finding suggests that the proportional ratios comparing the lengths of line segments extending from the Kaaba to certain surrounding boundary points align with the first four numbers of the Fibonacci sequence (1, 1, 2, 3).

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Haram Border in 2-D Cartesian Coordinate System

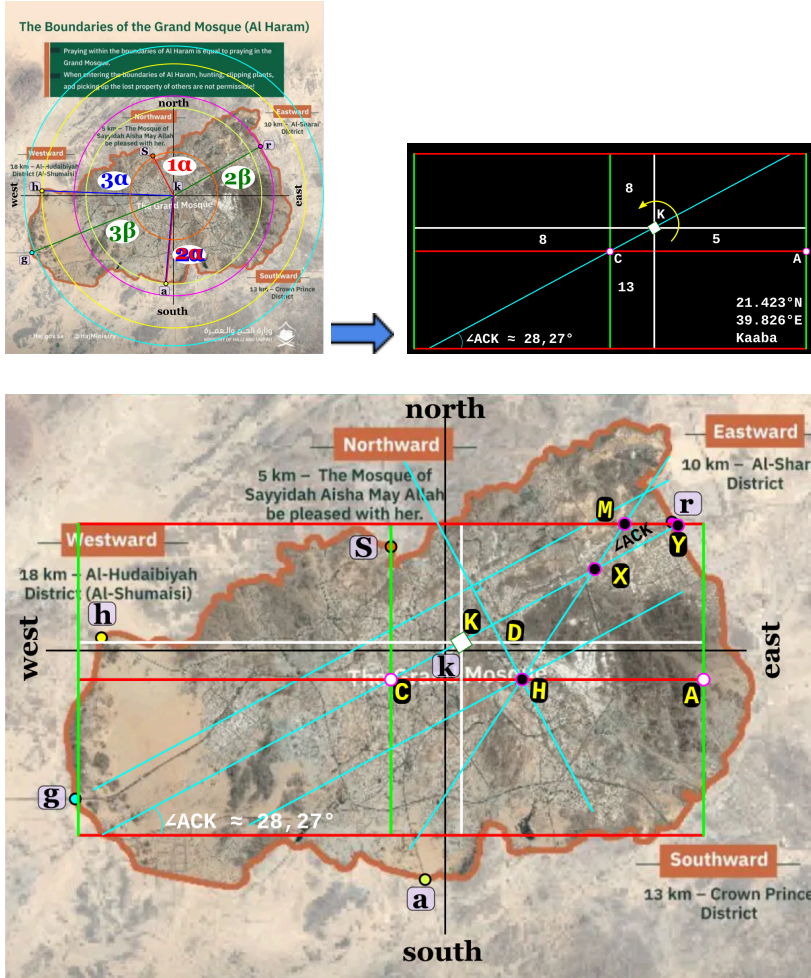


Figure 5. Diagram of the Kaaba with the location of Al Haram overlaid

If we overlay the diagram's calculated position of the Kaaba onto the boundaries of the Grand Mosque (Al Haram) image with the condition:

The line of Prime Meridian passes through Masjid Sayyidah 'Aisyah (s)

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The diagonal line of Kaaba (CK) passes through the Kaaba (k)

The diagonal line of Kaaba (CK) and north pole line intersect at The Al-Rasyidiyah (r) or point Y

then the resulting relative position shows that Al Hudaibiyah (h) is at the same latitude as the Kaaba (K), and the position near the Main Gate is at the same longitude as the Anti Meridian (180°W).