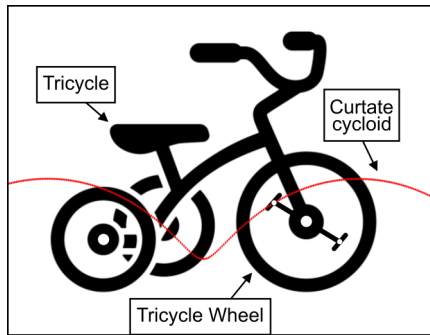


# Orion Works Sonova Quark

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## Putting it All Together, Orbital Mechanics in Stop-Motion



From Turbo #426

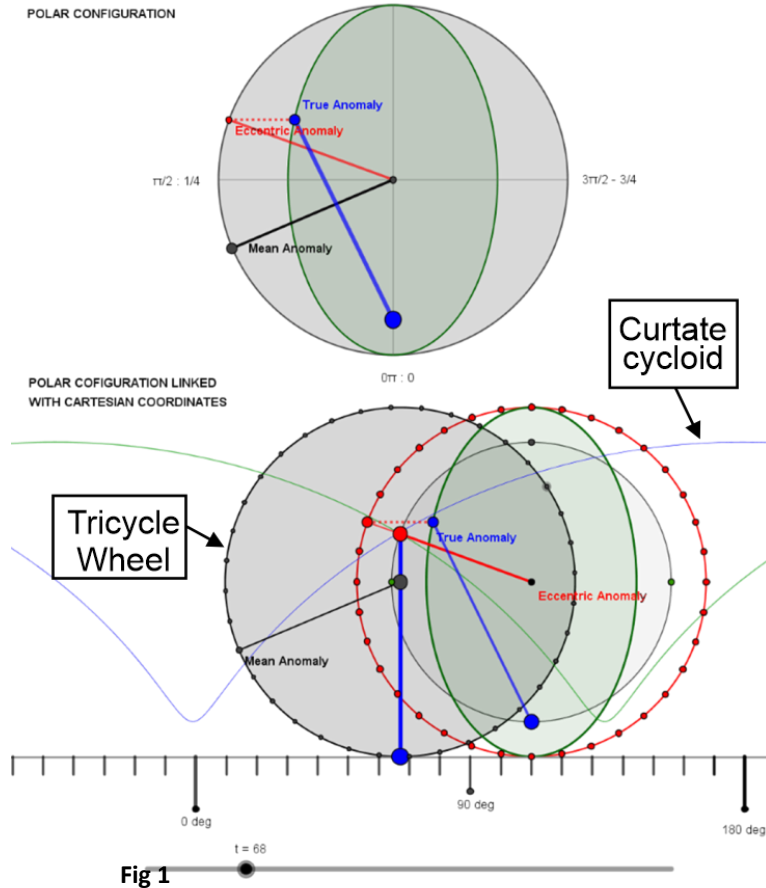


Fig 1

### INTRODUCTION: How to connect the circles and dots together

After publishing my Orbital Mechanics report in last month's TURBO edition I felt dissatisfied with the results. It might be more helpful if I attempt to visualize the subject through the use of two highly simplified stop-motion animations. Enclosed are two unique "animations", nine consecutive stop-motion images, each, on successive odd-even pages. Hopefully they will help reveal in a more intuitive way of how to plot planets and satellites following elliptical orbits. It is possible that parts of the geometry presented here may turn out to be new discoveries, particularly a back and forth "wobble" which I will go into detail later on. That said, if I do find evidence that the "wobble" had already been discovered I will certainly cite the original discoverer. I'll then probably complain for a while as to how could such an elegant "wobble" have remained so utterly buried to those of us who reside in the peanut gallery.

**Plotting the elliptical path of planets the old fashion way using the equivalent of mechanical-analog computer technology.**

For the light reader, this month’s Sonova Quark reveals two stop-motion “animations”, nine images each, placed respectively on odd-even pages. The animation on the even numbered left-sided pages is titled “**MEAN CIRCLE MOVING AT CONSTANT SPEED**”. The odd numbered right-sided pages are titled “**STATIONARY MEAN ROTATING CIRCLE**”. Each page, or stop-motion frame, represents one second of time having elapsed. A total of eight plus one extra frame, where eight seconds represents the completion of one orbital period plus an extra 9th frame duplicating the first frame. Both animations reveal the same orbital process based on the same one second time-slice. The left page animation shows a black rotating circle (the MEAN circle) moving to the right at a constant speed and rotation whereas the right page animation shows the same black (MEAN) circle stationary while rotating on its central axis at a constant speed. You are not required to understand most of the terminology or dynamics used. *All you need to focus on is noticing how the planet’s position changes based on the black circle PLUS an adjacent “wobbling” red (or green) circle that is connected in a unique way to the black circle.*

For those who might appreciate a bit more physics terminology, the animation on the odd-numbered right-sided pages reveal a red circle. (It’s green on the left). It is called the *eccentric anomaly*. Notice it speeding up at the beginning, and immediately slowing down and reversing direction by Frame 3. By Frame 5 the circle’s reversed speed is at maximum velocity. It now begins to slow down. By Frame 8 the red circle has halted it’s backward motion and quickly accelerates back to the starting point as seen in Frame 9 and 1. Meanwhile, the black circle (what is known as the *mean anomaly*) maintains a constant speed and rotation throughout the animation.

This cyclical speeding up and slowing down of the red/green *eccentric anomaly* circle is responsible for positioning a planet on an elliptical path. This is possible because the axis of the red circle is not positioned at the center. It is positioned at a mathematically pre-determined location based on the ellipse’s eccentric value, or how flattened the ellipti-

cal orbit is in the minor axis. The more flat (shorter) the length of the minor axis is the closer the axis needs to be positioned to red circle’s outer diameter. This causes the “wobbling” back-and-forth action observed in the red/green eccentric circle relative to the black circle whose axis traditionally remains centered in the middle. The black circle also maintains a constant speed and rotation. T

There is one more crucial detail that needs to be addressed. The red/green circle’s *eccentric anomaly* axis needs to be “physically” connected to the black *mean anomaly*’s centered axis. Doing so determines how to precisely (and mechanically) adjust the eccentric circle’s “wobble” forward or backward. *The red/green circle appears to speed up and slow down, but it’s offset axis maintains a constant horizontal speed that precisely matches the constant forward speed of the black circle’s centered axis. Taking advantage of this connection configuration is how one can start constructing a mechanical computer mechanism that can predict the position of a planet following an elliptical path around a star. All that is left to construct is a horizontal slot that moves a hidden pin attached to the red/green circle that horizontally repositions an extruding pin that physically follows an elliptical path. See the horizontal dashed line which represents the horizontal shifting of a planet’s Eccentric circular position to the planet’s True elliptical position*

Granted, computer programs can number-crunch and display the result in nanoseconds. But to the best of my knowledge I don’t think anyone has successfully built a mechanical mechanism that can handle the eccentricities involved in the positioning of a planet following an elliptic path. The closest representation I have found is the mysterious *Antikythera mechanism*. (see images on page 3) It was constructed more than 2000 years ago, and then lost to the seas due to a storm near Greece. While significant progress has been made in recent years uncovering the alleged purpose of various internal gears, via new and improved X-ray CT technology, its intricate design is still capable of baffling researchers. While amazingly accurate, especially considering how ancient it is, the internal cogs and wheels appear to reflect a geo-centric based universe where Earth is at the center of everything and all the stars and planets rotate around Earth, presumably in perfect circles.

I feel like apologizing for spending two consecutive TURBO

issues on this particular subject. It might help to realize that early in my adult life I got hooked on the conundrum of why planets orbit the way they do. I was an itch I could not satisfy. I sensed there remained some big holes in explaining the mechanics of eccentric orbits. For some arrogant reason which I have yet to adequately comprehend I felt I was the man to fill in some of those holes. Through the decades, as my knowledge base increased, there were times where I believed I had discovered something new, only to realize it had already been discovered by giants



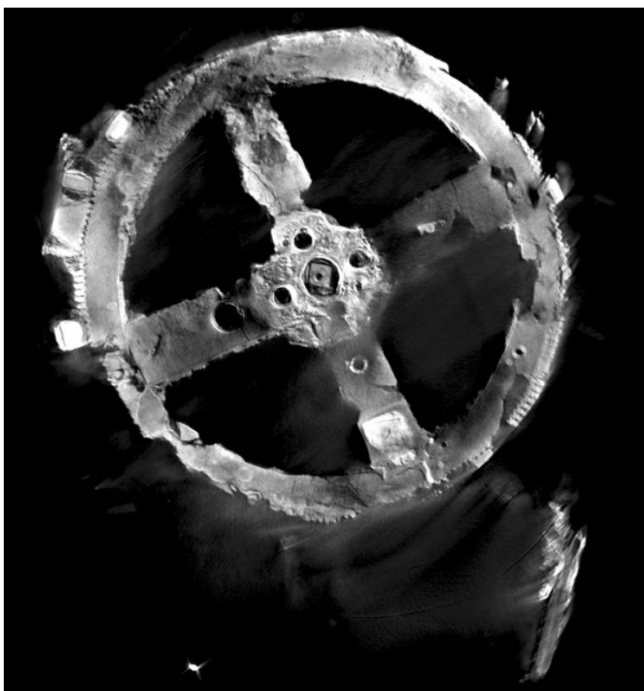
The Antikythera mechanism was an ancient Greek analog computer used to track and predict celestial motion. Pieces of the device at the National Archaeological Museum in Athens, Greece, are seen here.

Joy of Museums/Wikimedia Commons



This exploded view shows what the Antikythera mechanism might have looked like. Here, the front plate (left) includes zodiac and calendar dials, as well as seven pointers. The back plate (right) has spiral scales for displaying solar and lunar eclipses and more. A new reconstructed view of the device featuring a revised front plate is expected to be published soon.

© 2012 Tony Freeth



X-ray CT allows researchers to take slices of the mechanism's fragments. This view shows the so-called "chariot wheel" gear of fragment A. Antikythera Mechanism Research Project

centuries ago. I consoled myself with the realization that at least I was at on the right path.

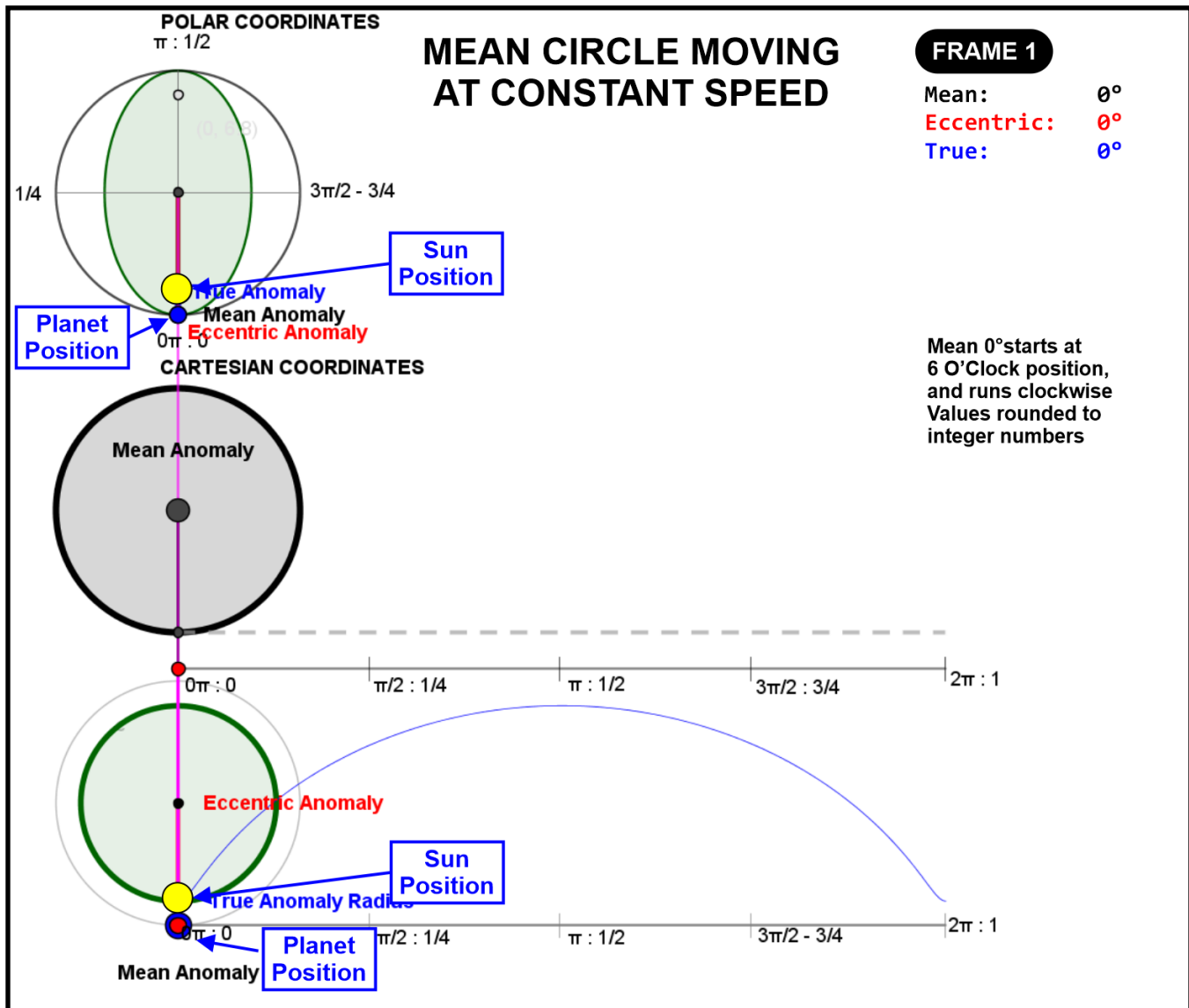
Things got really interesting after I retired and had time to whittle away at the problem in earnest. I continued hacking my way through the data, following leads, *often in complete ignorance* of what had already been discovered long ago. My ego-centric approach may have caused me to occasionally forge new paths that had not been adequately explored before. I have no doubt that had computers been available centuries ago

what I suspect I might have discovered would have already been uncovered and written up centuries ago. The moral of the story: Perhaps a little bit of ignorance can occasionally turn out to be a useful teacher, if taken in small doses.

The reproduced images from this page came from *Astronomy.com*, the magazine. Perform a web search on "Antikythera mechanism". It's under the link titled "Dissecting an ancient computer".

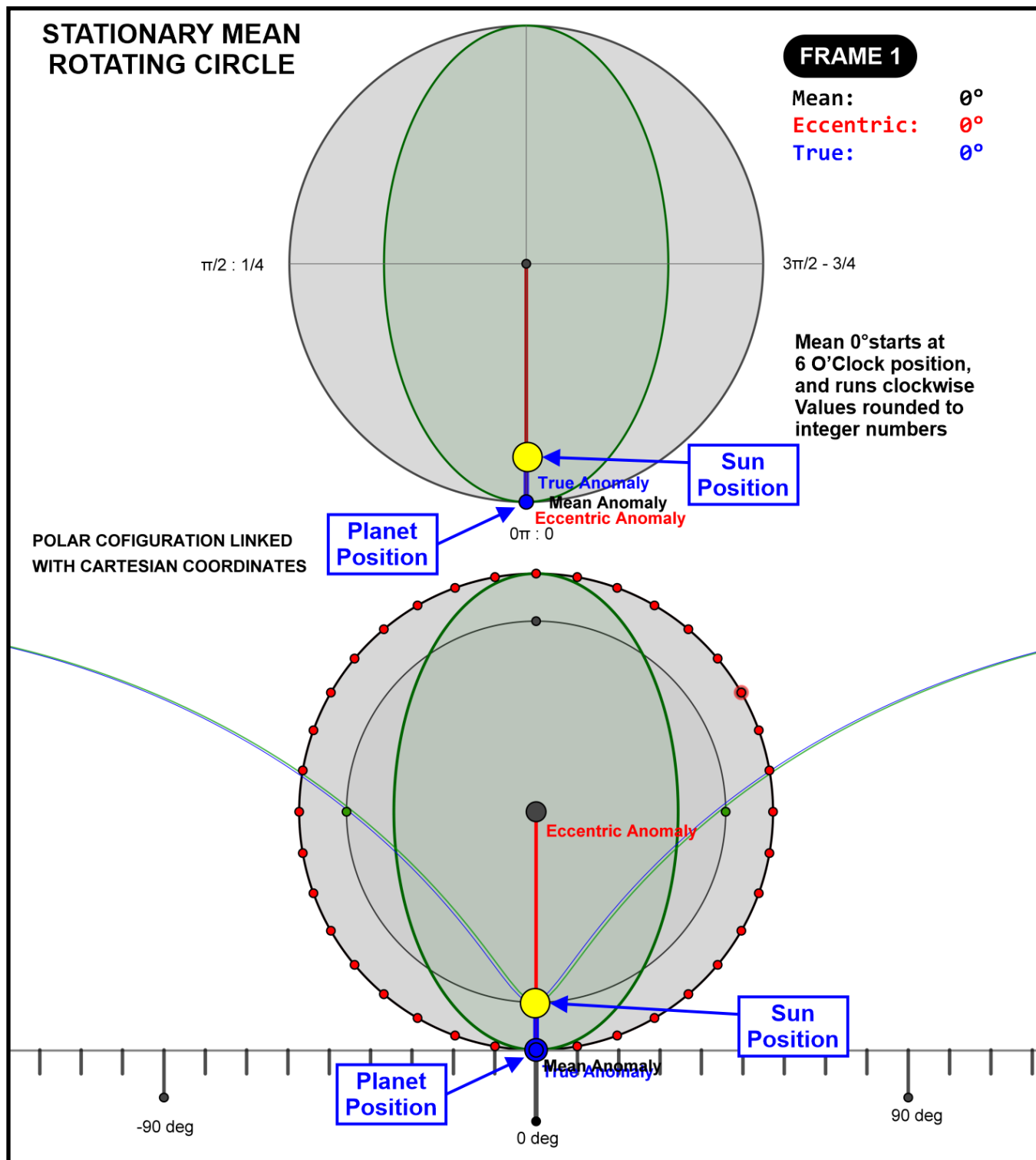
Again, I hope readers enjoyed my crude computer generated animations. Imagine if Kepler, Newton, or Maxwell had personal computers to play with. I wonder if space-ships utilizing anti-gravity fields would now exist, and we might be navigating the entire solar system and perhaps beyond. "So... you are our new neighbors. Here's our handbook on interstellar etiquette. You will be tested."

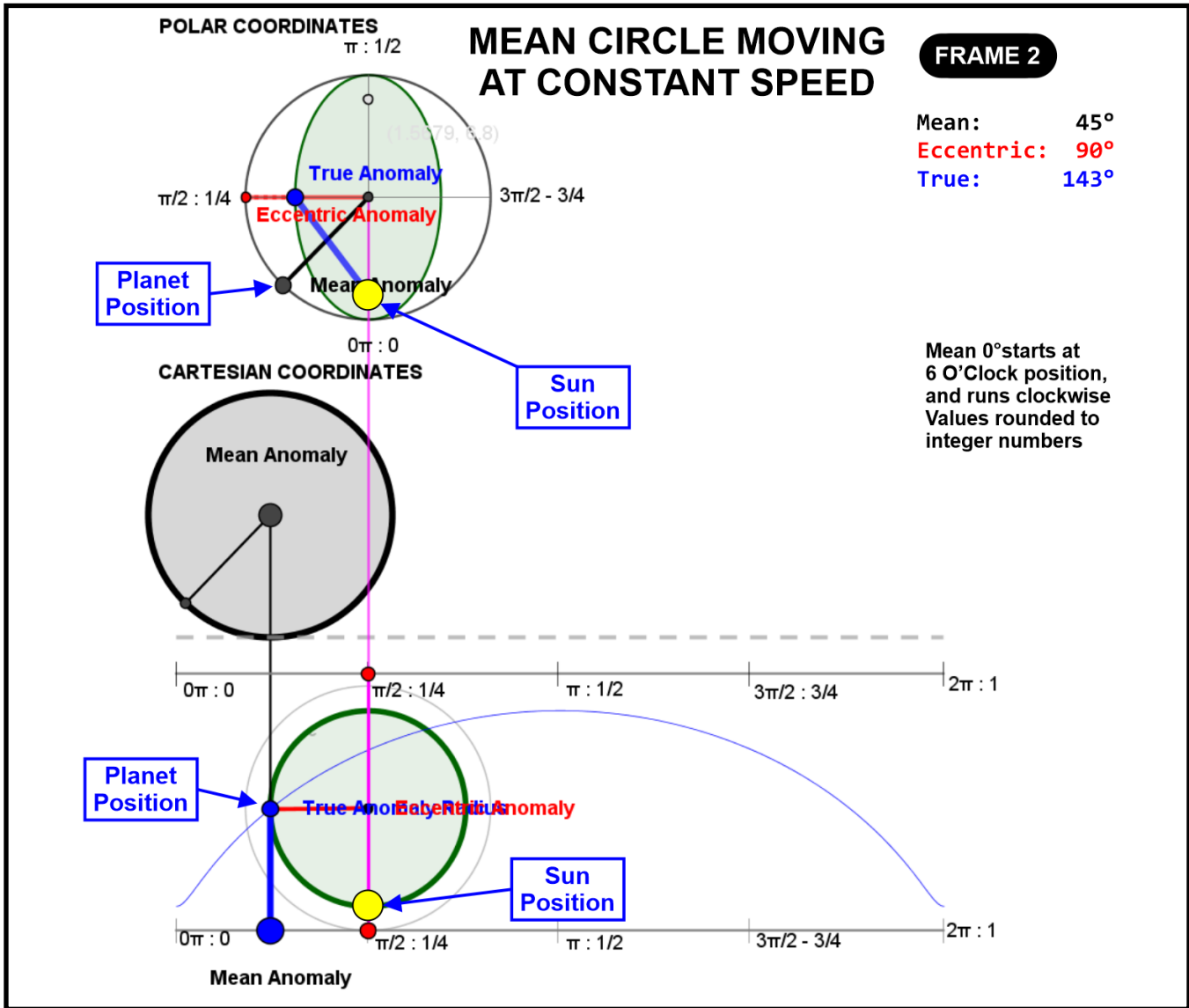




Chin to chin.

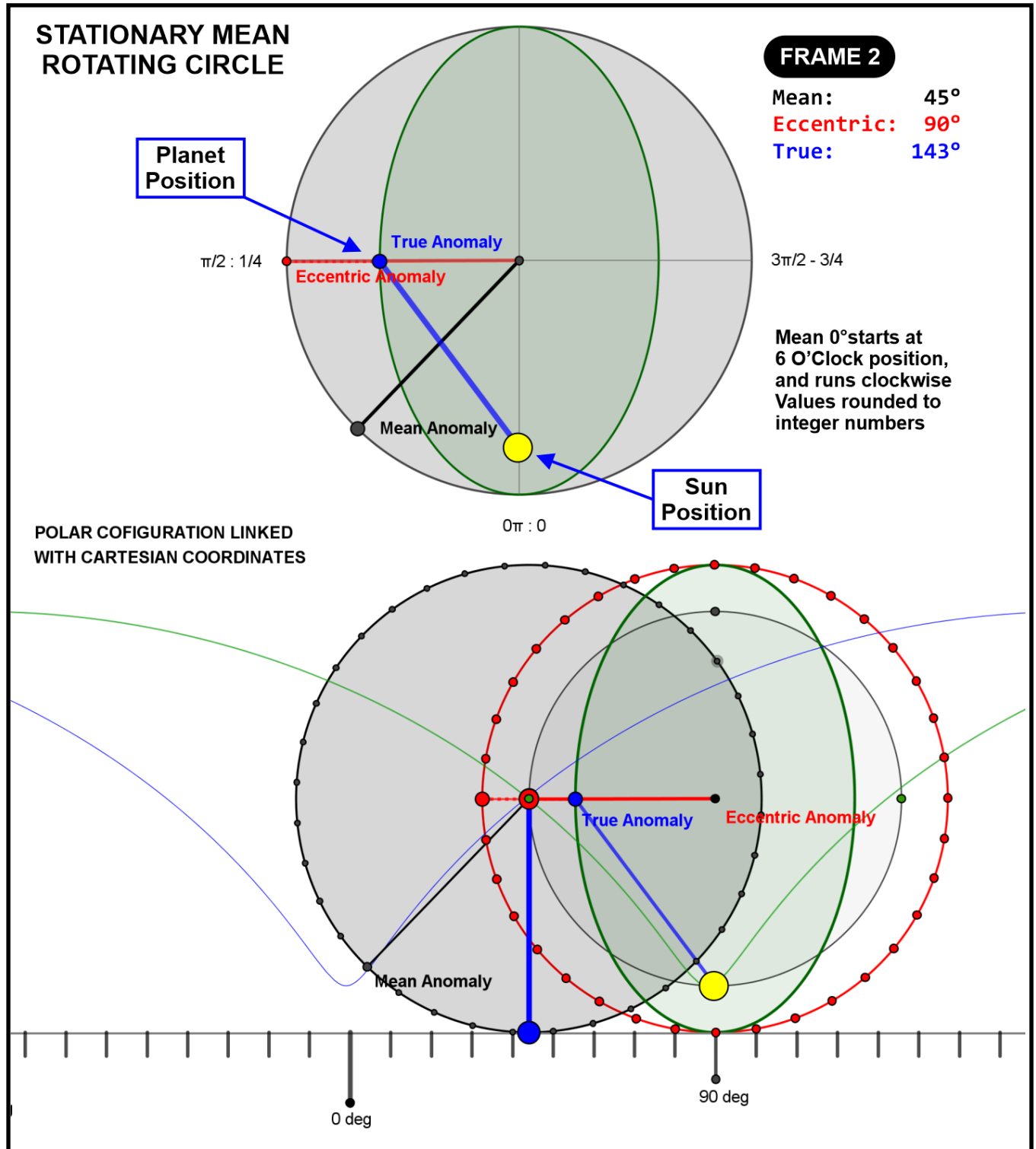


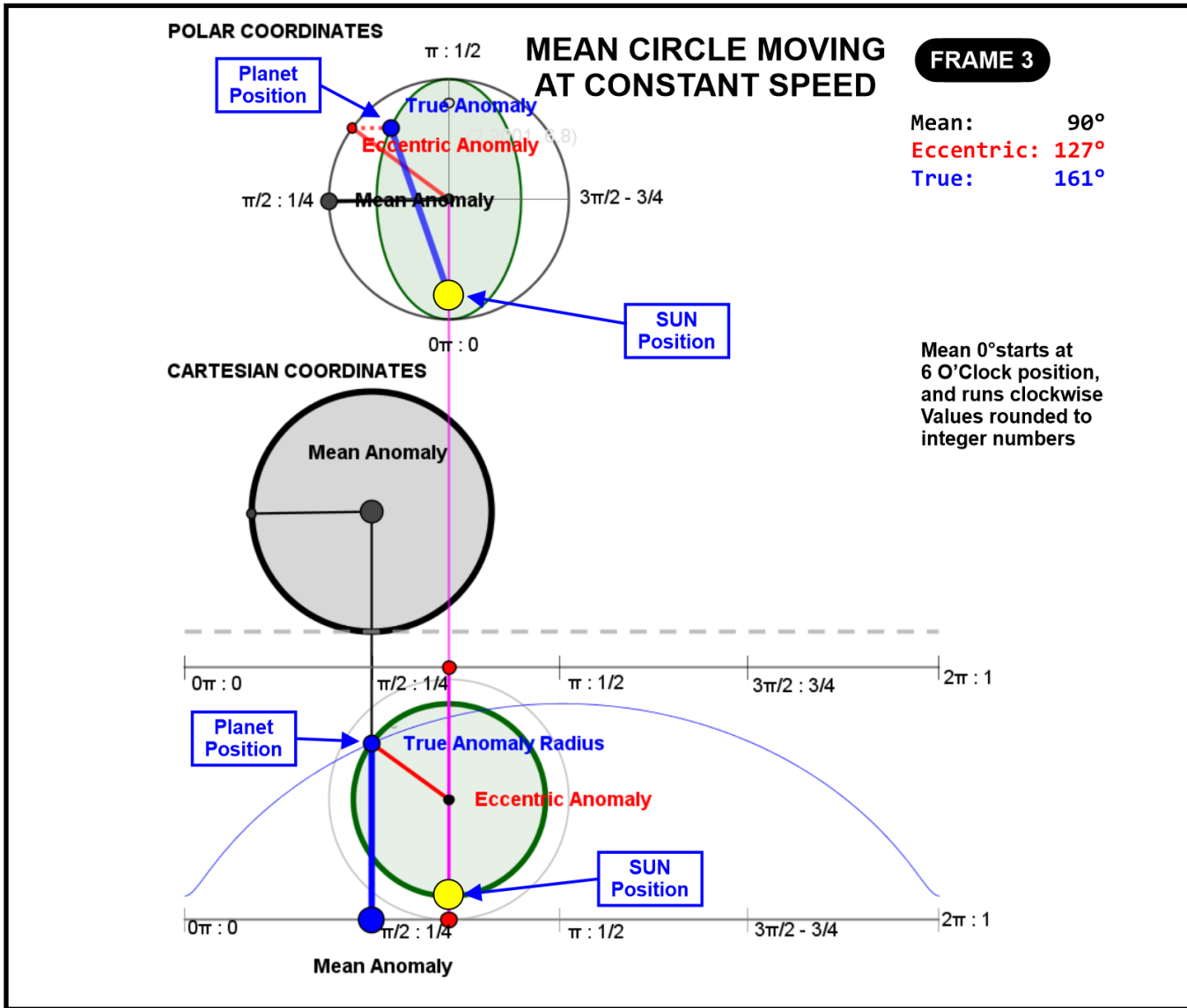




Detente

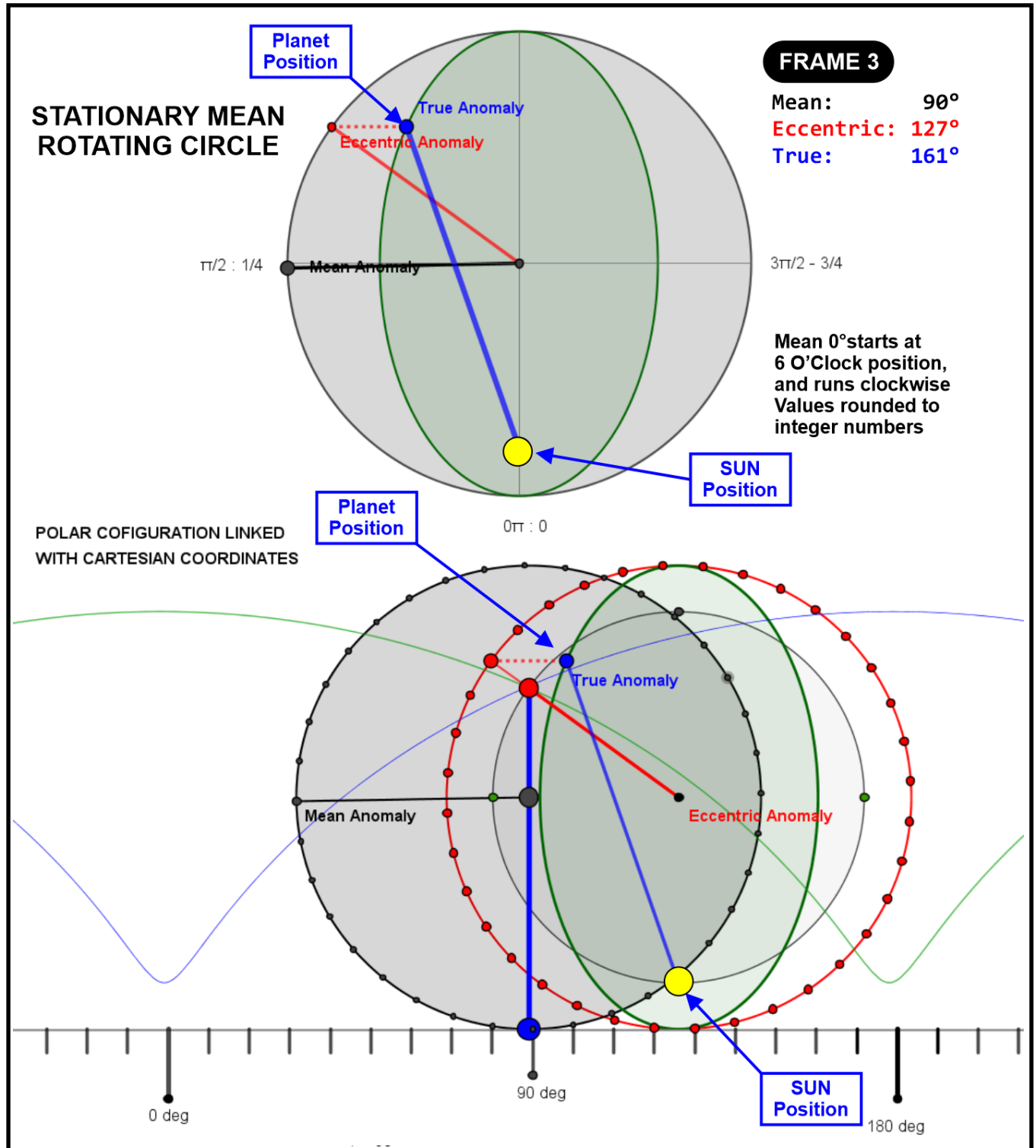


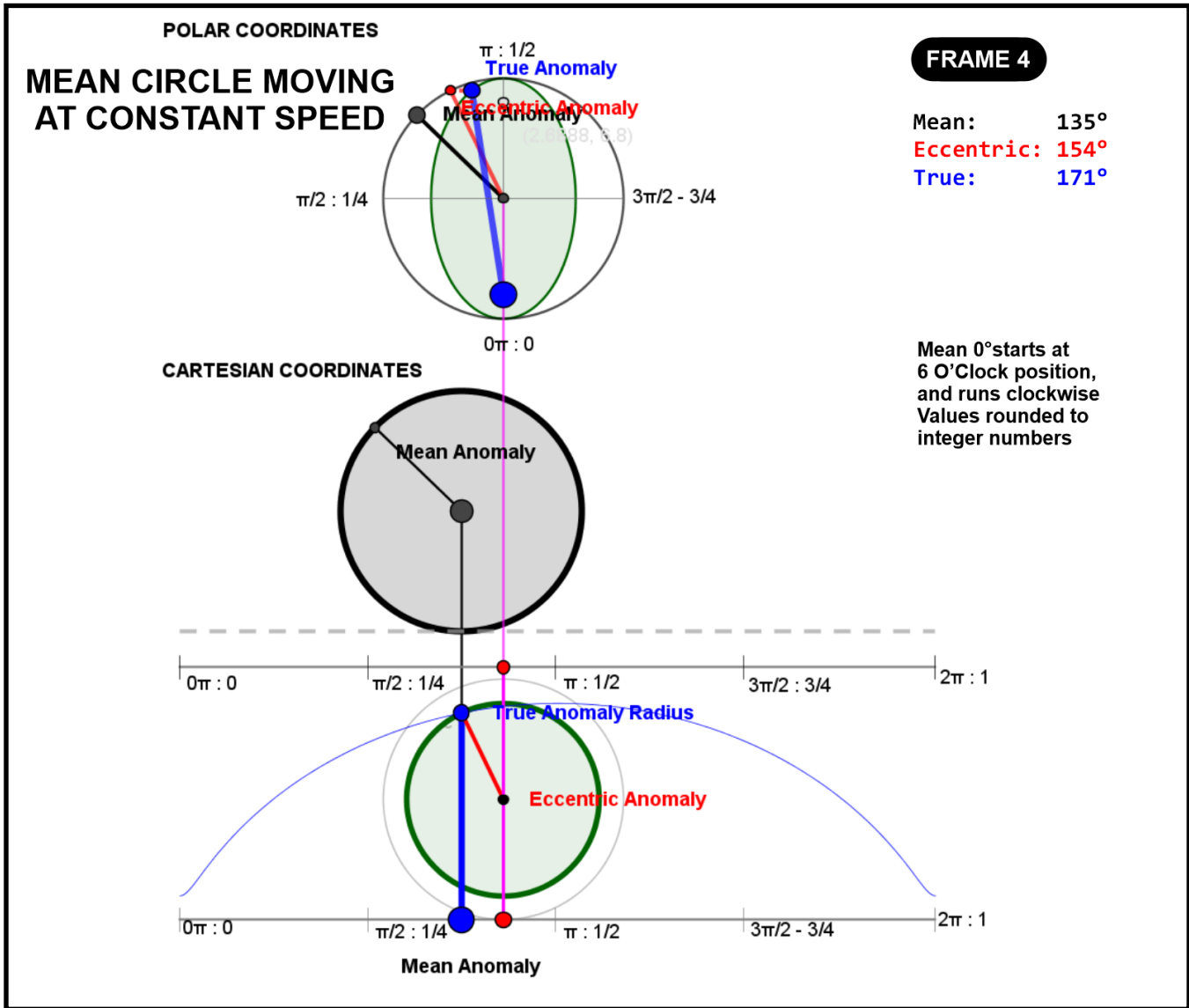




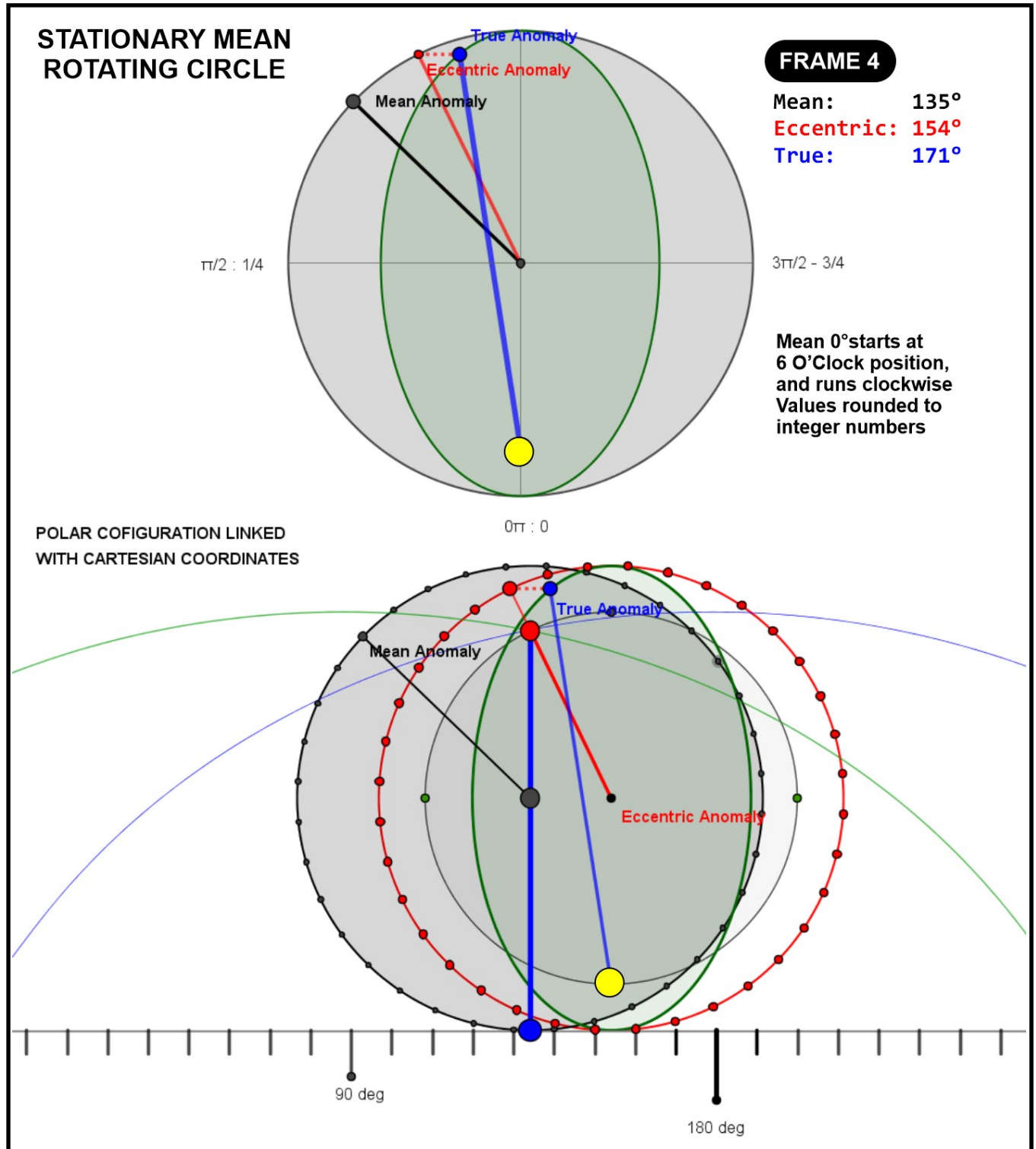
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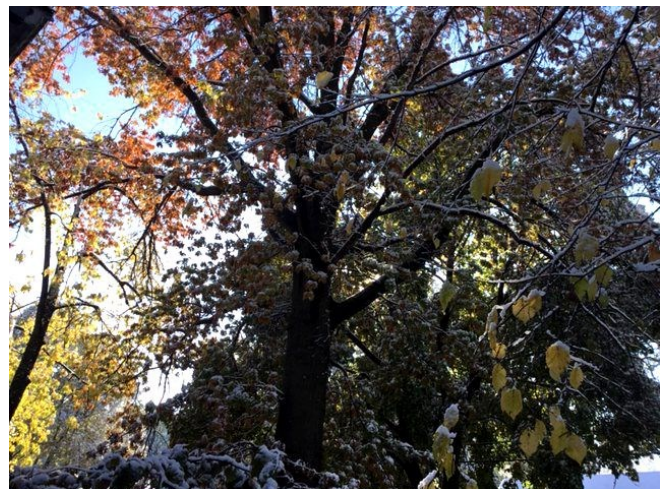
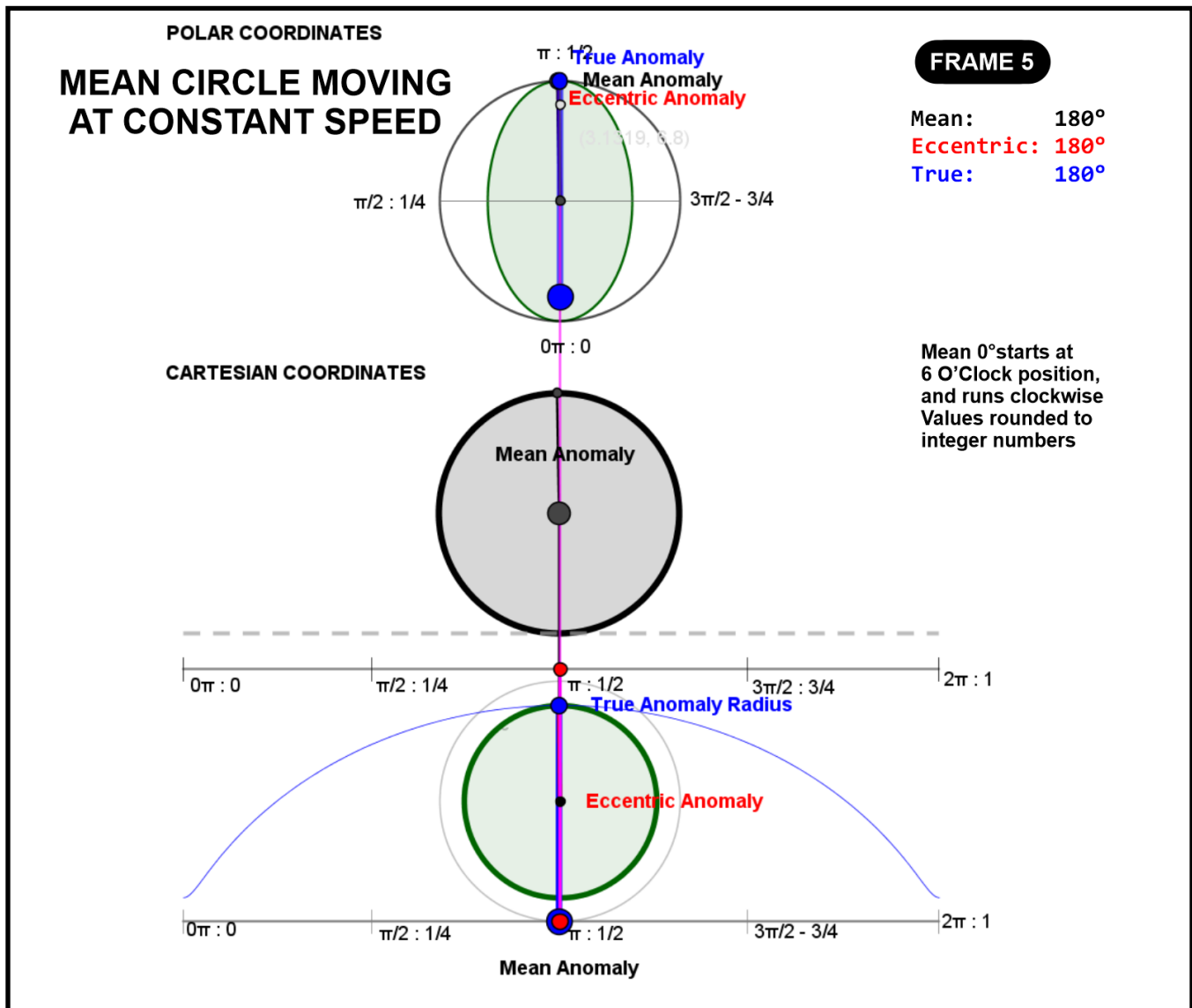




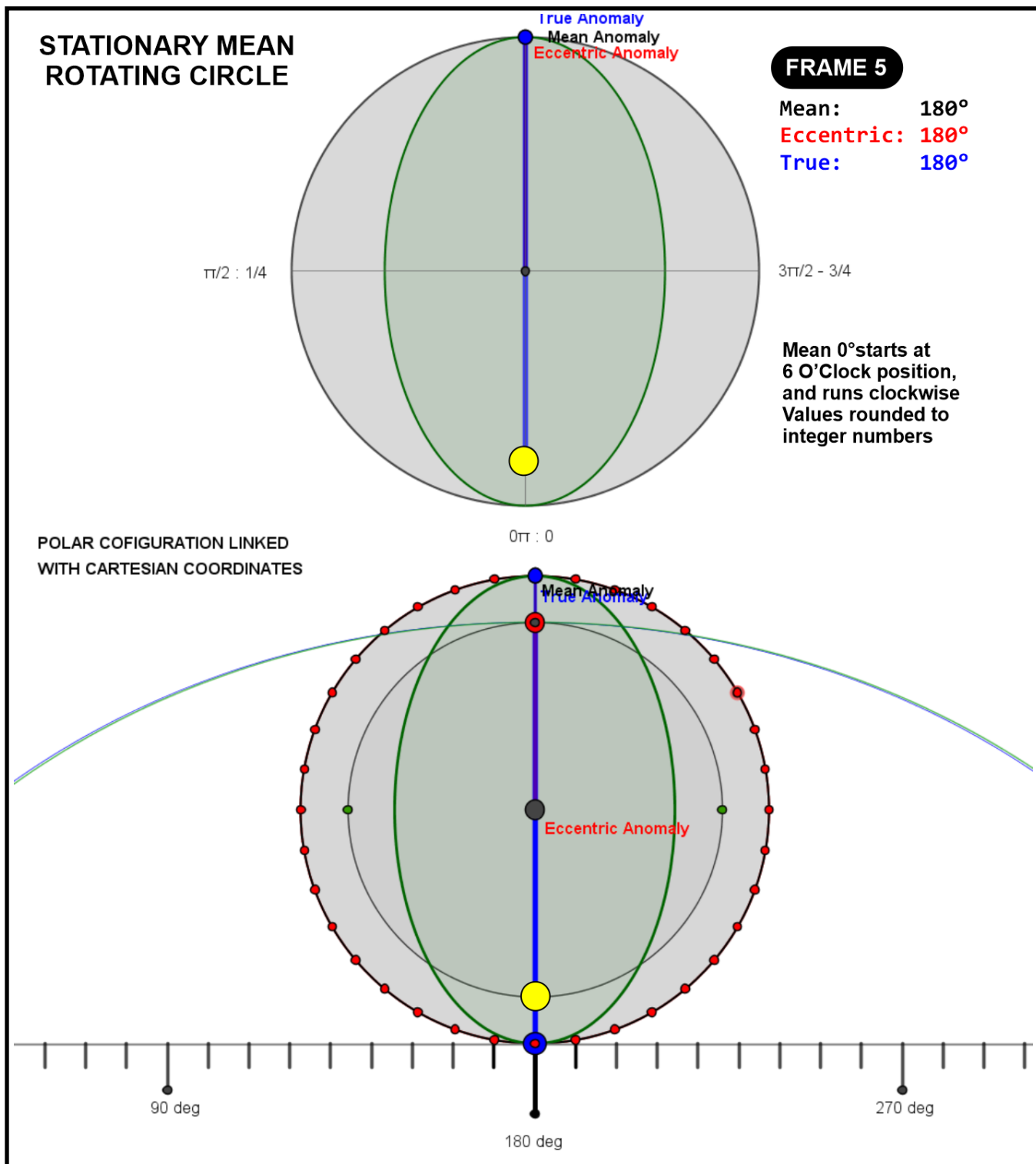
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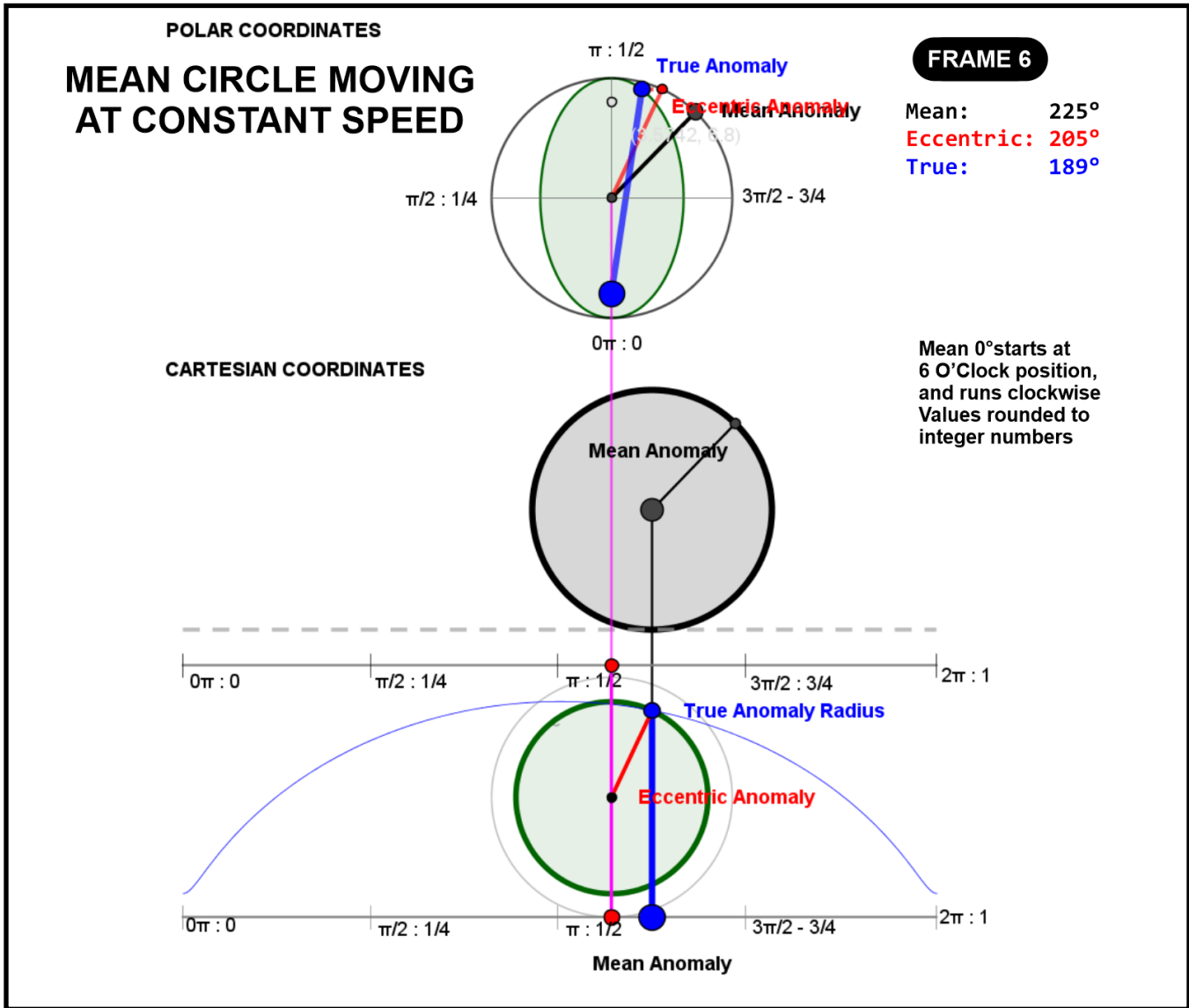




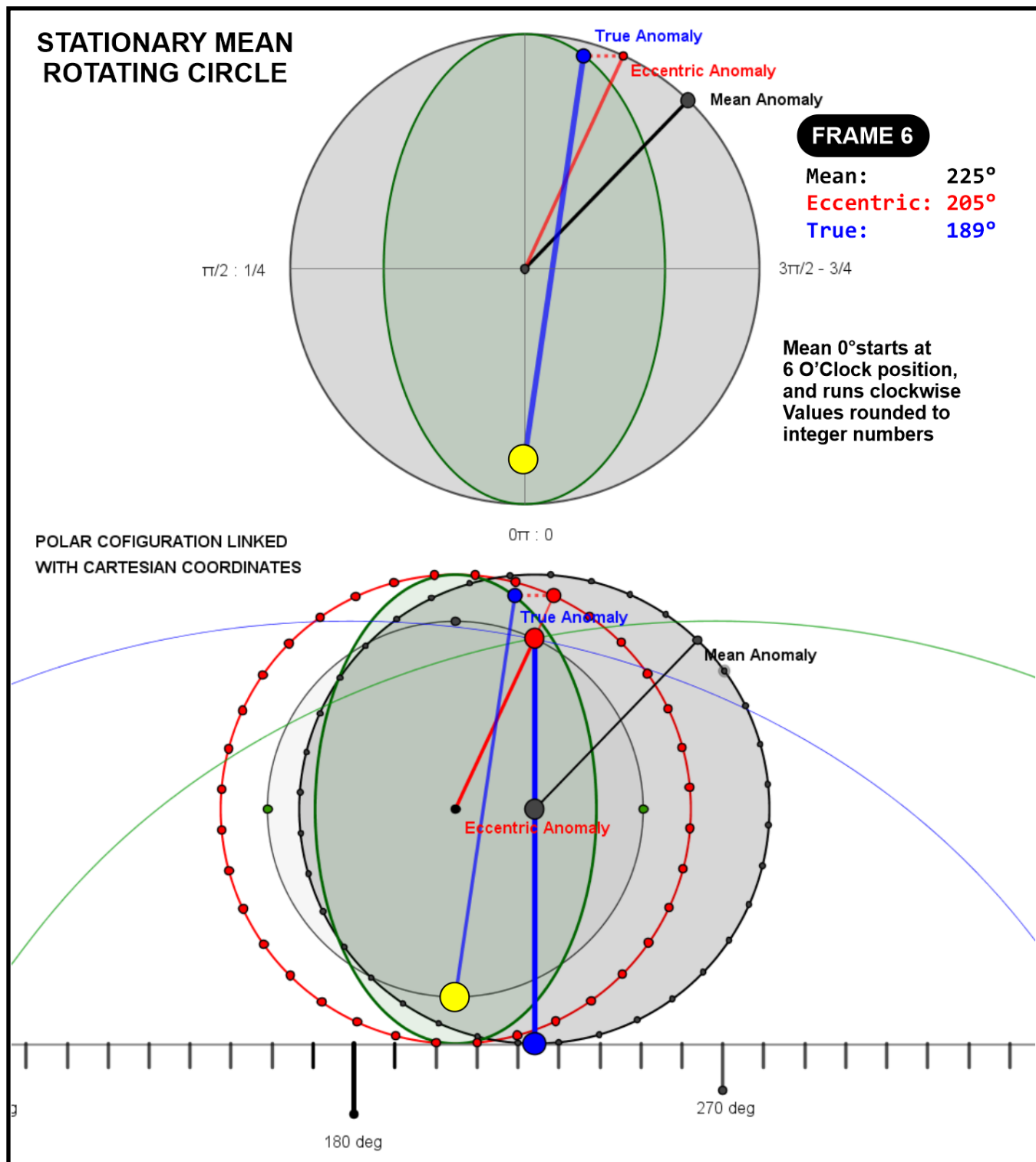
First Snow

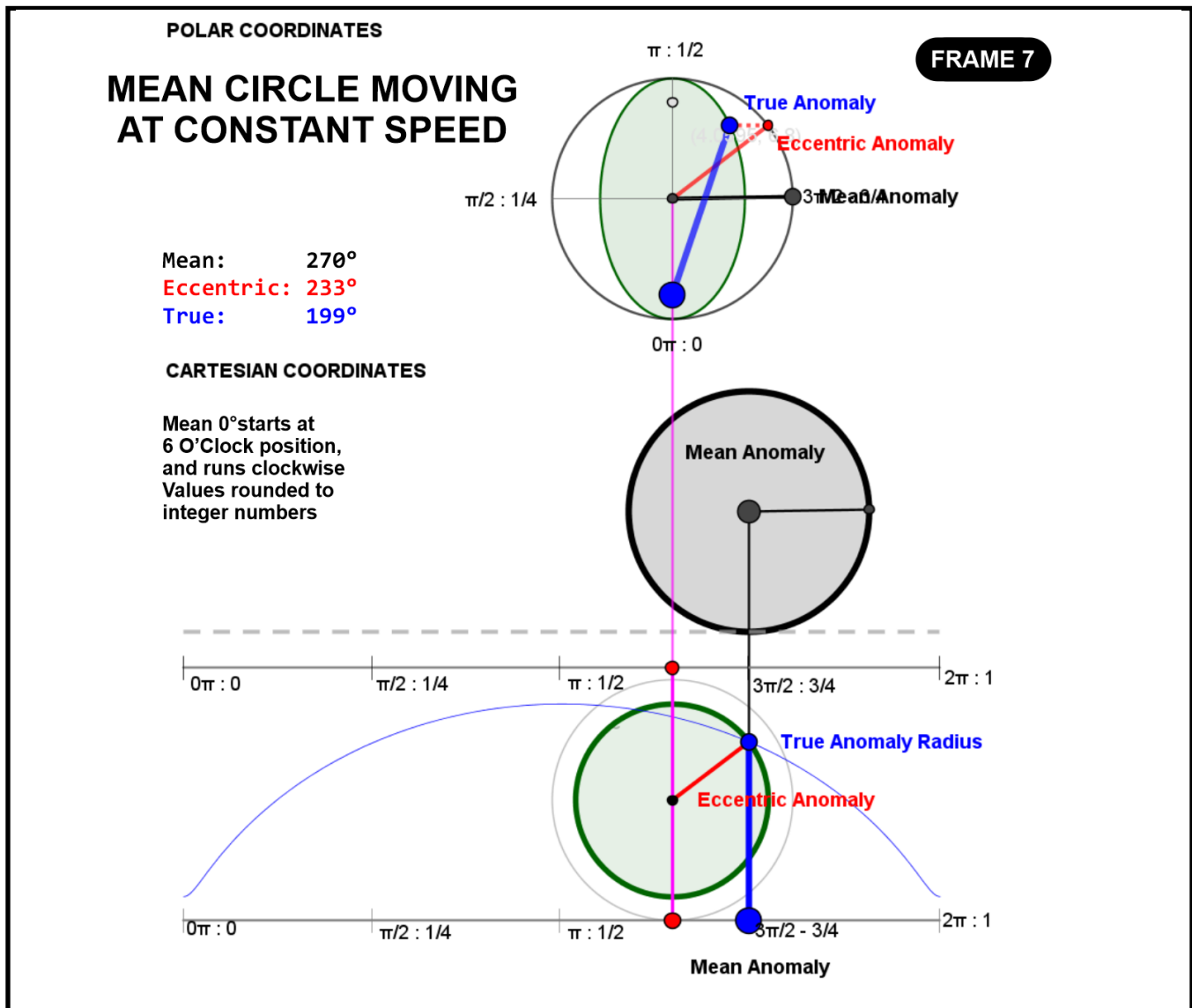






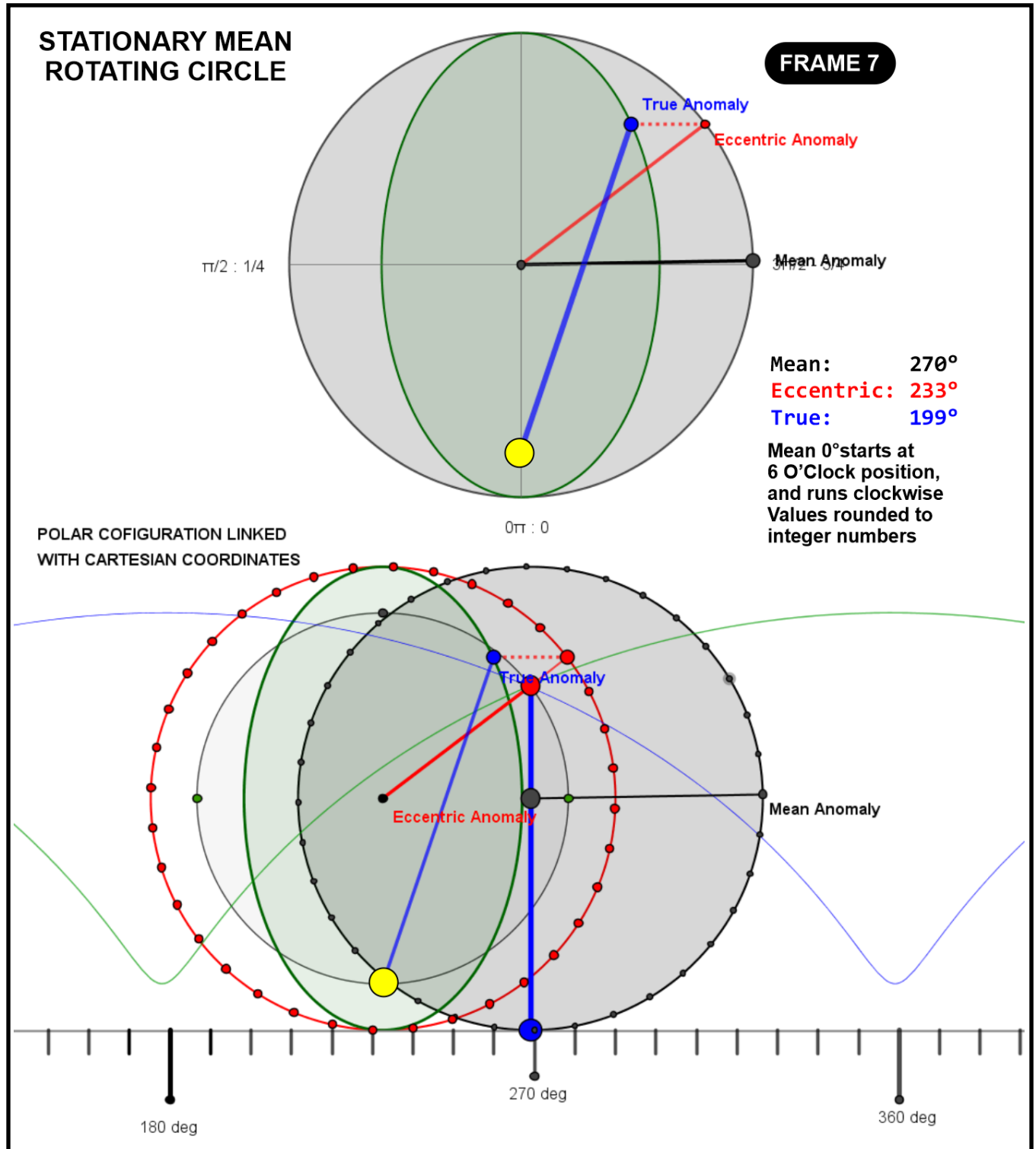
Lunch under the sunroof

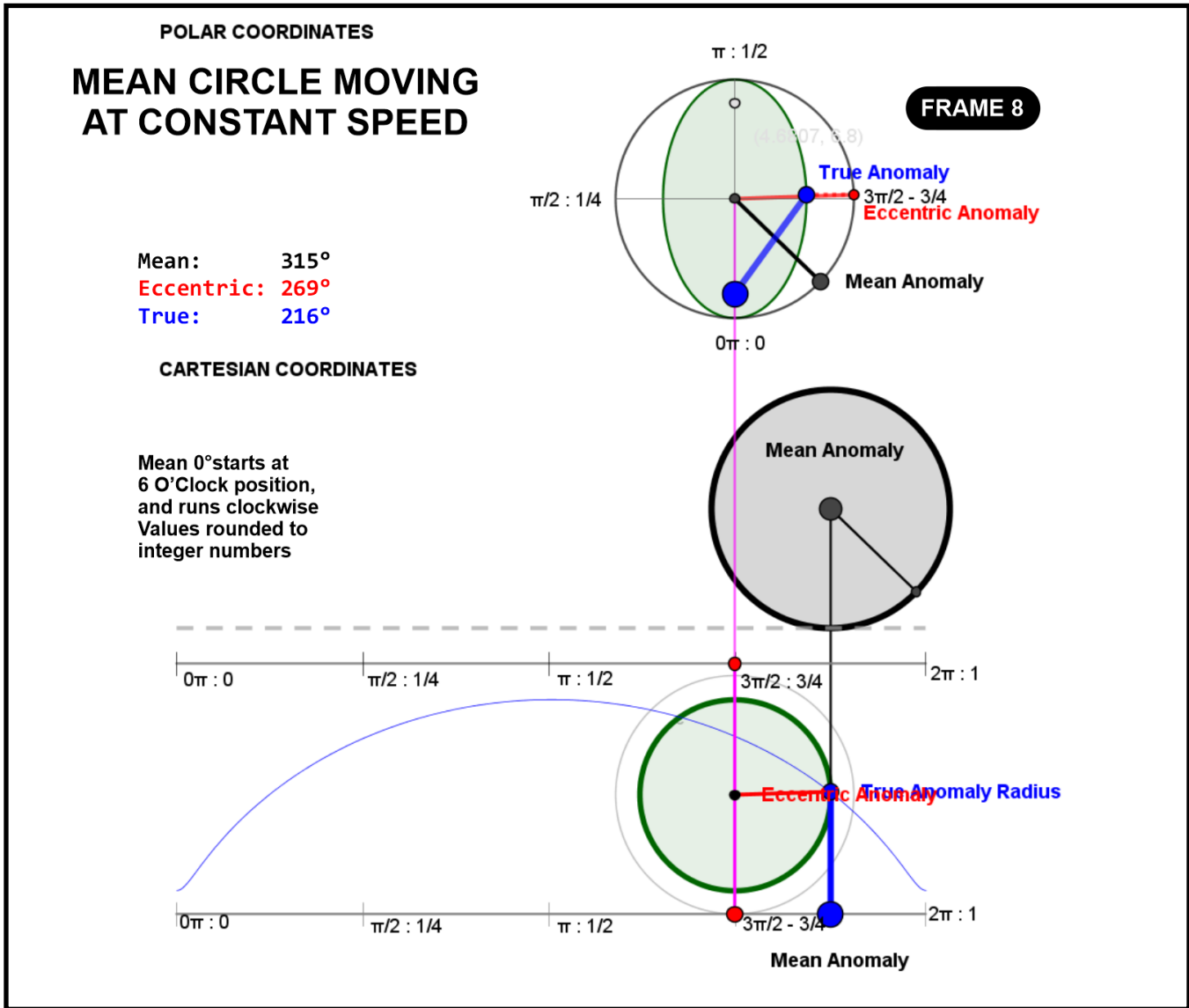




Stick and feather play







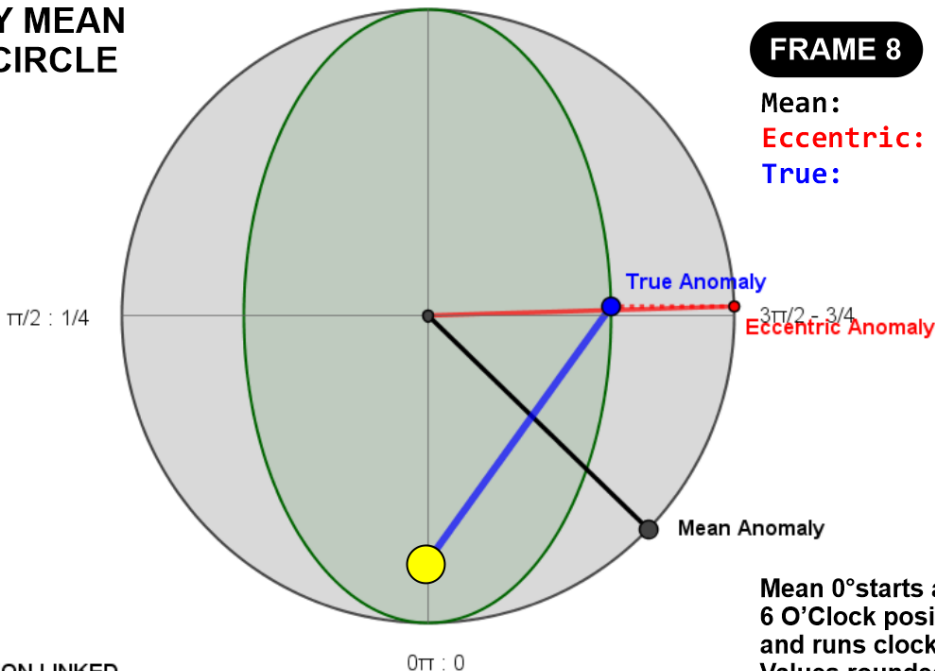
Charm guarding a valuable cash crop.



### STATIONARY MEAN ROTATING CIRCLE

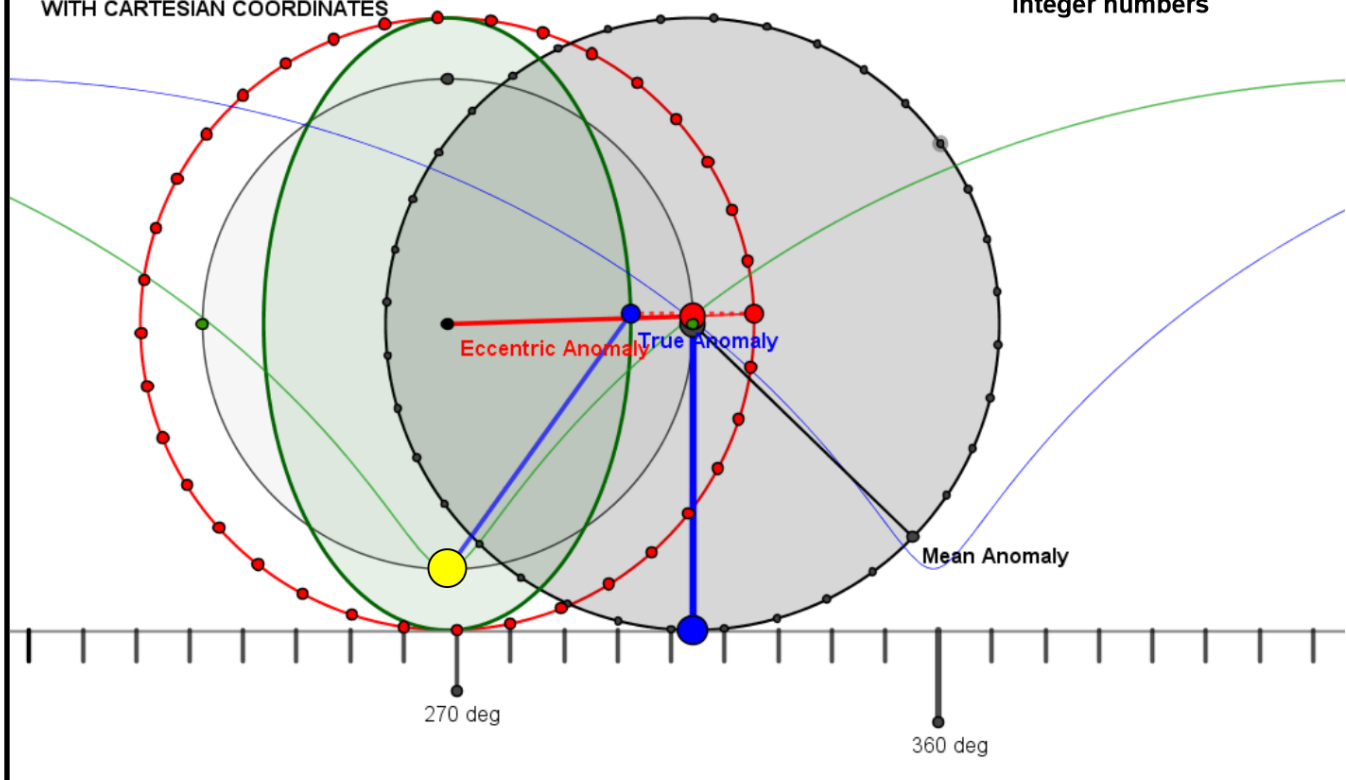
**FRAME 8**

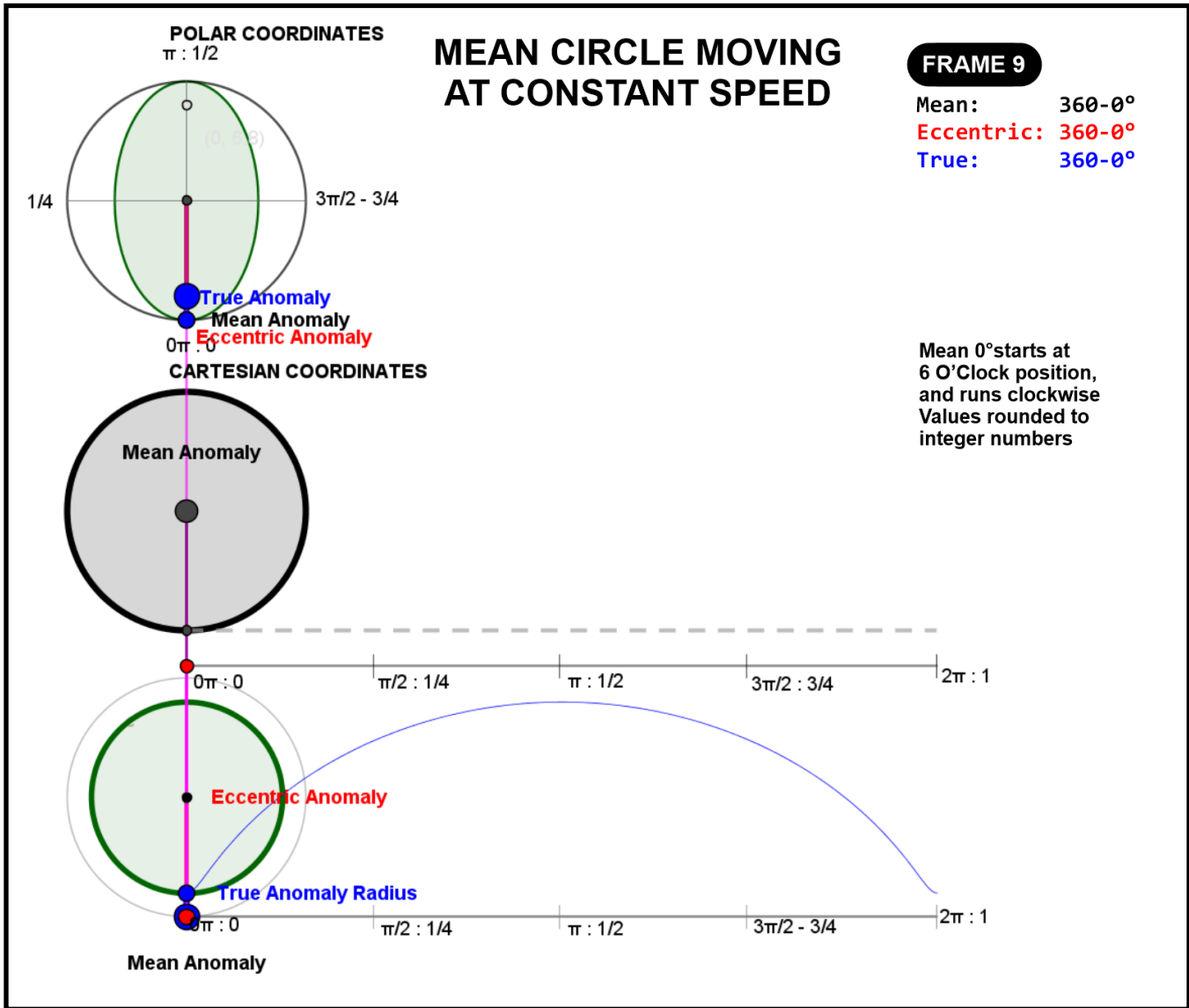
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Eccentric: 269°  
True: 216°



Mean 0° starts at  
6 O'Clock position,  
and runs clockwise  
Values rounded to  
integer numbers

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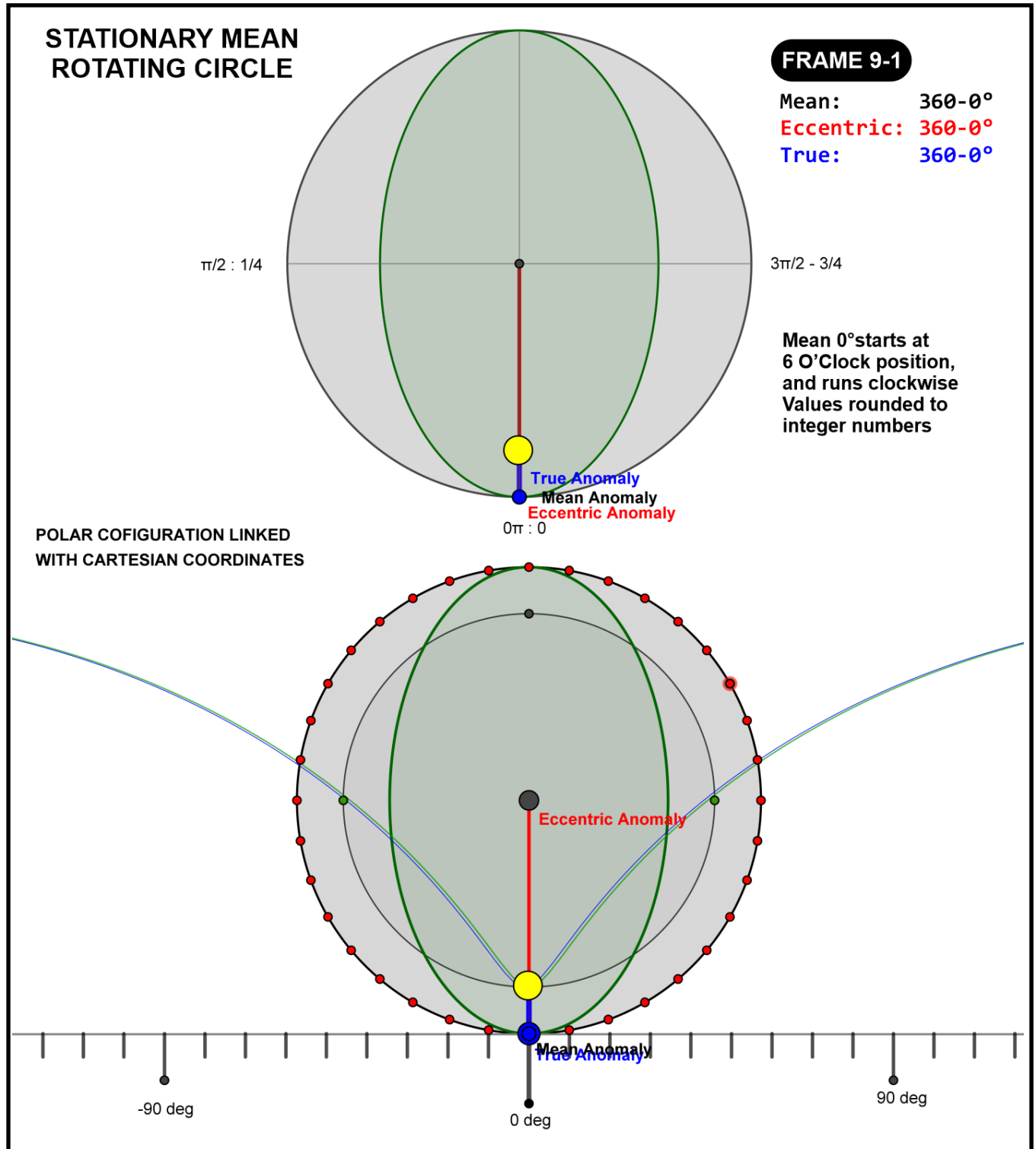




Peek a



Boo!



**Final Comments**

TURBO readers are now up-to-date with a significant portion of my Orbital Mechanics research. Another reason I have continued work on this project, perhaps incessantly, is because it has been immensely beneficial as I continue working through anxiety attacks that started to plague me over a year and a half ago. While EMDR therapy continues to be very beneficial, getting back in the saddle is the best remedy of all. Making TURBO contributions is helpful too.

It's been more than two years since I had my prostatectomy. My PSA levels remain undetectable. My surgeon recently informed me that checkups are now only necessary every six months, instead of three. This all continues to be the best kind of news I could receive.

Or



Zoey wants to wish everyone a Happy New Year, and a little more to the left, please.

**Correspondence**

**Georgie:** I appreciate the progress/status report you have given us. It helps to put into perspective the inevitable close encounters with mortality that none of us can escape from. I wish you a continued full recovery. I feel you have creative endeavors still left to explore and reveal to us, and to me. Over the decades I have enjoyed your unique sense of literary and visual humor filled with pragmatic insight. Omicron appears to be on the precipice of entering it's final encore of fading away into the night. It seems to be following a familiar process of eventually mutating into a less deadly endemic life-stage where annual flu shots will be all we'll need to concern ourselves with. It has been too long where the complicated extended family ties and relationships that make up TURBO, SF3, and the entire Science Fiction & Fantasy community could only be shared through virtual means. Soon will be able to see, feel, and actually touch one another again. In the flesh. Soon.

Or