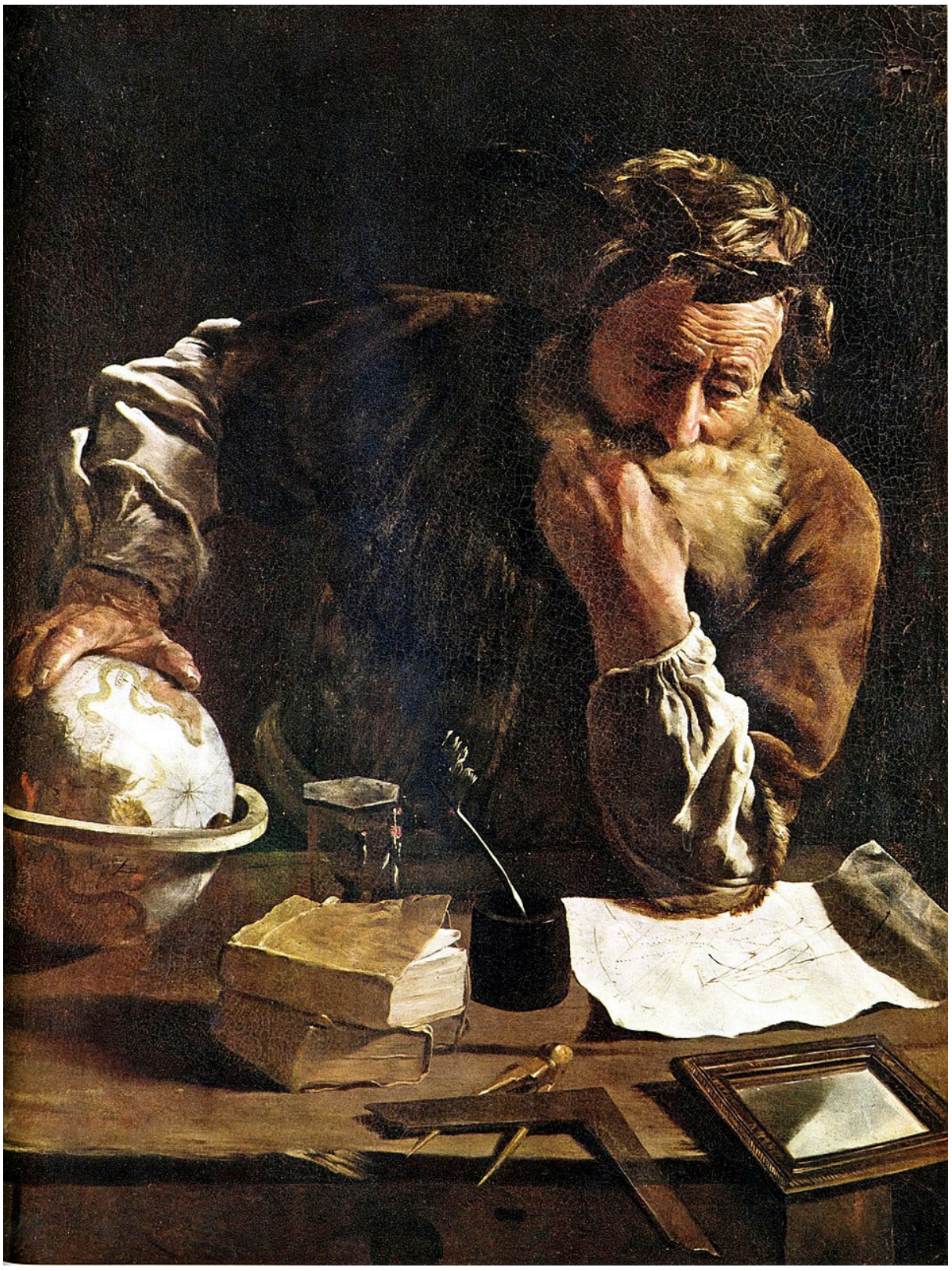


Archimedes (287-212 BCE)

I am going to be scaling the intelligence of Archimedes, like showcasing his feats, based on some pretty well explained videos by Ben Syversen and also other sources, like from Wikipedia articles.



How Archimedes Almost Broke Math with Circles

In the 3rd century BC, Archimedes proved the area formula of the circle. This was a very big challenge back then because a circle is curved and this was 2000 years before stuff like calculus was invented. Back then, they could only find areas of shapes with straight lines, sure some breakthroughs regarding circles had been made by people before him, but none found out how to derive its area. He also identified pi as we know it today.

Archimedes did this by dividing a circle into pieces and realized that the more slices he cut the circle into, the more and more it would resemble a rectangle with lengths of half a circumference and the radius. From what he saw, the circle would be a perfect rectangle with side lengths C/2 and R. So ofc the formula would be A = R*(C/2) aka A = R*Pi*R = Pi*R^2, the formula we know today.

However, this did cause a paradox because well wouldn't an infinitesimal slice of something be 0? How can it be anything other than 0 and if they weren't each 0, wouldn't adding an infinite amount of them give infinity? That is what the ancients had a problem with. Another strange thing was how a collection of infinite things added up to a different number compared to a collection of other infinite things.

Archimedes thus decided to technically use infinity without using infinity. He decided to do his proof instead of a method by Eudoxus, aka the method of exhaustion, showing the area of the circle was neither bigger than the rectangle nor smaller than the rectangle and therefore had to be the exact same size.

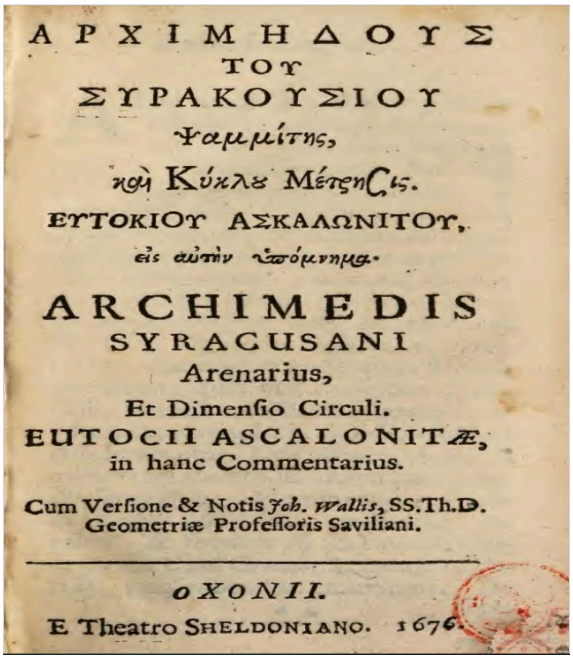
Archimedes actually formed the sectors of his circle from a right triangle, not a rectangle, so he technically did it in a way that is harder to visualize for us, according to the creator. Still though, he did it in a way that we would consider unconventional, as most of us would know of only the way to do it with rectangles, not right triangles.

It was only until the 16th and 17th century in Europe that major intellectual figures engaged with the idea of the infinitely small, as his works were either lost or just not that spread, but detractors still existed and the Jesuits wanted to ban the concept from ever being taught.

Keep in mind, this concept, the method of exhaustion and the infinitely small slices of circle that were used by Archimedes were actually sort of precursors to calculus. Newton would develop calculus based on intensive study of the works of Archimedes, which did show the fact that they did have a role of being precursors to calculus and sort of introduced notions that would be used in it thousands of years before. Newton stood on the shoulders of Archimedes.

Also using the method of exhaustion, he created a shape with 96 sides and narrowed the value of pi to be between 3.1408 and 3.1428. With the method of exhaustion, he also used to narrow down the value of the sqrt(3), concluding it was between 1.732026 and 1.732051. That is how close he was.

(VSI, FRI, WMI, CPI, Abstract Thinking, Systematic Thinking, Decompositional Thinking, Analogical Thinking, Linear & Non-Linear Thinking, Deductive Reasoning, Inductive Reasoning, Abstract Reasoning)


ΑΡΧΙΜΗΔΟΥΣ
ΤΟΥ
ΣΥΡΑΚΟΥΣΙΟΥ
Ψαμμίτης,
καὶ Κύκλου Μέτρησις.
ΕΥΤΟΚΙΟΥ ΑΣΚΑΛΩΝΙΤΟΥ,
εἰς αὐτὴν ὑπόμνημα.

ARCHIMEDIS
SYRACUSANI
Arenarius,
Et Dimenſio Circuli.
EUTOCII ASCALONITÆ,
in hanc Commentarius.

Cum Verſione & Notis *Joh. Wallis*, SS.Th.D.
Geometriæ Profeſſoris Saviliani.

OXONII.
E Theatro SHELDONIANO. 1676.

The Sand Reckoner

https://en.wikipedia.org/wiki/The_Sand_Reckoner

Archimedes set out to figure out the number of grains of sands that would fit inside the entire Universe. However, he soon faced a problem. The first problem was that the counting system of his time just could not create such large numbers. It could go only up to a myriad, aka 10 000.

To solve this problem, he used the fact that by utilizing the word myriad, he can make a number that is called a myriad myriads, or 10^8, so roughly 100 000 000. So Archimedes then called the numbers up to 10^8 the first order and 10^8 itself the unit of the second order. Multiples of the unit became the second order, so for example 10^8*10^8 = 10^16. This 10^16 became the unit of the third order whose multiples were the third order and so on. Archimedes continued naming numbers in this way up to a myriad-myriad times the unit of the 10^8-th order so (10^8)^(10^8).

After having done this, Archimedes called the orders he had defined orders of the first period and called the last one the unit of the second period. He then constructed the orders of the second period by taking multiples of this unit, just like how he did with the unit of the first order and so on. He then arrived at the myriad-myriadth period. The largest number constructed by Archimedes was the last number in this period, which was roughly equivalent to 10^(8*10^16), which would be 10^(80 000 000 000 000 000), an insanely large number, that basically makes the number of atoms in the universe look like nothing in comparison.

(VCI, CPI, WMI, FRI, Fluid Intelligence, Inductive Reasoning, Decompositional Thinking, Analogical Thinking)

Along the way, he also discovered the law of exponents and proved said law, aka b^m*b^n = b^(m+n), necessary to manipulate the powers of some base b (b = 10, powers of 10, in our case).

(FRI, VSI, WMI, Systematic Thinking, Decompositional Thinking, Deductive Reasoning, Fluid Intelligence)

To actually estimate the size of the Universe, he actually used the heliocentric model of Aristarchus of Samos. He must have known the geocentric model to be wrong before Copernicus did in the 1500s or that it would not have been useful for his problem at all, which still meant it was inferior anyway, so he had thought ahead of his time on this.

To be honest, he had a lot of constraints, after all, they did not know the size of the Universe, nor did they know the size of really anything, let alone the Solar System, like keep in mind their astronomical knowledge was far more limited, so of course Archimedes did show limited knowledge when you will see the result, but he still managed to get a decent result for someone who lived in the Ancient Greek times.

He had to make assumptions, that were just out of thin air cuz he obviously could not prove them, but they were: The universe was spherical and that the ratio of the diameter of the Universe to the diameter of the orbit of the Earth around the Sun equalled the ratio of the diameter of the orbit of the Earth around the Sun to the diameter of the Earth.

In order to obtain an upper bound, Archimedes made the following assumptions of their dimensions:

- that the perimeter of the Earth was no bigger than 300 myriad stadia ($5.55 \cdot 10^5$ km, an overestimate by roughly a factor of 40).

- that the Moon was no larger than the Earth, and that the Sun was no more than thirty times larger than the Moon ($1.65 \cdot 10^7$ km, an overestimate by roughly a factor of 10)
- that the angular diameter of the Sun, as seen from the Earth, was greater than 1/200 of a right angle (π/400 radians = 0.45° degrees, an over estimate, but accurate to within 20% of the true value).

Archimedes then concluded that the diameter of the Universe was no more than 10^{14} stadia (in modern units, about 2 light years), and that it would require no more than 10^{63} grains of sand to fill it. With these measurements, each grain of sand in Archimedes's thought-experiment would have been approximately 19 μm (0.019 mm) in diameter.

Sure, he thought the Universe was just 2 light years across, which is very far from 93 billion light years across, but that is a pretty high number for a people that thought the Universe was just their own Solar System for all they knew and they didn't really know the size of things or like orbits or whatever and he basically did as much forward thinking as he possibly could in his time, like make so many assumptions to try and get a realistic figure.

(FRI, WMI, CPI, VSI, Abstract Thinking, Systematic Thinking, Decompositional Thinking, Abstract Reasoning, Fluid Intelligence)

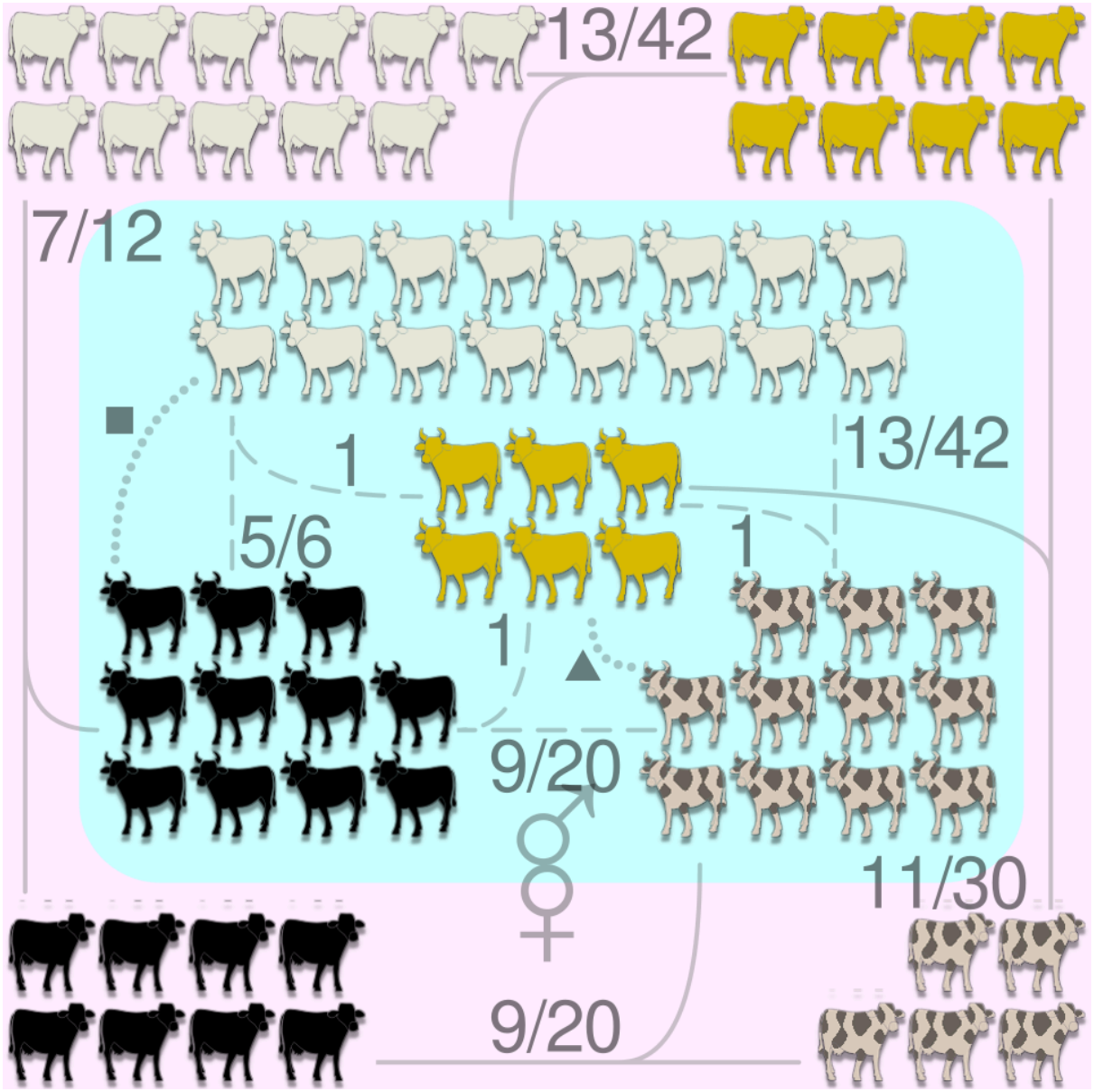
Archimedes made some interesting experiments and computations along the way. One experiment was to estimate the angular size of the Sun, as seen from the Earth. Archimedes's method is especially interesting as it takes into account the finite size of the eye's pupil, and therefore may be the first known example of experimentation in psychophysics, the branch of psychology dealing with the mechanics of human perception, whose development is generally attributed to Hermann von Helmholtz. Another interesting computation accounts for solar parallax and the different distances between the viewer and the Sun, whether viewed from the center of the Earth or from the surface of the Earth at sunrise. This may be the first known computation dealing with solar parallax.

(VSI, WMI, FRI, Deductive Reasoning, Decompositional Thinking)

Archimedes Cattle Problem

https://en.wikipedia.org/wiki/Archimedes%27s_cattle_problem

https://www.youtube.com/watch?v=V2S39AgjFpQ



Archimedes would, in a letter to Eratosthenes, write out a mathematical problem about cattle of the Sun, that when translated to English, looks something like this:

If thou art diligent and wise, O stranger, compute the number of cattle of the Sun, who once upon a time grazed on the fields of the Thrinacian isle of Sicily, divided into four herds of different colours, one milk white, another a glossy black, a third yellow and the last dappled. In each herd were bulls, mighty in number according to these proportions: Understand, stranger, that the white bulls were equal to a half and a third of the black together with the whole of the yellow, while the black were equal to the fourth part of the dappled and a fifth, together with, once more, the whole of the yellow. Observe further that the remaining bulls, the dappled, were equal to a sixth part of the white and a seventh, together with all of the yellow. These were the proportions of the cows: The white were precisely equal to the third part and a fourth of the whole herd of the black; while the black were equal to the fourth part once more of the dappled and with it a fifth part, when all, including the bulls, went to pasture

together. Now the dappled in four parts were equal in number to a fifth part and a sixth of the yellow herd. Finally the yellow were in number equal to a sixth part and a seventh of the white herd. If thou canst accurately tell, O stranger, the number of cattle of the Sun, giving separately the number of well-fed bulls and again the number of females according to each colour, thou wouldst not be called unskilled or ignorant of numbers, but not yet shalt thou be numbered among the wise.

But come, understand also all these conditions regarding the cattle of the Sun. When the white bulls mingled their number with the black, they stood firm, equal in depth and breadth, and the plains of Thrinacia, stretching far in all ways, were filled with their multitude. Again, when the yellow and the dappled bulls were gathered into one herd they stood in such a manner that their number, beginning from one, grew slowly greater till it completed a triangular figure, there being no bulls of other colours in their midst nor none of them lacking. If thou art able, O stranger, to find out all these things and gather them together in your mind, giving all the relations, thou shalt depart crowned with glory and knowing that thou hast been adjudged perfect in this species of wisdom.

This problem that Archimedes redacted, while we do not know if he had the capacity to solve it or not, we do not know how far he would have gotten, but to be able to redact such an elaborate problem shows a very intelligent mind, limited by the mathematics of his time, of course. He is only human after all. This problem has five parts.

The first part of the problem can be readily solved using a system of equations, writing the number of white, black, dappled and yellow bulls are written as W, B, D and Y and the number of white, black, dappled and yellow cows are written as w, b, d and y the problem is just to find a solution to this system of equations:

W = (5/6)B + Y

B = (9/20)D + Y

D = (13/42)W + Y

w = (7/12)(B+b)

b = (9/20)(D+d)

d = (11/30)(Y+y)

y = (13/42)(W+w)

This is by the way a system of seven equations with eight unknowns. It is indeterminate and has an infinite number of solutions. The smallest positive integers satisfying this are:

B = 7.460.514 W = 10.366.482 D = 7.358.060 Y = 4.149.387 b = 4.893.246 w = 7 206 360 d = 3 515 820 and y = 5 439 213

This is a total of **50 389 082 cattle.**

The second part states that the number of white and black bulls added together form a square number and that the number of yellow bulls and dappled bulls form a triangular number. This part of the problem took until 1880 to be solved, so this problem remained unsolved for over 2100 years, just this part, this second part. That is how powerful the mind of Archimedes is to be able to construct a problem of such immense difficulty with the knowledge you had at the time. Like bruh it does not even matter if you could solve it or not, the fact you imagined it is insane.

The solution was based on Pell's equation where **n = ((x^(4658j) - x^(-4658j))^2)/(4657)(79072)** j was just any positive integer, while x was 300 426 607 914 281 713 365*sqrt(609) + 84 129 507 677 858 393 258*sqrt(7766)

Squaring x results in:

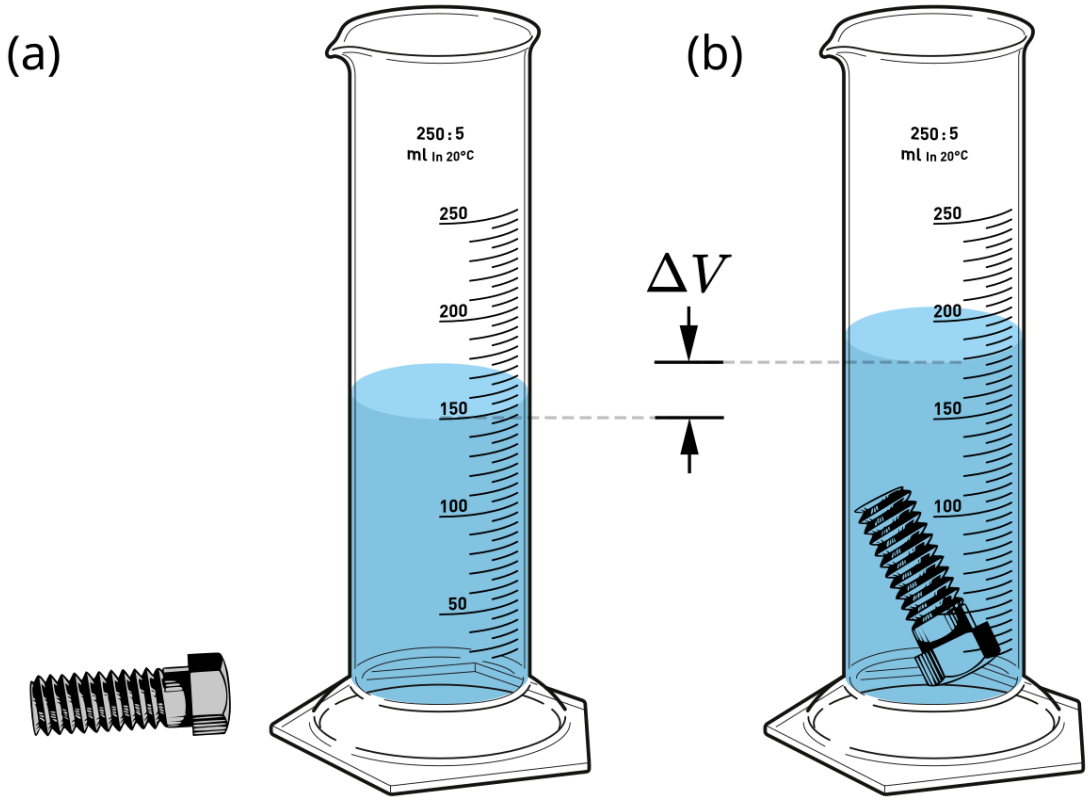
x^2 = u+v*sqrt((609)(7766)) where (u,v) is the fundamental solution of the Pell equation.

The smallest size of the herd is given by j=1 and the result is **7.76*10^206.544.** It took until 1965, for a computer at the University of Waterloo to just write out this massive number with OVER 200 THOUSAND DIGITS. The computers were IBM 7040 and IBM 1620, so they used two computers and it still took hours. Of course, modern computers, that are very powerful, can display this number, but like this number is so unimaginably large.

Sure, whether Archimedes could solve this problem or not remains an open debate and most say he could not, the fact he could construct a problem that took millenia to solve and required thousands of years of mathematical evolution says a lot about his mind, I think this is honestly impressive even if he did not solve it. If he could, that would make him undoubtedly the smartest human in history, but this is still impressive as fuck and all of this qualifies him as the smartest man in the Ancient world, combined with what I have said before this section and what I will say after.

(FRI, VSI, WMI, PSI, Abstract Thinking, Creativity, Deductive Reasoning, Analogical Thinking, Foresight)

Golden Wreath



https://en.wikipedia.org/wiki/Archimedes

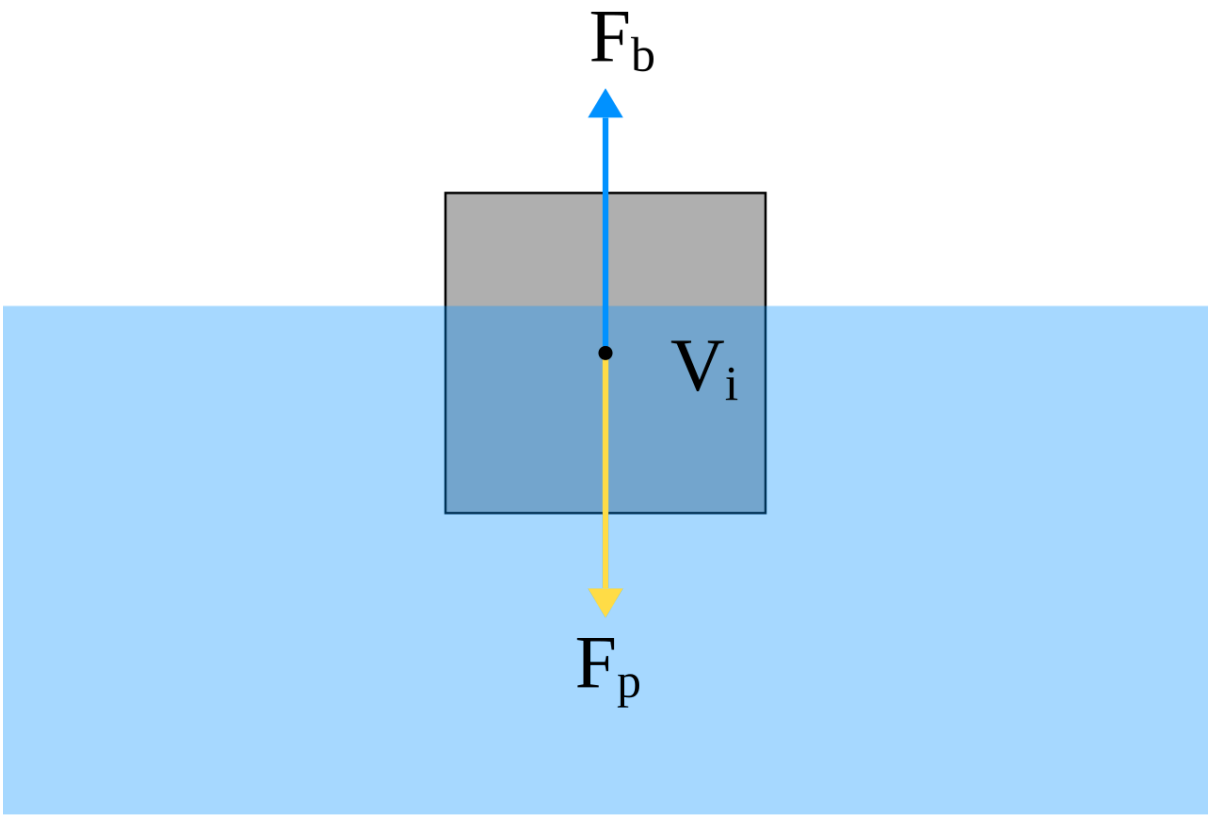
According to Vitruvius, King Hiero II of Syracuse commissioned a golden wreath and wanted it to be made of pure gold, however he had suspected after it was made that the goldsmith substituted some cheaper silver and kept some of the pure gold himself and because the smith did not confess, he asked Archimedes to investigate.

While stepping into a bath, Archimedes noticed that the level of the tub rose more the further he sank and through this effect he could determine the volume of the golden crown, which eventually led to the famous Eureka moment.

He then took a lump of gold and a lump of silver that were each equal in weight to the wreath and, placing each in the bathtub, showed that the wreath displaced more water than the gold and less than the silver, demonstrating that the wreath was gold mixed with silver.

(FRI, VSI, PSI, Analytical Thinking, Applied Reasoning, Observation, Creativity)

Archimedes Principle



https://en.wikipedia.org/wiki/Archimedes%27_principle

In his work On Floating Bodies from 246 BCE, Archimedes would suggest that any object, totally or partially immersed in a fluid or liquid, is buoyed up by a force equal to the weight of the fluid displaced by the object.

Considering the cuboid as shown in the image, we will see that the fluid will exert a normal force on each face, but only the normal forces on top and bottom will contribute to buoyancy. The pressure difference between the top and bottom is directly proportional to the height. Multiplying the pressure difference by the area of a face gives a net force on the cuboid - the buoyancy - equaling in magnitude the weight of the fluid displaced by the cuboid.

By summing up sufficiently many arbitrarily small cuboids this reasoning may be extended to irregular shapes, and so, whatever the shape of the submerged body, the buoyant force is equal to the weight of the displaced fluid.

The formula generated from this can be expressed in the following equation: Fa = ρgV.

Fa is the buoyant force, rho is the density of the fluid and V is the volume of the displaced fluid and g is the acceleration due to gravity.

Of course, Archimedes wrote it more like weight of displaced fluid = weight of object in vacuum - apparent weight of object in fluid. Like seriously, mathematical notation was so much different back then.

He would also create the Principle of Flotation which states that any floating object displaces its own weight of fluid.

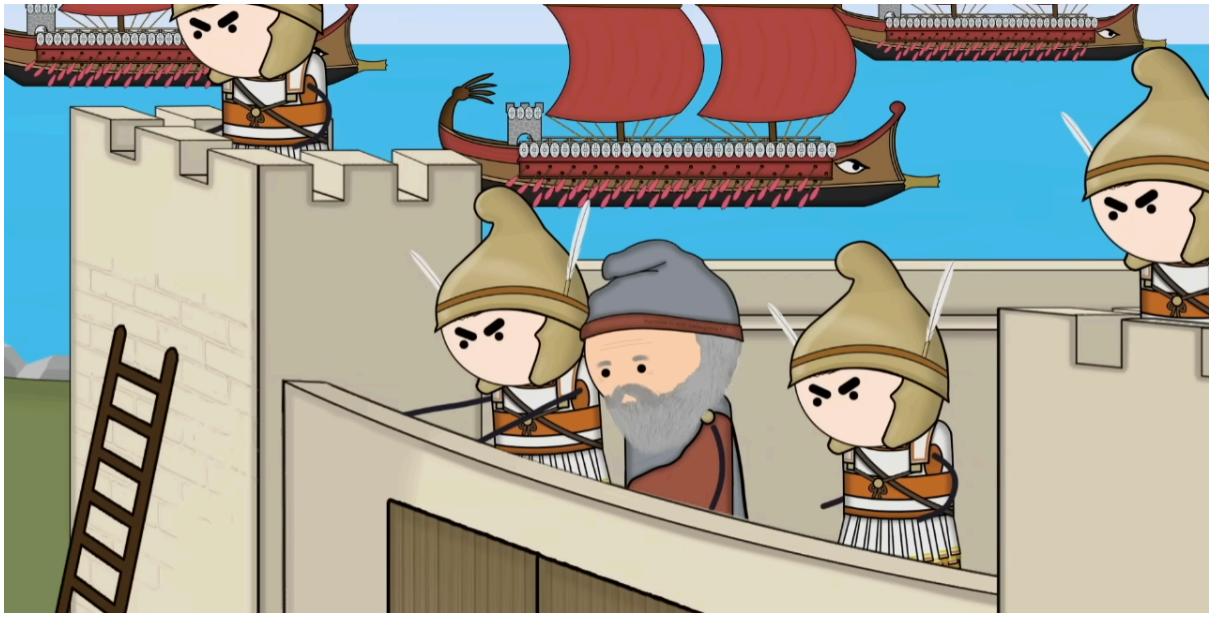
Yea, he also created another principle during this work, like the principle we know of was not all he did in this field of hydrostatics.

(FRI, VSI, Creativity, Analytical Thinking, Applied Reasoning, Deductive Reasoning, Systematic Thinking, Observation)

Galileo Galilei would invent a hydrostatic balance in 1586 inspired by Archimedes work (over 1800 years later btw), saying that he used the same method Archimedes used and that his balance was based on demonstrations done by Archimedes. That is how ahead of his time he was.

(FRI, WMI, VSI, Foresight)

War Machines - Siege of Syracuse



https://en.wikipedia.org/wiki/Archimedes

https://youtu.be/1BVJzaXv3rk?si=iuRd8fFoclZbA9Sn&t=569

https://explorable.com/archimedes-war-machines

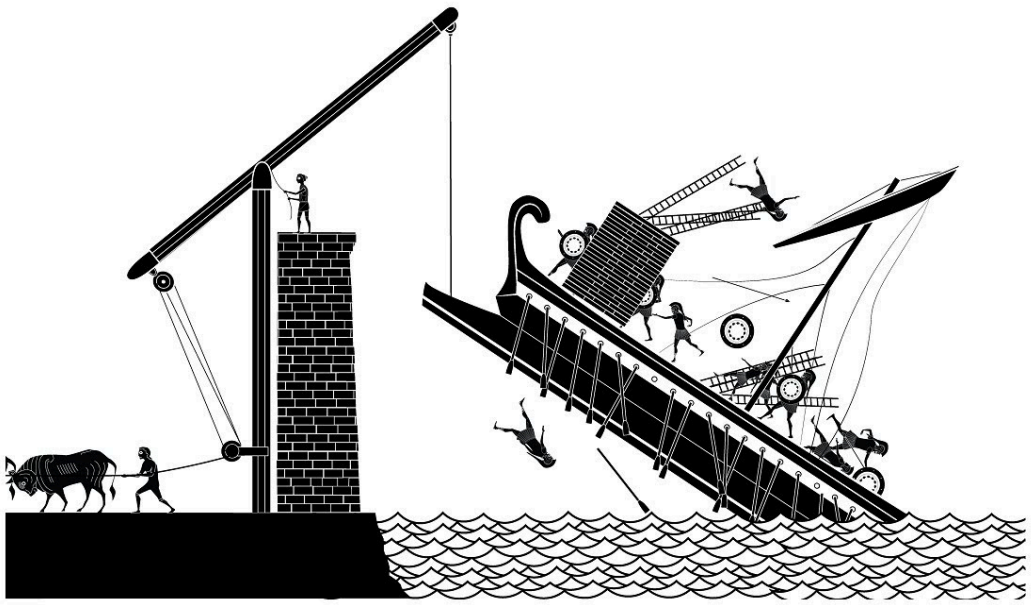
Archimedes did not just show skills across mathematics, physics, hydrostatics and astronomy. Oh no, he was also an engineer and a powerful one at that, especially for his

time.

During the Second Punic War, Archimedes constructed War Machines for King Hiero II because Syracuse was under a Roman siege, because it had switched allegiances from Rome to Carthage. The Romans under Marcellus tried to take the city.

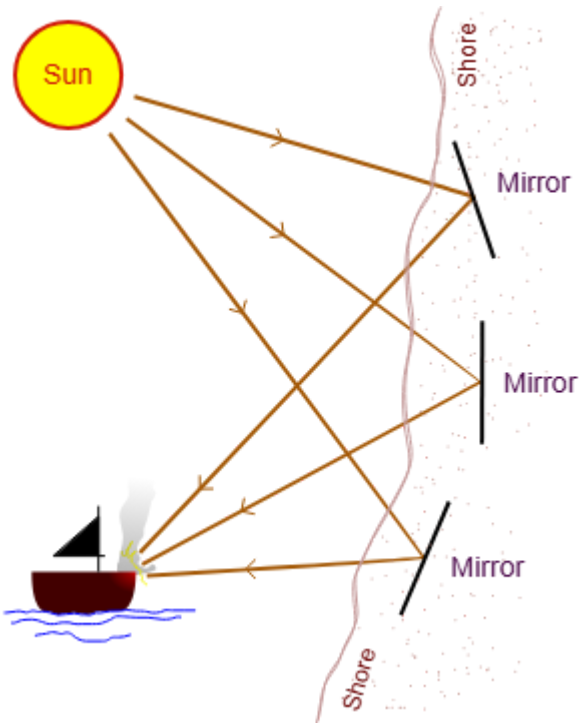
He created stone throwers and large crossbows, but some more notorious inventions said by ancient historians are the Archimedes Claw, which used a crane and a grappling hook to reach down and grab Roman galleys, capsizing them in the process. And modern-day historians have confirmed that he had the expertise to actually build such a machine. It is believed more likely than not that this device existed.

It required knowledge of levers, pulleys, forces, equilibria and many other stuff. It is a massive claw that could capsize Roman galleys, the sheer engineering knowledge you need to have for it is insane, I do not need to explain why.



(Creativity, FRI, VSI, PSI, Crystallized Intelligence, Fluid Intelligence)

This, alongside other engineering contraptions, like a sort of heat ray, using mirrors to focus sunlight, which would end up burning Roman ships, although this is more legendary (if it is true, it suggests knowledge of reflection, optics, heat transfer, angles etc.), but all of this would basically result in the siege taking a whopping 2 years for the Romans, despite having almost 20 000 men and actual siege equipment and Syracuse well not being as large of a city as say Rome.

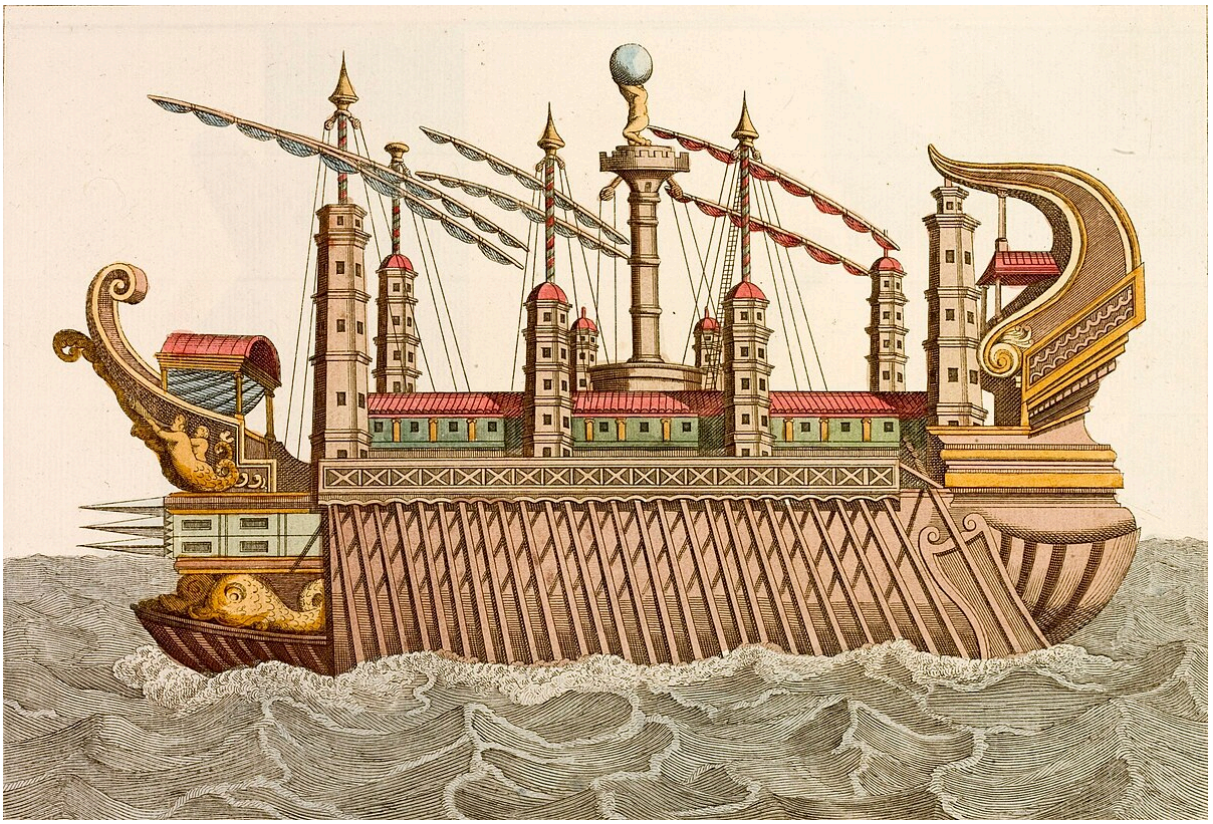


The only reason they even made it to the city was because the Syracusans, even though they were still under massive siege, decided to party like crazy, by having a feast for the goddess Artemis. That is the only reason they lost. Archimedes was just obliterating the Romans, almost soloing them (his main thing wasn't war, he was just focused on his math, he just did this for defense and it basically worked), both on land and sea. This just left them vulnerable for the Romans to eventually to just go in and go in the city and start massacring, this siege resulting in the death of Archimedes, due to stuff outside of his control.

(Creativity, VSI, FRI, CPI, Resource Management, Perseverance, Deductive Reasoning, Holistic Thinking, Strategic Thinking, Adversity Capacity)

Syracusia

https://en.wikipedia.org/wiki/Syracusia



Archimedes would design in 240 BCE a ship known as the Syracusia, the largest transport ship of antiquity and would be built by Archias of Corinth on the orders of the King of Syracuse. It could carry cargo of 1600-1800 tons and house 1942 passengers. She bore more than 200 soldiers as well as a catapult. Well, it only sailed once to Alexandria, where it was given to the pharaoh. It was too big for any port in Sicily.

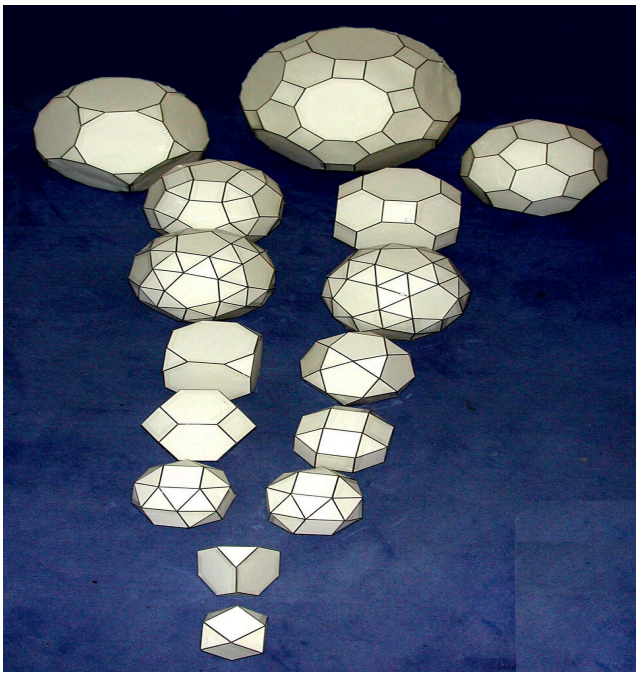
The hull was protected from biofouling and it was coated with horsehair and pitch, it being the first example of anti-fouling technology in history, aka to prevent the attachment of fouling organisms. The ship also had a garden and an indoor bath, that is how big it was. It was also decorated with ivory and marble and it had public spaces with mosaics depicting the Iliad. It also had a library and a gymnasium, as well as a small temple dedicated to Aphrodite. Oh yea, it also had 20 rows of oars on each side.

It was literally an ancient cruise ship that was not just meant for transport but also had war stuff like a giant catapult, like that is how insanely big it was and Archimedes designed all of it. The sheer amount of knowledge he would have had is insane. He would have had to know about anti-fouling technology, make it actually float when it actually set out to sea, the strength of materials, aesthetics and many many other things when designing it.

(VSI, Systematic Thinking, Decompositional Thinking, Crystallized Knowledge, Abstract Reasoning, Resource Management, Applied Reasoning)

Archimedean Solids

https://en.wikipedia.org/wiki/Archimedes



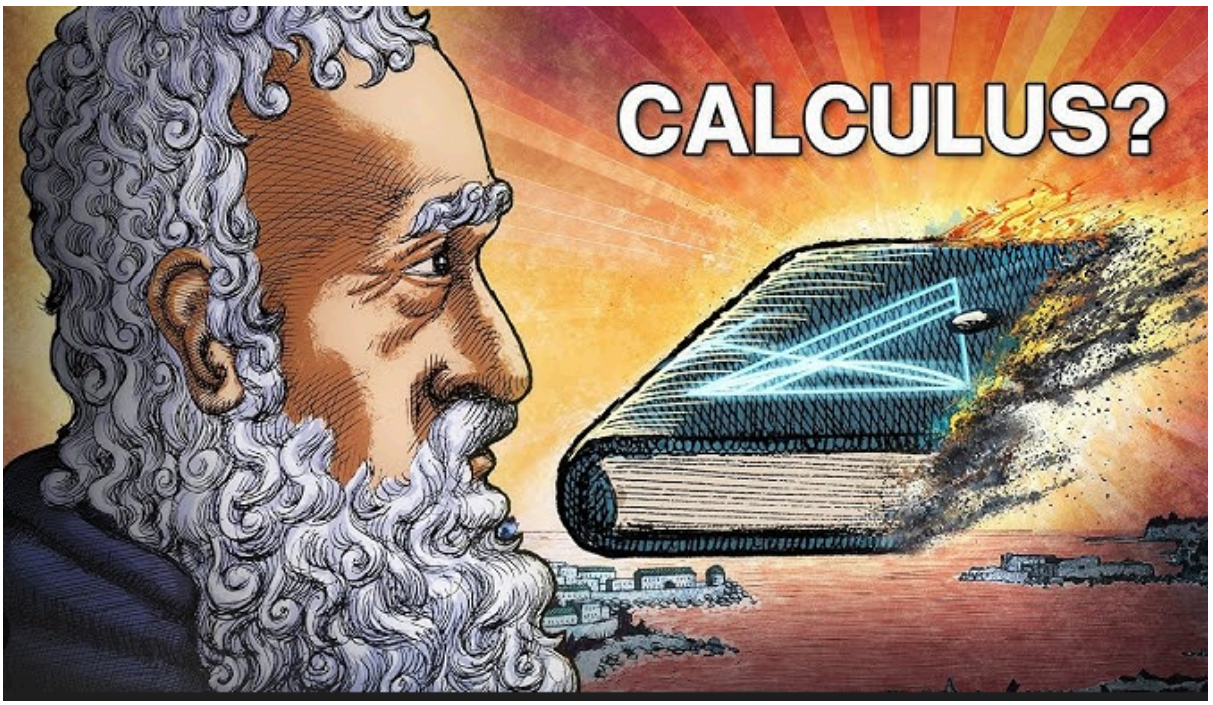
In a lost work described by Pappus of Alexandria, Archimedes proved that there are exactly thirteen semiregular polyhedra.

(VSI, Deductive Reasoning, Crystallized Knowledge, Convergent Thinking, Abstract Reasoning)

The 2M$ Lost Book by Archimedes

https://www.youtube.com/watch?v=ZXNIgHov0Nk

Saving what is probably the best feat for last.



Inside this 2M$ lost book, like it was lost for centuries, this book contained the **Mechanical Method,** a method Archimedes said he used to make his mathematical discoveries. It's called that because of an analogy he has in his mind where he used his expertise with levers and seesaws (which we saw with the Archimedes Claw), he literally weighs shapes in his mind as if they were material objects of something solid, it is not an abstract object, it is a real object in his mind. Through this method he found the areas and volumes of shapes, such as spheres and cylinders.

Archimedes would also use another mathematical idea that he is credited with, the **Law of the Lever**. It says that the place where two objects balance is such that the ratio of the distances is equal to the reciprocal of the ratio of the objects masses.

So if something is ⅓ the distance of the center compared to some other thing, then that something is x3 heavier than that other thing. He then starts slicing them, cutting them really thin, he imagines cutting the shapes infinitesimally thin. He just imagines the shape to be made of these infinitely many lines that are within it.

He treats the lines like they have uniform weight so if one line is twice as long as another, he says it is twice as heavy. He just drags the lines one by one into a position on the seesaw where he can weigh them which seems bogus to us because they are infinitesimal, they do not have weight. But it gives him the right answer anyway.

This gave Archimedes his greatest insights about curved shapes which were much harder to work with back in the day than things like triangles and rectangles. His work with curves went beyond what people thought was possible at the time. In his lifetime, it was known that using infinitesimally small things would lead to errors, because saying a shape is made out of an infinite number lines is paradoxical.

If the lines have no width, there will be nothing, if the lines have very very small width, there will be an infinite number of them, as I said previously. And yet an infinite number of lines is supposed to add up to different areas for different sized shapes. It seems impossible.

While he did use them to get the answer to fantastically complicated problems, he did it all in private because of this danger. He wrote letters to his friends but did not want to have the infinitesimals distract from the discoveries he made, so he left that part out, from all his letters, except one, except Eratosthenes, yes the same guy who discovered the circumference of the Earth and he says that it may help the future generations of mathematicians discover theorems that he has not discovered.

He knew that any letter he sent would be preserved at the Library of Alexandria for generations to come. Ok, I know it got burned, but no one was going to predict that, it was basically the place anyway, it had texts preserved in the best manner, plus Eratosthenes was the head librarian so he could trust him with keeping this information secret and preserved. Also, he was probably one of his really good friends. It was like sending a message in a bottle to the future where he privately confessed he broke the rules of Ancient Greek mathematics.

The Mechanical Method he shows here was private and he also said that it only gave an indication of what the right answer would look like, but it still was insanely impressive. His public method was the method of exhaustion as we established previously. It is very rigorous, it still meets the standards of rigor today. It never uses infinity, it only uses polygons with a finite number of sides, he knew to avoid backlash for his ideas and potential consequences by not exposing the Mechanical Method to the public, which does involve infinity and the paradoxical infinitesimals.

It was only suspected after the Renaissance and until the early 1900s that he had a private method that he used to solve problems ahead of time, an element of mystery, they never knew what it was, cuz it was lost back then.

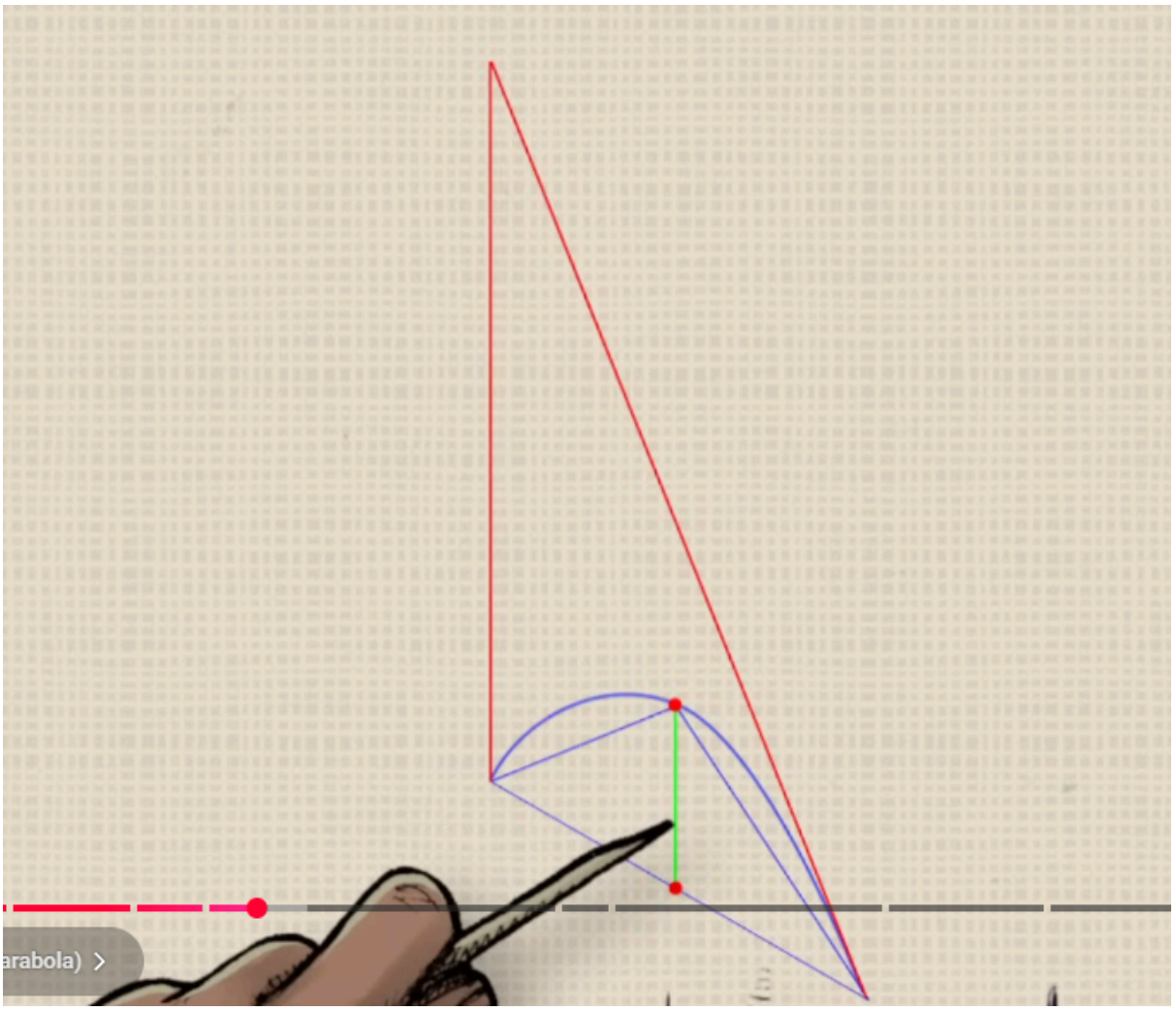
(VSI, FRI, Meta-Cognition, Crystallized Knowledge, Foresight, Non-Linear Thinking, Analogical Thinking, Abstract Thinking, Systematic Thinking, Holistic Thinking, Abstract Reasoning, Inductive & Deductive Reasoning, Divergent Thinking, Fluid Intelligence)

The Method - Parabola

Back in the Ancient Greek world, parabolas were not formed the way we form them today by graphing a quadratic equation, but rather by slicing a cone parallel to one of its slanted sides. He wanted to find the area you get when you cut a section of a parabola with a line.

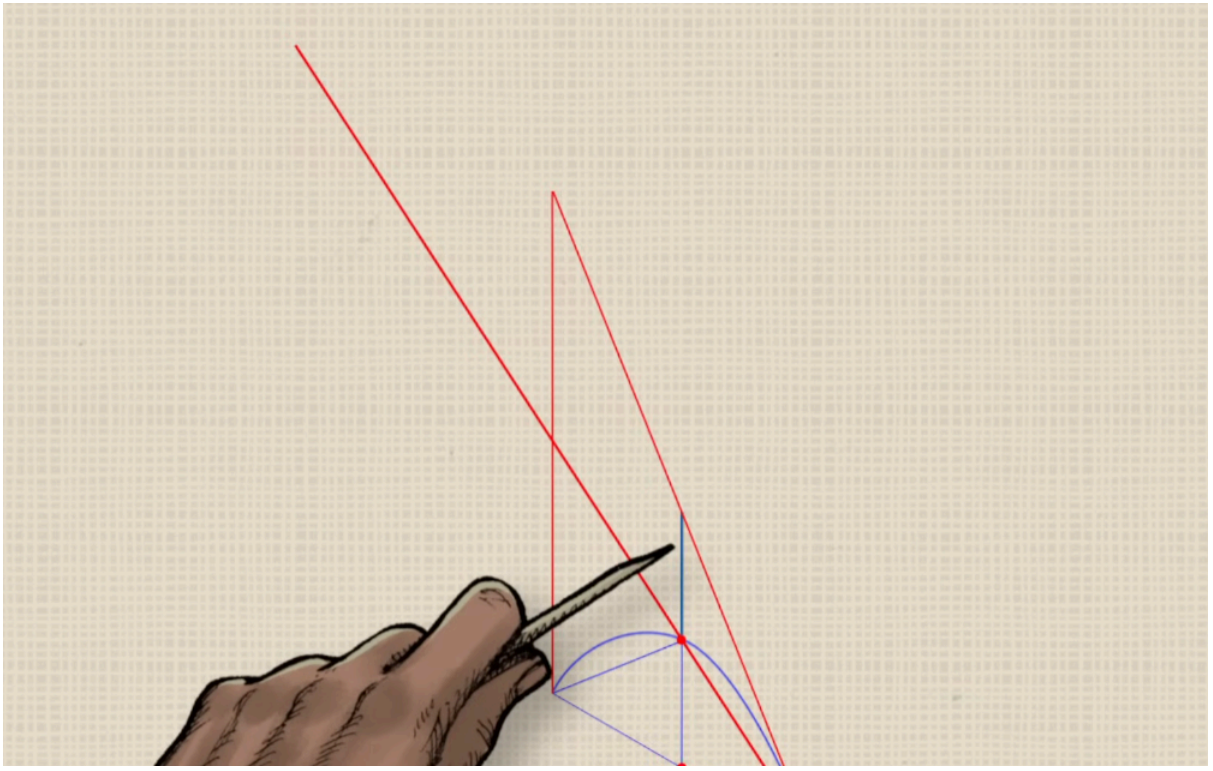
He did it by comparing the parabolic section to this inscribed triangle. The important part is going to be the line that goes from the mid-point of that line to the top of the triangle. He extends a line that is tangent to the parabola at the right corner of the triangle and draws another line that starts on the left corner of the triangle and runs parallel to that first line

segment we mentioned going from the mid-point of that line to the top of the triangle. This is how it looks like so far:



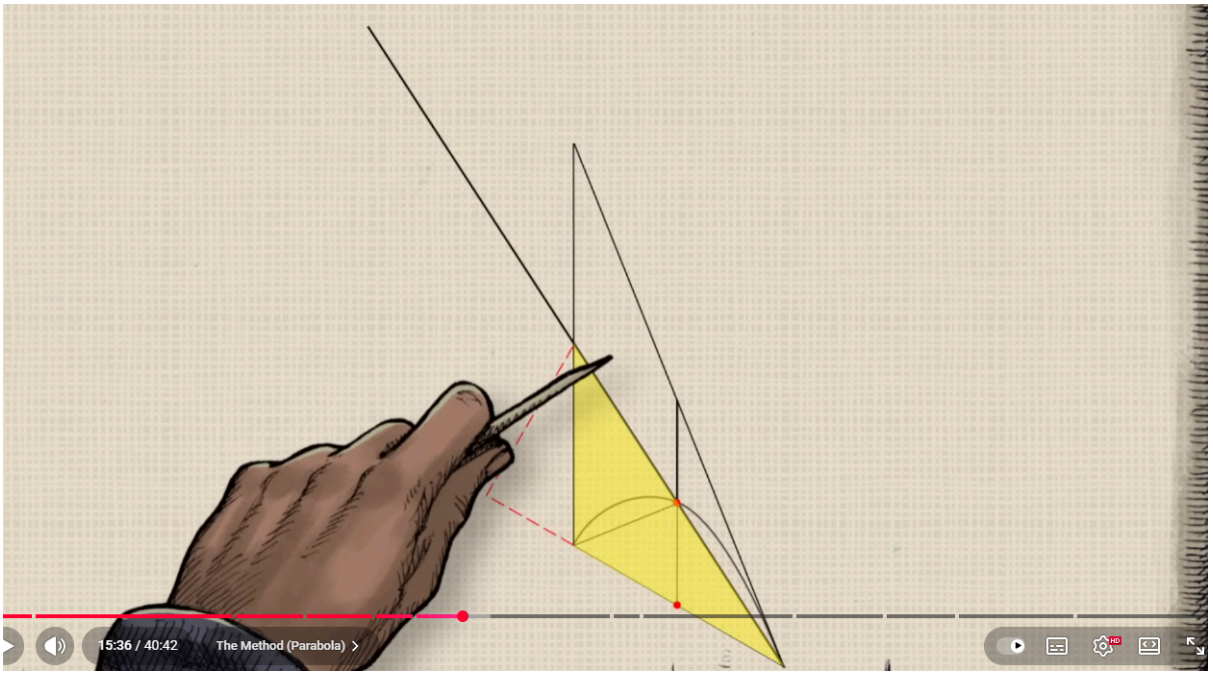
He then takes the right side of the small triangle and extends it until the part that goes past the big triangle is the same length as the part that is inside. This gives the set up for the balancing scale that he is going to use.

He got two facts from Euclid that are not obvious today before setting it up: The point at the top of the triangle is the mid-point of this line shown by the pencil on the screen.



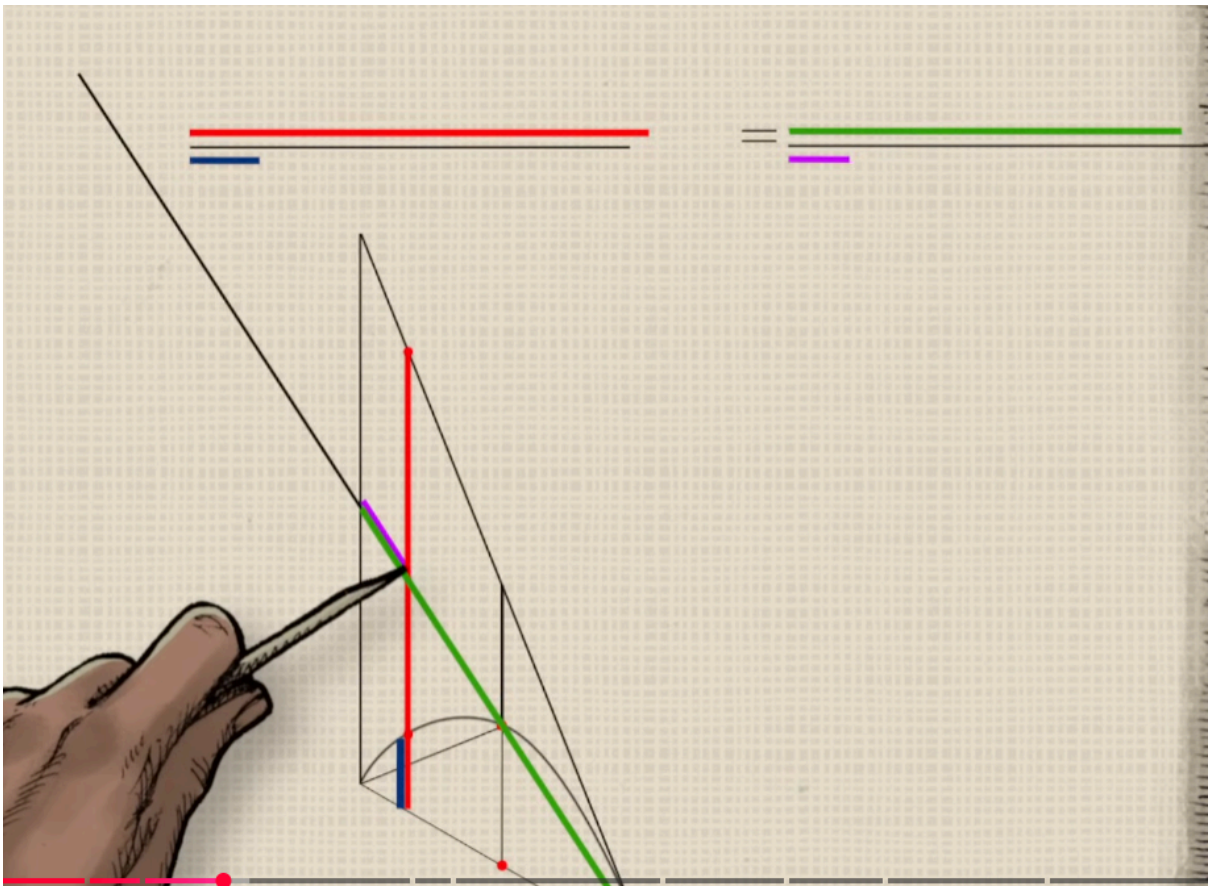
Knowing that, Archimedes can use similar triangles to show that the intersection of the point that is the intersection of those two red lines at the far left there, like a bit above and to the left of the pencil, are also equal.

So if we start with a big triangle and cut the height in half then the newly formed triangle, then the triangle shown in yellow has half the area of the big one.



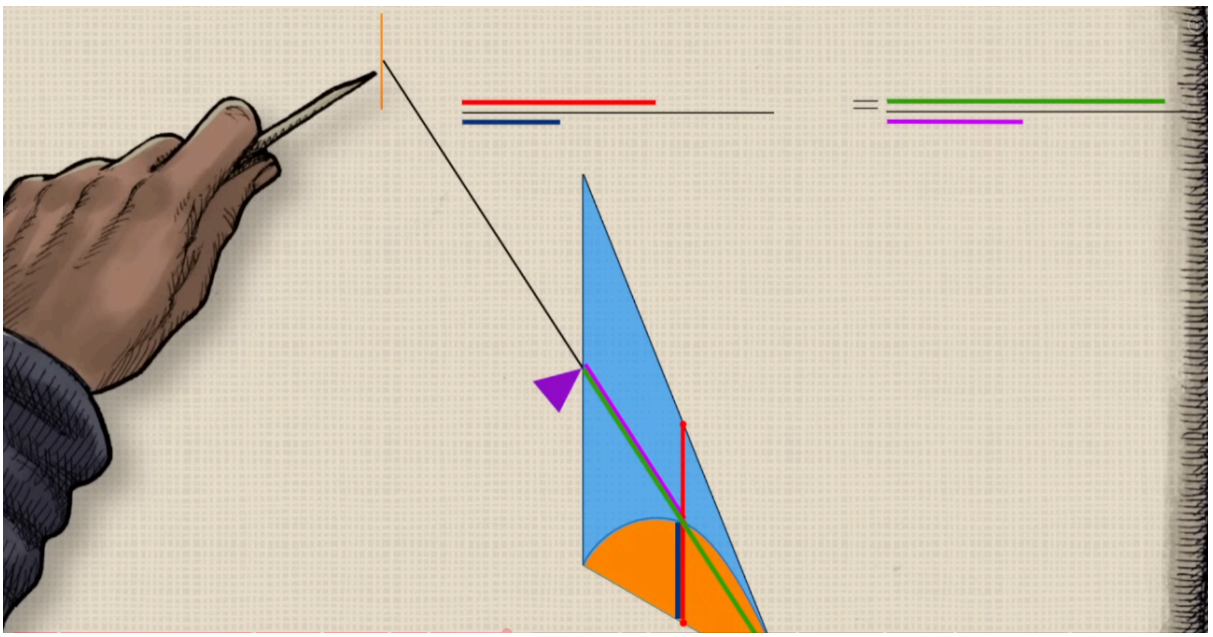
He eventually proves the area of the smallest triangle that we started with originally, like the first triangle we made, is a quarter of the area of the big triangle.

The second fact he manages to know is that if he draws a random line parallel to those two other lines that are like going upward, the ratio of this length and this length is equal to the ratio of this length and this length, aka the formula shown on the screen here:



He imagines that the very long line that you can see exiting the triangle out by a lot is the balancing scale and that the fulcrum is at the edge of the big triangle, aka at the point where this very long line exits the triangle. So the two sides of the scale have the same length, as it has been established previously.

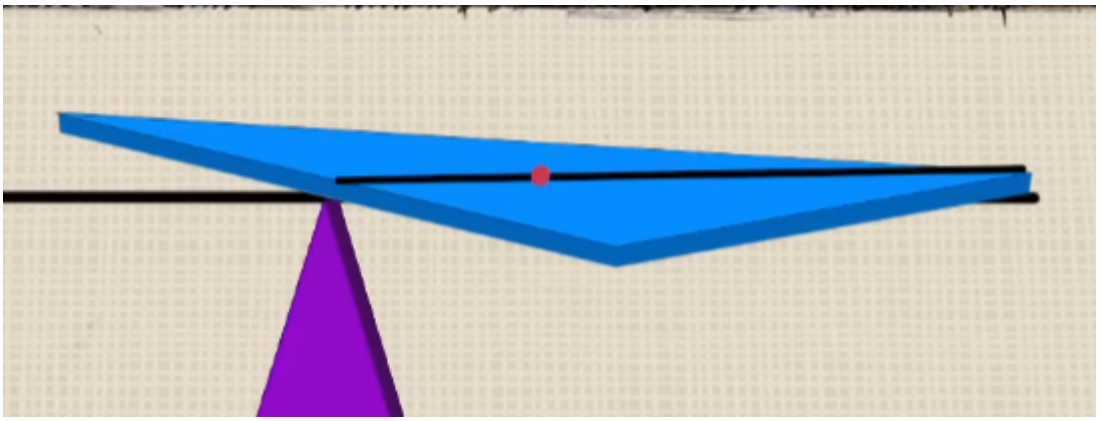
He pretends the shape is made of actual material he can weigh and then he can use the weights to figure out their relative sizes. So when he takes a thin slice of the parabola and moves it to over on the left side like this:



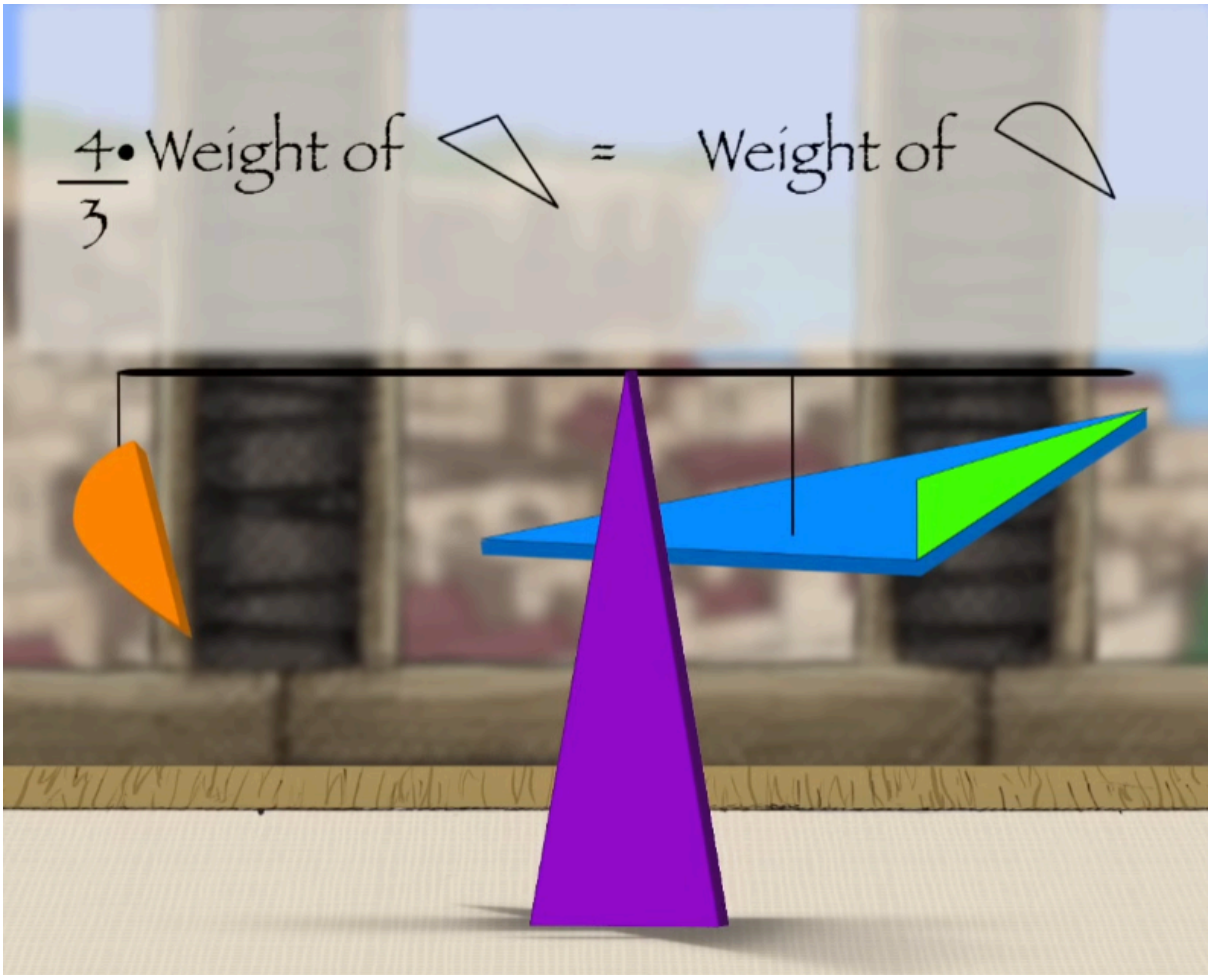
Then the Law of the Lever tells us that this thin slice of the parabola balances perfectly with this line of the triangle that is in red on the image shown here. The red line is twice the length of the orange line, but it is located at half the distance from the center. Because of that weird proportion he knew, he could do this regardless of where he put that line on the diagram.

Each time, the slice from the parabola and the slice from the triangle will balance perfectly because the ratio of their distances is inversely proportional to the ratio of their lengths.

Knowing that the parabola and triangle are each made up of all the possible lines, he can balance the triangle and the parabola, with the parabola hanging, next he uses the fact that the center of gravity of a triangle is ⅓ of the distance along this line:



Because of that, the triangle can just be hung from that point and it will balance on the scale. So the law of the lever says that the weight of the triangle is three times the weight of the parabola. But we are only interested in the little triangle we started with and we know that it is a quarter the size of the big one, so we get that 4/3 the weight of the triangle is the weight of the parabola.



So we get the final answer that the parabolic segment is 4/3 the area of the triangle that is inscribed and also ⅔ the area of the rectangle that surrounds it. Other people who had access to this method only used it for practical architectural purposes. No one else is known to have used this method the way Archimedes actually used it.

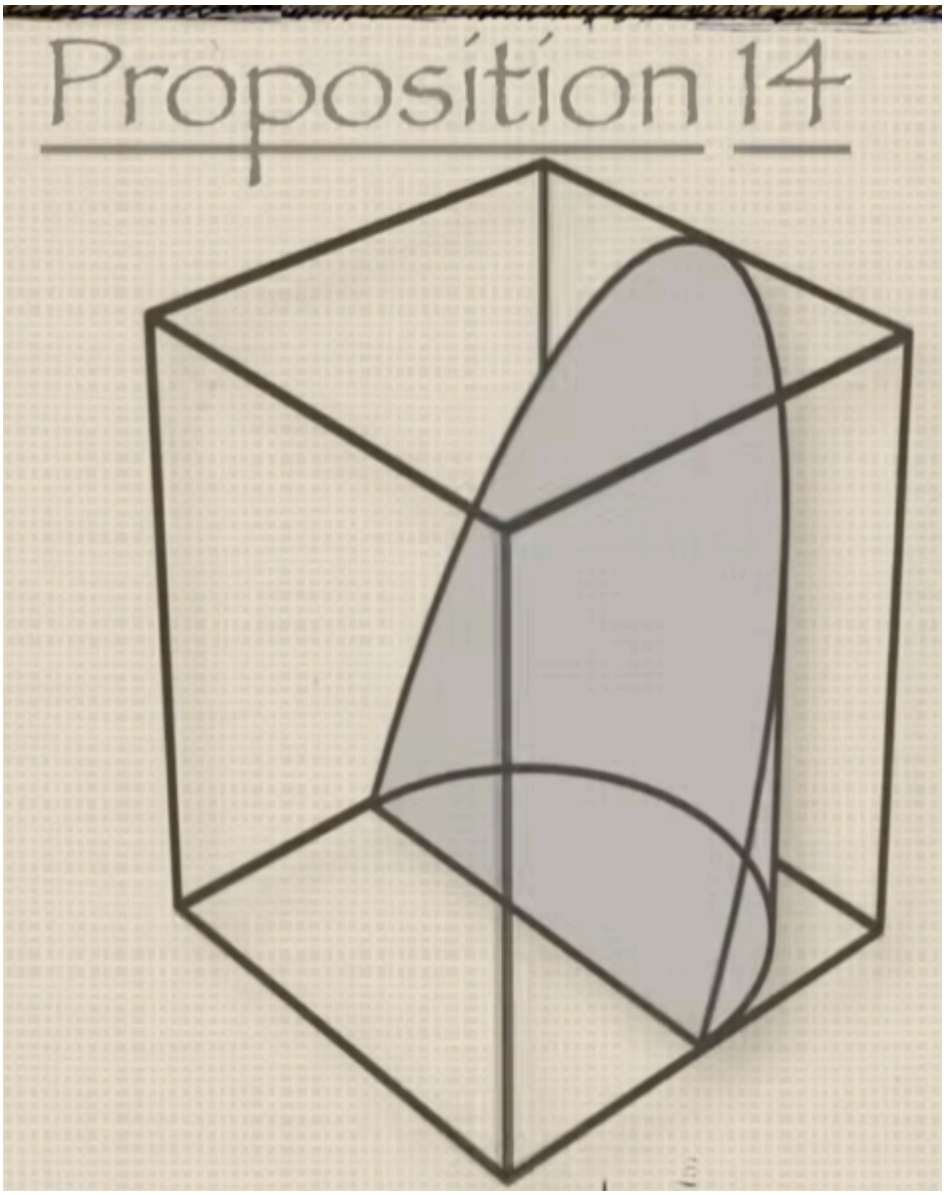
By the way, he figured out the area of a parabola without having knowledge of calculus or any other stuff that would get invented 2000 years later. He basically knew of stuff that would be fundamental to calculus like infinitesimals and also imagined them in a very unique way and stuff that no other mathematician of his time ever knew. He was legit above them in that sense.

He was legit centuries ahead of his time, that is just how his mind worked. He was most likely the smartest person in Antiquity, just because of this Mechanical Method because he knew how to work with infinitesimals in such a fascinating way, the way I described. The other stuff might as well be the cherries on top. He was so smart that he would basically break the rules, aka the foundation, of Greek mathematics so he had to keep them hidden, for his own sake.

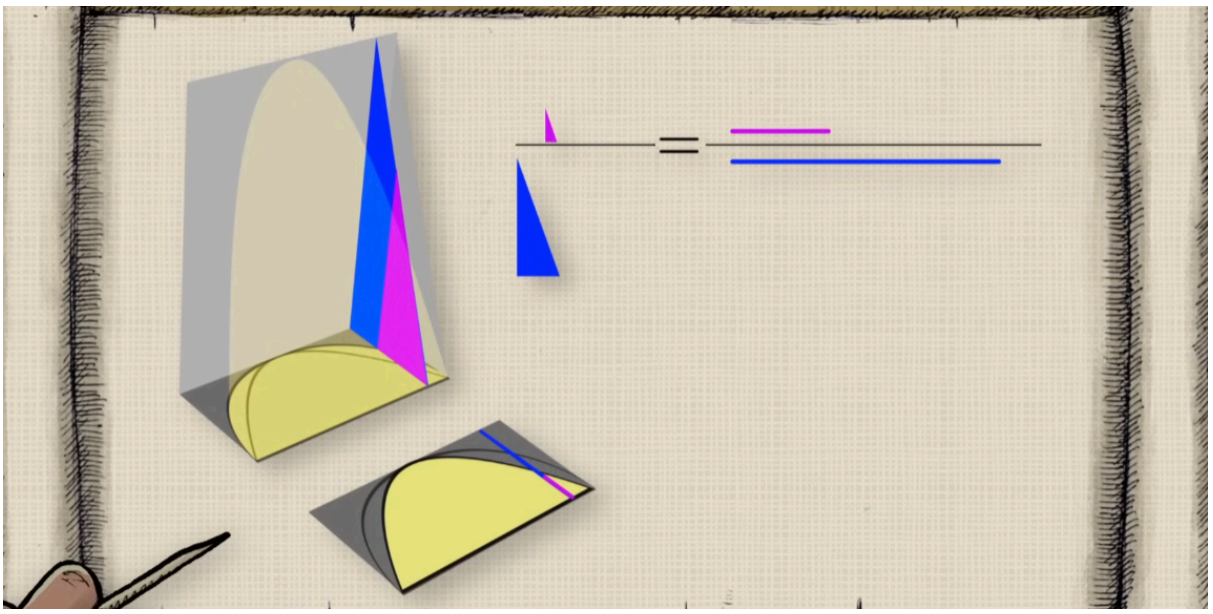
(VSI, FRI, WMI, Abstract Thinking, Crystallized Intelligence, Systematic Thinking, Non-Linear Thinking, Deductive Reasoning, Conceptual Reasoning)

New Discoveries

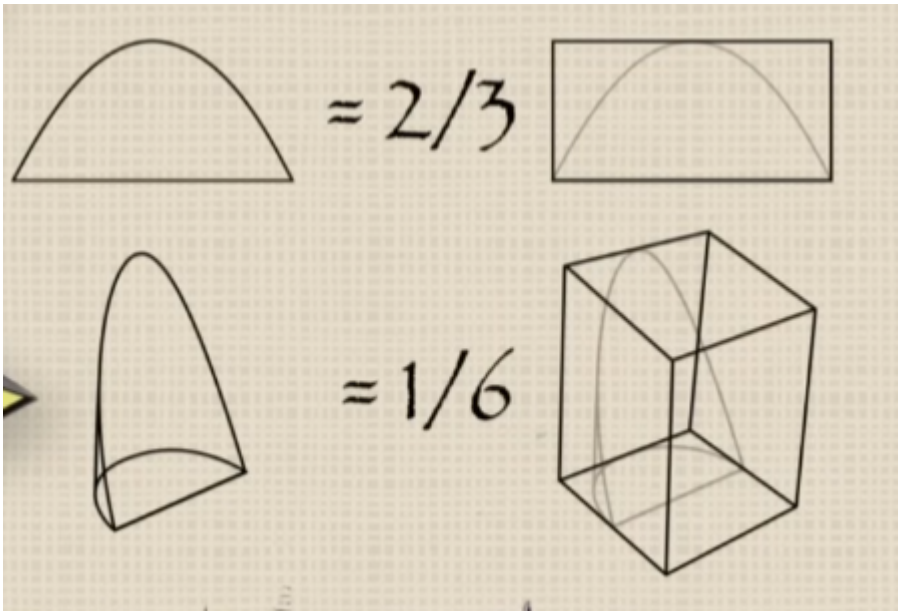
It was figured out in the 1990s that Proposition 14, the problem with the slice of cylinder, was different from his other 13 propositions. Archimedes was not pretending to work with physical objects, instead he was even more daring to use the infinitesimals than anybody had ever thought he was.



He thought that the ratio of this triangular slice and this triangular slice was the same as the ratio of this line inside a parabolic segment and this line inside the rectangle segment, but outside the parabola.



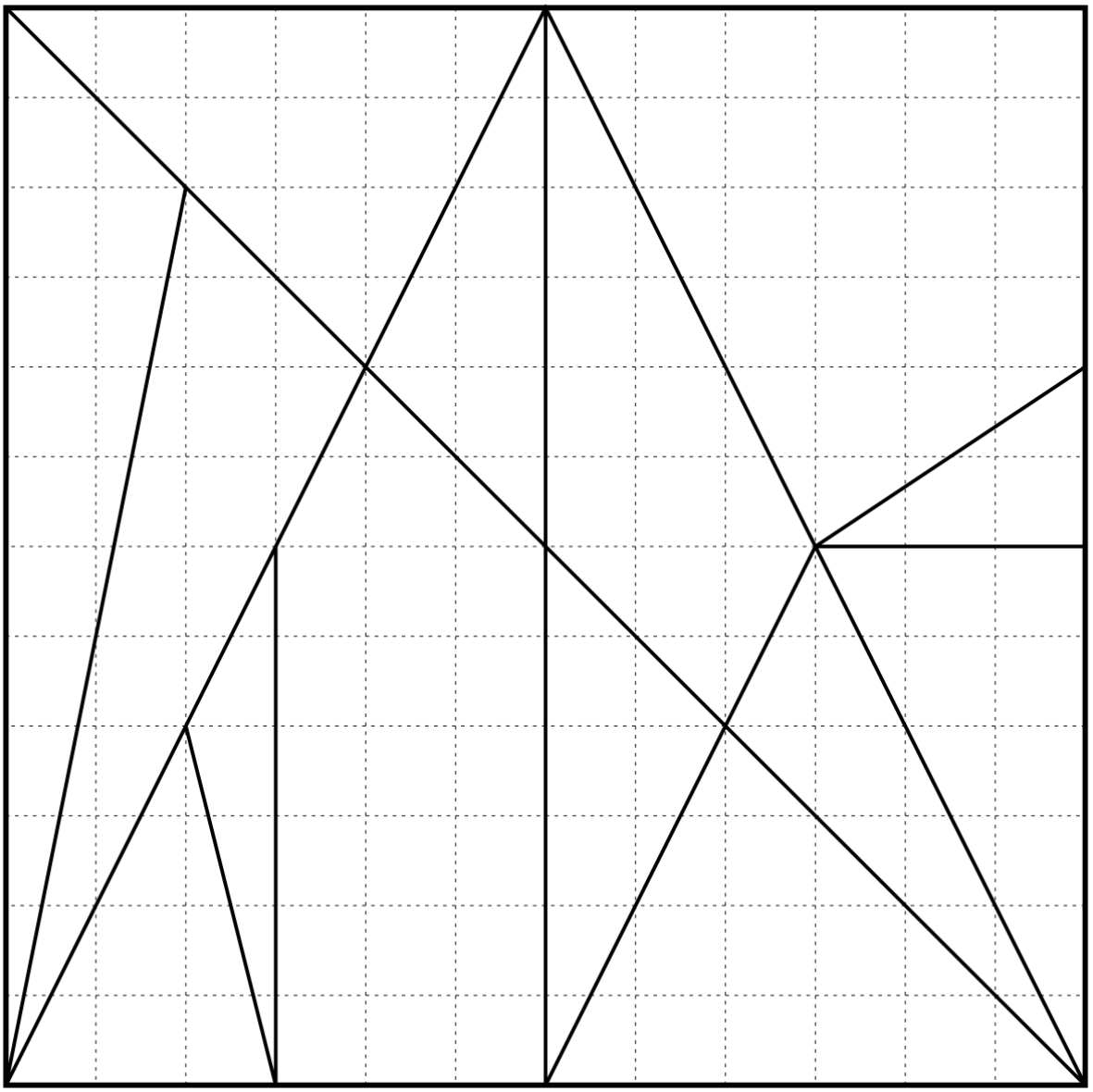
He already figured out the parabolic segment had ⅔ the area of the rectangular segment so he says that the volume he gets by taking the sum of the areas of his triangles will be ⅔ the volume of the wedge. So in other words, ⅙ the volume of the entire cube.



Despite his vagueness, it is clear he is dealing with actual infinity here and all of its paradoxes and without making a physical analogy. It's a systematic argument based on the fact that the number of triangles inside a prism is equal to the number of lines inside of a rectangle.

(VSI, FRI, WMI, Cognitive Discipline, Non-Linear Thinking, Decompositional Thinking, Analogical Thinking, Deductive Reasoning, Abstract Reasoning, Crystallized Intelligence)

Stomaichon



Archimedes was trying to figure out how to arrange the 14 different puzzle pieces that make up the Stomachion to still make a perfect square. We know now the answer is 17.152 ways and it is the earliest example of a mathematician studying combinatorics, showing further how ahead of his time he was.

(FRI, VSI, Decompositional Thinking, Abstract Reasoning, Deductive Reasoning, WMI)

Best Categories:

- VSI

- FRI

- Decompositional Thinking

In conclusion, Archimedes is most probably the smartest mind of the ancient world, being far ahead of his time in many subjects like engineering, hydrostatics, infinitesimals, combinatorics and many more. There is a reason people say he was on the cusps of discovering calculus more than 2000 years ago. This man was basically on the level of math before calculus, which most would expect to be around the 1500s or whatever, but he was in the 200s BCE.

He just has a lot of feats. It is sad that he is not really mentioned among other historical figures for his intelligence because he is so damn well-rounded for someone his time. Sure in his time you had purely philosophy geniuses like Aristotle or whatever, or military geniuses like Hannibal or math geniuses like Euclid, but like Archimedes basically combined a lot of the main domains that most other people would only be good at only one of them.
He was basically the Leonardo da Vinci of his time.

In short, do not disturb his circles.