on the use of an inverse square to solve for \(\pi\) with exactitude

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Abstraction:

This paper demonstrates the use of an inverse square to precisely calculate the area of a circle (of known radius \(r = 1/2\)). The result finds Archimedes' initial basic underlying assumption amounts to what was (& is) an ongoing "Blunder of Millennia" herein hypothesized to be the real underlying culprit of the "unsolved" status of the notorious Riemann Hypothesis problem.
Admittedly, since at least the time of Archimedes, Mathematicians have been iteratively & exhaustively "approximating" the circumference of a circle (by way of use of polygons of ever-increasing sides $n$). We therefore begin with Archimedes' initial assumption of a regular octagon(s) (both inscribed & circumscribed):

ARCHIMEDES' INITIAL ASSUMPTION

Figure 1.

...the assumption being: such a comparison(s) was & is ever a "valid" one.

In the end (or rather, in this case: since the beginning), Archimedes assumed by iteratively & exhaustively doubling inscribed & circumscribed regular polygons' number of sides $n$, one reconciles the circumference of a circle to any desired degree(s) of precision. That is: any/all decimals produced are taken to be accurate to the circle with no loss of fidelity.

Has this assumption ever been questioned by mathematicians? If not, why not? Archimedes' unchallenged assumption results in the ongoing belief the numeric approximation & decimation:

3.14159265358979323846264338327950288419716939937510582097494459230781640
62862089862803482534211706798214808651328230664709384460955058223172535
94081284811745028410270193852110555964462294895493038196442881097566593
34461284756482337867831652712019091456485669234603486104536264821339360
72602491412737245870660631558817488152092096282925409171536436789259036
0011330530548820466521384146951941511609433057270365759519559309218611738
193261179310511854807446237966274956735188575272489122793818301194912983
367336244065664308602131944639522473719070217986094370277053921717629317
675238467481846766940513200056812714526356082778577134275778960917363717
87214684409012249534301465495853710507922796892589235201995611212902196
0864034418159813629774771309960518707211134999999837297804995105973173281
6096318595024459455346908302642522308253344685035261931188171101000313783
87528865875332083814206171766914730359825349042875546873115956286388235
378759375195778185778053217122680661300192787661119590921642019893809525
720106548586327886593615338182796823030195203530185296899577362259941389
12497217752834791315557485724245415069595082953311686172785588907509838
175463746493931925506040092770167113900984882401285836160356370766010471
if even **absurdly** carried out to **trillions** of decimal places... is **inerrantly** describing a one-and-only curvature constant observing a **constant** radius of **precisely** 0.5000... with **precisely** 0.000..... margin of error.

This, instead of it merely describing two **unlike** polygons' "approximation" of such a constant & whose **fidelity** begins and ends with the very same (**lack** of) fidelity **Archimedes** began with.

The categorical **hubris** underlying such an unchallenged basic underlying assumption (**esp.** in light of all the corollary) is **nearly** immeasurable; for, if **false**, it is naught but **human hubris** which exhaustively approaches (in similar **Archimedean** fashion) an otherwise unprecedented **googleplex** in magnitude. If such a comparison of a circle to an octagon(s) is, **in principle**, a **false** one, it would so follow that any/all **upper-** and **lower-bounds** calculated using them would be & are likewise, **false ones**.
Unfortunately, mathematicians & scientists – many of whom are not entirely observant of the imperative need to incessantly challenge basic underlying assumptions - have failed to do just that... for a measurable millennia. One of the many proofs of this can be found in Archimedes' unchallenged assumption & address of what is nature's finest specimen: the curvature constant known as pi.

Archimedes' initial unproven assumption (& all the polygonal folly following it) fundamentally underlies what can only be described as an ongoing "Blunder of Millennia" as according to the use of an inverse square to precisely calculate the area of a circle without iteratively & exhaustively approximating it. Unlike Archimedes' & mathematicians' approach, this approach explicitly solves for pi with exactitude & is contained herein (to follow).

First, instead of beginning with Archimedes' initial assumption, we begin with an even more basic one: human beings are fallible & tend to make mistakes. It is therefore necessary, should that be the case here, to suspend (if even temporarily) any/all hitherto taken-to-be-true notions concerning pi as a consequence of Archimedes' approach.

Specifically, this includes the hitherto-endorsed outstanding belief(s):

i. The circumference of a circle whose radius is 0.5000... is (approx.) 3.14159...
ii. The number pi is (therefore) approximately 3.14159..., and
iii. Pi is "transcendental" as was "proven" by Lindemann et al. in 1882.

These beliefs (as believed to be indisputably "proven") among many others, could in reality be owing to a single false basic underlying assumption should it ever be the case any real circumference of any real circle whose radius is really 1/2 = 0.5000... is measured & observed to be greater than such a decimation as 3.14159... If so, it would follow the decimation 3.14159... would not actually be pi... And, if that is so, it would follow Lindemann et al. did not really prove pi is transcendental at all, but rather proved the approximated decimation 3.14159... is (and this part of the result can remain undisputed). But, if pi is actually another number entirely such as an exact ratio expressible in an exact form(s) & such a ratio happens to be algebraic... then, the opposite would be true: pi would not be "transcendental".

It is important to be conscious of any/all condition(s) & circumstance(s) under which an assumption(s), belief(s) and/or conclusion(s) hitherto taken to be 'true' by any body of consensus can actually be proven 'false'. Recognizing a false basic underlying assumption is the very spark preceding the inevitable explosion of scientific discovery & progress. We so proceed to challenge Archimedes' basic underlying assumption.

We begin by questioning Archimedes' use of regular polygons of sides n, asking: "...on what foundation, if any, did Archimedes assume by iteratively & exhaustively doubling the sides of a regular polygon(s), their perimeter(s) should reconcile the circumference of a circle to any desired degree of accuracy? Moreover: concerning the calculation of pi: is there not a better way(s)?"

We continue by allowing the possibility Archimedes made a mistake(s) in his assumption(s), so we reject Archimedes' approach entirely & try a new one by inscribing & circumscribing a circle of known radius with a perfect square(s) and square the four right angles of the circle up against the four right angles of that square.

In doing so, the condition of a like-for-like comparison is satisfied: both circle and square discretely observe each others' four right-angles.
We observe a unit square of side $2r = 1$ and of area $(2r)^2 = 4r^2 = 1$ observing $r = 1/2$, the geometric radius of the inscribed circle whose own area is $(a) = \pi r^2 = \pi (1/2)^2 = \pi/4$. We find it geometrically circumscribing a smaller square relatively $s^2 = 1/2$ whose area is precisely half the area of the larger unit square. An extremely important **line-area magnitude equality** exists ('**LAME**' is proposed for describing the condition necessarily following from any & all severing of geometric integrity) while/as observing the geometric integrity of $r = 1/2 = s^2$. Accordingly: the radius of the circle is equal in magnitude to the area of the square the circle geometrically circumscribes.

What is important to note here, for hitherto being unrecognized, is the integrity of the radius of the circle ($r = 1/2$) practically owing itself to the integrity of a real geometric square the circle geometrically circumscribes ($s^2 = 1/2 = r$).

What we are looking for is a better way to **calculate** the area and/or circumference of the $r = 1/2$ circle **without a priori** assumption(s), belief(s) and/or conclusion(s) the number $3.14159...$ as exhaustively arrived at by Archimedean "approximation" methodologies... is correct. Mathematicians, scientists & physicists have hitherto assumed & relentlessly continue to believe (to this very moment) there is no known better way (as according to their own enduring false basic underlying assumptions).
We proceed with the (very) motive (of science): to explore & discover new possibilities; a new way(s) of looking at things; a new way(s) to calculate something without the headaches & traumas induced by trigonometry, calculus, endless iteration(s) & mere approximation(s) or absurd approaches to “infinity” etc. We do what mathematicians, scientists & physicists have not: we challenge our most basic underlying assumptions, beliefs & conclusions.

Recall the radius of the concerned circle is \( r = 1/2 \) in units & find its area \( (a) \) in units squared to be contained by a relative circumference \( (4a) = \pi \) in units. This relation implies the circle is accordingly self-referential: length \( (4a) \) units circularly surrounds \( (a) \) units squared. As shown below, the four quarters of the circumference (each of length \( (a) \) units) contains an area \( (a) \) units squared.

If somehow not immediately obvious: a squared symmetry already exists between the concentrically placed circle & square(s). It happens to be an important one catastrophically ignored by Archimedes’ approach entirely (and has been by mathematicians ever since). This squared symmetry can & should be used to calculate the only possible magnitude for \( (a) \) permitting such a relation with respect to a known radius of \( 1/2 \). If unclear: the circumference of the circle is exactly \( (4a) = \pi \) for \( r = 1/2 \) regardless of its numerical decimation.

Instead of inscribing & circumscribing the circumference with ugly-edged polygons and blundering with another invalidated comparison(s), here we have a circular squared area \( (a) \) geometrically contained by a length of \( (4a) \). Unlike the octagons, the \( (4a) \) circumference of the circle precisely contains \( (a) \).
If we also surround the \((4a) = \pi\) circumference with another squared area(s) exactly equal to \((4a)\) units squared (thus in the form of an annulus), we can then use an inverse square operation on the width of the annulus to calculate the only possible value of \((a)\) which geometrically permits it to (simultaneously):

i. be a circular squared area \((a)\) in units squared while/as

ii. contained by a relative \((4a)\) circumferential length in units

iii. and surrounded by an annulus of area \((4a)\) units squared...

...such that it all unitarily observes a radial length \(r\) of exactly \(1/2 = 0.5000\ldots\)

To surround the \(r = 1/2\) circle with an annulus containing a relative \((4a)\) in units squared, the \(r = 1/2\) circle must uniformly expand radially until it discretely captures \((4a)\):

For which uniform width \(w\) would an annulus surrounding \((a)\) units squared...

...contain \((4a)\) units squared?

Figure 4.
We may recall the area equation of an annulus $\pi(R^2 - r^2)$ wherein R is the larger 'Major' of two radii (hence Majora) and r is the smaller 'Minor' (hence Minora). The product of their resp. difference (Majora – Minora) and the circle constant $\pi$ is equal to the area of the annulus. While/as we do not yet have a numerical value for $\pi$, we do know it must be (4a) while/as observing a radius of $1/2 = 0.5000...$:

$$4a(R^2 - r^2) = 4a$$

What we do not yet know is the required length of the other: the Majora, to properly contain 4a between it & the Minora. We therefore substitute in the knowns and calculate the unknown:

Given:

$\pi(R^2 - r^2)$

Equate to 4a:

$$4a(R^2 - r^2) = 4a$$

Substitute r with a known (1/2):

$$4a(R^2-(1/2)^2) = 4a$$

Solve for the unknown (R):

$$4a((\sqrt{5}/2)^2 - (1/2)^2) = 4a$$

$$4a(5/4 - 1/4) = 4a$$

$$4a(1) = 4a$$

∴ the annulus of

Majora $R = \sqrt{5}/2$ and Minora $r = 1/2$

contains an area of exactly 4a units squared.

Both mathematicians & non- (incl. number specialists & theorists) have somehow completely missed the geometric relationship between the sum of the two principle ratios (1/2 and $\sqrt{5}/2$) as the so-called "golden ratio" $\phi$... and the circle constant $\pi$. Instead, our humanity ongoing suffers a dark age of scientific stagnation wherein assumptions without foundations are at the very foundation of it (& us all). So we suffer the illusion of knowledge & so subdued are we by a debilitating "bind" that is stagnation; non-exploration, non-discovery, non-progress & all of it owing solely to one common collective failure(s) of mathematicians, scientists & physicists to incessantly & unreservedly:

**CHALLENGE ANY & ALL BASIC UNDERLYING ASSUMPTIONS, BELIEF(S) & CONCLUSION(S).**
The circle equations of the Major and Minor radii circles \( R = \sqrt{5}/2 \) and \( r = 1/2 \) are \textit{resp.}:

\[
\text{Majora} = x^2 + y^2 = 5/4 \\
\text{Minora} = x^2 + y^2 = 1/4 \\
\therefore \text{Majora} - \text{Minora} = 1
\]

The difference between these circles is predictably \textit{equal} to the difference of \textit{sequential squares} \( p^2 - p = 1 \) whose \textit{principle} \( p \) predictably contains the Minora & Majora lengths:

\[
p = (r \pm R) \\
p = (1/2 \pm \sqrt{5}/2)
\]

Plotting these two circles concentrically about an origin \( o \):

For two concentric circles:

\[
\begin{array}{c}
\text{Majora} = x^2 + y^2 = 5/4 \\
\text{Minora} = x^2 + y^2 = 1/4
\end{array}
\]

\[
\text{and}
\]

\[
\begin{array}{c}
\text{Let } a_r = \pi r^2 \text{ describe the area of the } r = 1/2 \text{ circle} \\
& \text{and find } a_r:
\end{array}
\]

\[
\begin{array}{c}
\text{For } r = 1/2:
\end{array}
\]

\[
\begin{array}{c}
a_r = \pi r^2 \\
a_r = \pi (1/2)^2 \\
a_r = \pi r/4 = a \\
\therefore a_r = a
\end{array}
\]

\[
\begin{array}{c}
\text{Let } a_R = 4a r^2 \text{ describe the area of the } R = \sqrt{5}/2 \text{ circle} \\
& \text{with respect to } a \text{ & find } a_R.
\end{array}
\]

\[
\begin{array}{c}
a_R = 4a r^2 \\
a_R = 4a (\sqrt{5}/2)^2 \\
a_R = 4a (\sqrt{5}/4) \\
a_R = 20a/4 \\
a_R = 5a
\end{array}
\]

\[
\begin{array}{c}
\text{Plotting these two circles concentrically about an origin } o:
\end{array}
\]

\[
\begin{array}{c}
\text{If one begins with an } R = \sqrt{5}/2 \text{ circle whose area is relatively } (5a) \text{ observing } r = 1/2 \\
& \text{and removes a circular squared area } (a) \text{ from its center, one is invariably left with a squared area } \text{exactly equal to } (4a) = \pi \text{ in the form of an annulus. Significantly, the area of this annulus is equivalent to the area of the ordinary unit circle as described by } \pi r^2 = \pi \text{ for } r = 1 \text{ and/or } r = -1.
\end{array}
\]
We are now equipped to answer the crucial question: for which width does the area of the annulus equal \((4a)\) units squared?

![Diagram](image.png)

\[
4a \left( \left( \frac{\sqrt{5}}{2} \right)^2 - \left( \frac{1}{2} \right)^2 \right) = 4a \left( \frac{5}{4} - \frac{1}{4} \right) = 4a \times \frac{4}{4} = 4a
\]

\(-\frac{1}{2} + \frac{\sqrt{5}}{2} \approx 0.61803398\ldots\)

\begin{itemize}
  \item The width of the annulus capturing \(4a\) units squared while/as surrounding \(a\) is:
  \item The reciprocal of the golden ratio is the only possible width satisfying this annulus.
  \item Be this the case, the preceding 'golden annulus' is so named for: uniquely possessing the reciprocal of the golden ratio as its width & whose area is equivalent to (that of the) ordinary unit circle. Given the surface area of a sphere is \(4\pi r^2\), the presence of the so-called golden ratio \(\phi\) within \(\pi\) is nothing short of extremely significant.
\end{itemize}
Unlike Archimedes’ approach, here we are effectively inscribing and circumscribing the circle with squared areas instead of ugly-edged polygons. This way, we are practically circumventing Archimedes’ initial assumption all while duly observing & diligently preserving geometric integrity (for uniformly squaring each a outwards until discretely capturing (4a) in/as a surrounding squared area).

Finally, we use an inverse square to solve for the only possible value of (a) by equating the known width of the annulus (equal to the reciprocal of the golden ratio) to a perfect square of (a):

For which a does its own square equal the reciprocal of the golden ratio?

\[ a^2 = \frac{-\sqrt{\frac{1}{4}} + \sqrt{\frac{5}{4}}}{2} \]
\[ \therefore a = \sqrt{-\frac{\sqrt{\frac{1}{4}} + \sqrt{\frac{5}{4}}}{2}} \]

\[ = \frac{\sqrt{2(\sqrt{5} - 1)}}{2} = \frac{2}{\sqrt{2(\sqrt{5} + 1)}} \]

in EXACT FORM(S).

If we let \((1/2 + \sqrt{5}/2) = \Phi\) and \((-1/2 + \sqrt{5}/2) = 1/\Phi\)

then simply:

\[ a^2 = \frac{1}{\Phi} \therefore a = 1/\sqrt{\Phi} \]
Therefore,

\[
4a = \frac{8}{\sqrt{2(\sqrt{5}+1)}} = \pi
\]

\[
= 4\sqrt{\frac{1}{4} + \frac{5}{4}}
\]

\[
= 2\sqrt{2(\sqrt{5}-1)}
\]

\[
= \sqrt{8\sqrt{5}-8}
\]

\[
\text{METHOD} \quad \text{DECIMATION / APPROXIMATION}
\]

INVERSE SQUARE : 3.144605511029693144...

ARCHIMEDES’ APPROXIMATION : 3.141592653589793238...

0.003012857439899905...

\[(0.7853981633974483...)^2 = w\]

\[
w = 0.61685027...
\]

\[
w \neq 0.61803398...
\]

\[\therefore \text{the width } w \text{ is deficient}\]
If the inverse square method & result is correct, implied is:

\[
\pi \neq 3.141592653589793238...
\]
\[
\pi = \sqrt{(8\sqrt{5} - 8)}
\]
\[
\approx 3.144605511029693144...
\]

\[\therefore \pi \text{ is NOT } "\text{transcendental}" \text{ for being a root of the polynomial with integer coefficients:}
\]
\[x^4 + 16x^2 - 256 = 0\]

Further, if correct, we should predictably expect to find (& rather immediately) some enigmatic (unsolved) problem in the field of mathematics concerning circle geometry. It so happens, we do: in the notoriously unsolved Riemann Hypothesis problem.

In 1859, Bernhard Riemann hypothesized the real part of all non-trivial zeros of his, the (π-dependent) Riemann zeta function, is \(1/2 = 0.5000\ldots\). The problem is, neither he nor anyone else since could prove this. Why not? What was/is the impasse?

In the same way it is sometimes more effective to address a question with another question, in this case: it is entirely appropriate to address Riemann's unsolved hypothesis with another hypothesis (albeit one tacitly informative of the "real" underlying problem):

The "Blunder of Millennia" Hypothesis:

The unsolved status of the Riemann Hypothesis (problem) is owing to an unrecognized inexactitude in & of the hitherto endorsed approximation (decimation) of pi (as):

\[3.141592653589793238\ldots\]

According to the use of an inverse square:

\[\pi \neq 3.141592653589793238\ldots\]
\[\pi = \sqrt{(8\sqrt{5} - 8)} \text{ with exactitude}\]

whose approximation (decimation) is

\[3.144605511029693144\ldots\]

& strictly observes the geometric integrity (of):

\[r = 1/2 = s^2\]

If the Blunder of Millennia Hypothesis is true, clearly: prior to the construction of his analysis, Bernhard Riemann failed to rigorously verify (in this case: falsify) the geometric integrity of 3.14159... before ever allowing it into his zeta function. Riemann would have assumed 3.14159... was/is without geometric blemish & so carried on with his analysis accordingly... (as mathematicians still do to this day).
Predictably, the real underlying culprit as to why the Riemann Hypothesis problem is "unsolved" would be strictly as a matter of principle alone: under no circumstances can one "prove" anything 'true' so long as one initially begins with a false basic underlying assumption. In hindsight: the problem would have begun in the "unsolvable" state, for the real underlying problem being in the hitherto unrecognized geometric deficiency (ie. inexactitude) in & of the very circle constant pi itself (!)

Unfortunately, neither Archimedes, nor Riemann, nor anyone else since has ever thought to question the geometric integrity of the otherwise undisputed approximation of the circle constant pi. From Archimedes to Riemann to present: all will have operated under a single shared false basic underlying assumption one would have wanted to know before one expired.

The real lesson in waiting would be: this problem could & would never have existed in the first place had a single mathematican(s), scientist(s), physicist(s) etc. at least once (since the time of Archimedes over 2000 years ago) invested the necessary time & energy required to rigorously check their answer for pi by comparing it to an inverse-square-based reality.

Finally, in the end (or rather again: since the beginning) our commonly suffered & prevailing "crisis" in science would immediately be clarified by one corollary equality predicting one culprit categorical ignorance of two universal constants' constant union, given

\[ \Phi = (r + r\sqrt{5}) \]
\[ \text{as } r = 1/2 = s^2 = 0.5000... \]

and if:

\[ \pi \neq 3.14159... \]

but rather:

\[ \pi = \sqrt{(8\sqrt{5}-8)} \]
\[ \approx 3.144605511029693144... \]

it so follows:

\[ \pi^2 = 16 / \Phi \]
\[ \Phi = 16 / \pi^2 \]
\[ 16 = \Phi\pi^2 \]
\[ 1 = \Phi(\pi/4)^2 \]

...that one ever was & is so very simply a product of a golden ratio & square of pi-quartered.

As a matter of principle alone: if even unreservedly forgiving of Archimedes' millennial blunder... given an observed inverse square (law) relation, we, living now in the 21st century ought to know better than to ever so crudely & carelessly "approximate" a universal constant(s) such as pi.
In dedication to **Isha**:
- for all sufferings endured -
  a measure of our ignorance.