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New π Value: Its Derivation and Demarcation of an Area of Circle Equal to $\frac{\pi}{4}$ In A Square

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ABSTRACT: *π value is 3.14159265358… it is an approximation, and it implies the exact π value is yet to be found. Here is a new method to find the most sought after exact π value. 3.14159265358… is actually is the value of inscribed polygon in a circle. It is a transcendental number. When line-segments of circle are involved in the derivation process then only the exact π value can be found.* $\frac{14-\sqrt{2}}{4}$ *= 3.14644660942… thus obtained is an algebraic number and hence squaring of circle is also done in the second part (method-3) of this paper.*

KEYWORDS: *Circle, Diagonal, Diameter, π value, Radius, Square, Squaring of circle*

I. INTRODUCTION

METHOD-1: Computation of tail-end of the length of the circumference over and above three diameters of the Circle

The **Holy Bible** has said π value is 3. **Archimedes** (240 BC) of Syracuse, Greece has said π value is less than 3 1/7. He has given us the upper limit of π value. In 3 1/7, 3 represents three diameters and 1/7 represents the tail-end of the circumference of the circle (πd = circumference)

In March, 1998, Gayatri method said the π value as $\frac{14-\sqrt{2}}{4}$ = 3.14644660942… and its tail-end of the length of the circumference of a circle over and above its 3 diameters as equal to $\frac{1}{2\sqrt{2}+4}$ when the diameter is equal to 1.

1/7 of **Archimedes** = 0.142857142857…

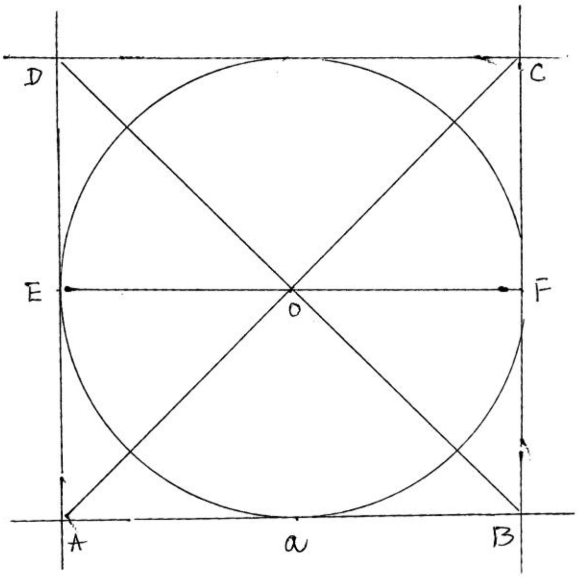
$\frac{1}{2\sqrt{2}+4}$ of Gayatri method = $\frac{1}{6.82842712474}$ = 0.14644660942…

In the days of **Archimedes** there was no decimal system, because there was no **zero**. **Archimedes** is correct in saying the tail-end length of the circumference is less than 1/7. How ? Gayatri method supports **Archimedes'** concept of **less than 1/7** by giving $\frac{1}{6.82842712474}$. The denominator part of the fraction, is actually, less than 7 of 1/7. He is a great mathematician. This fraction $\frac{1}{6.82842712474}$ has become possible because of the introduction of zero in the numbers 1 to 9 and further consequential result of decimal system of his later period. If he comes back alive, with his past memory remain intact, **Archimedes** would say, what he had visualized in 240 BC has become real.

II. PROCEDURE

Let us see how this tail-end value of circumference is obtained: Draw a circle with Centre 'O' and radius a/2. Draw four equidistant tangents on the circumference. They intersect at four prints called A, B, C and D, creating a square ABCD. The diameter of the circle EF is also equal to the AB side of the square. Draw two diagonals AC and BD. Their values are $\sqrt{2}a$. Perimeter of the square is equal to 4a.

In this circle-square composite system there are now 3 types of straight lines and one circumference which is a curvature. The straight lines are 1. Perimeter of the square, 2. Two diagonals and 3. Diameter of the circle. The values of these straight lines are known and exact. The length of the circumference is unknown and hence this method is to find out its exact length with the help of known lengths of three types of straight lines.



Let us repeat here again the perimeter (4a) of the square and the sum of the lengths of two diagonals $\left(2\sqrt{2}a\right)$ are the outcome of the **tangents** on the circumference. It is clear therefore that the **curved** circumference **reflects** its **true** length in **all** the straight lines of square and circle.

We know very well that there are three diameters and some length called tail-end in the circumference.
Circumference = 3 diameters + tail end length
Tail-end length is unknown and hence it is called x.
3d + x = circumference
Diameter is equal to side of the square i.e. d = a
Let us rewrite 3d + x as 3a + x

To find out the length of the x

We take the help of all the straight lines. **The reciprocal of the two diagonals plus the perimeter of the square and when this product is multiplied by the square of the diameter (= side), will give x value.**

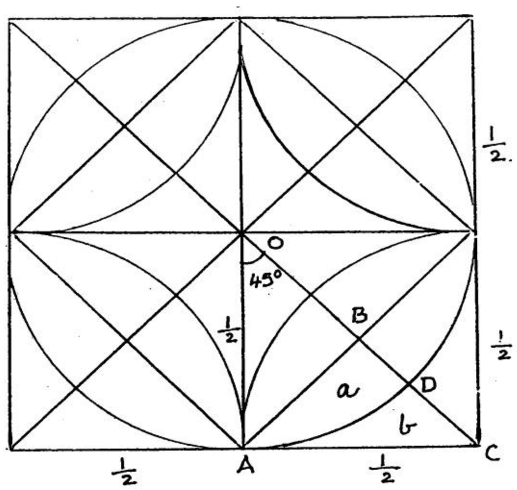
$$x = \left(\frac{1}{2\sqrt{2}a + 4a}\right)a^2 = \left(\frac{1}{2\sqrt{2} + 4}\right)a$$

Circumference = 3 diameters (3a) + tail-end length (x) = $3a + \left(\frac{1}{2\sqrt{2}+4}\right)a = \left(\frac{14-\sqrt{2}}{4}\right)a$

Circumference of the circle = $\pi d = \pi a$

So, $\pi a = \left(\frac{14-\sqrt{2}}{4}\right)a$ $\qquad\qquad \therefore \pi = \frac{14-\sqrt{2}}{4}$

The length of the circumference is obtained by superscribing a square. The correct understanding of the relationship among perimeter, diagonals of the square and the diameter of the circle (= side of the square) results in knowing the exact length of the tail-end of the circumference (x), what the great mathematician **Archimedes** has said is less than 1/7 **is proved now** to be $\left(\frac{1}{2\sqrt{2}+4}\right)=\frac{1}{6.82842712474}$ The denominator of Gayatri method 6.82842712474 … is less than 7 of 1/7 of 3 1/7 of **Archimedes**.



METHOD-2: Computation of Segmental Areas (An Elementary Approach)

1. BD = $\frac{2-\sqrt{2}}{4}$; CD = $\frac{\sqrt{2}-1}{2}$;

   AB = OB = $\frac{\sqrt{2}}{4}$
2. Area of ABC = $\frac{1}{16}$
3. Area of a + b = $\frac{1}{16}$
4. Area of Δ OAC = $\frac{1}{8}$; Δ OAB = $\frac{1}{16}$; Sector OAD $\approx$ $\frac{1}{10}$
5. Area of segment 'a' = OAD – OAB = $\frac{3}{80}$ = 0.0375

   Area of segment 'b' = OAC – OAD = $\frac{1}{40}$ = 0.025
6. 'a' is larger than 'b'. So, 'a' is greater than half of Δ ABC $\left(\frac{1}{16}\right)$.

   'b' is smaller than 'a'. So, 'b' is lesser than half of Δ ABC $\left(\frac{1}{16}\right)$.
7. Half of Δ ABC = $\frac{1}{32}$ = y
8. Let a – y = s, y – b = t; s = t
9. Let us assume $s=\frac{BD\times AC}{16}=\frac{2-\sqrt{2}}{128}$; $t=\frac{CD\times AB}{16}=\frac{2-\sqrt{2}}{128}$

10. $a - y = s$; $a = s + y = \frac{6-\sqrt{2}}{128}$
11. $y - b = t$; $b = y - t = \frac{2+\sqrt{2}}{128}$
12. $\therefore a + b = ABC$
13. Inscribed circle consists of 16a and 8b

    so, $16\left(\frac{6-\sqrt{2}}{128}\right)+8\left(\frac{2+\sqrt{2}}{128}\right)=\frac{\pi d^2}{4}$ Where d = 1

    $\therefore \pi = \frac{14-\sqrt{2}}{4}$

METHOD-3: DEMARCATION OF AREA OF CIRCLE WITH ITS STRAIGHT-LINED BOUNDARY

From Gayatri method, the world came to know in March 1998, for the first time, the length of the circumference of the inscribed circle, demarcated in the perimeter of the square. The demarcated length of the circumference of the circle is BA + AD + DC + CH = a + a + a + $\left(\frac{2-\sqrt{2}}{4}\right)a = \left(\frac{14-\sqrt{2}}{4}\right)a$

The area of the circle is now bounded by a curvature called the circumference. In this method this area can have a straight-lined boundary. In this process the value of π plays important role. The official π value is 3.14159265358… With this π value let us locate the area:

1. Square = ABCD, Side = AB = a; AC = BD = diagonals = $\sqrt{2}$ a ; O = Centre
2. Inscribed a circle with centre O and radius = $\frac{a}{2}$; side = diameter = a
3. OF = OG = Radius; FOG = triangle; OF = $\frac{a}{2}$; FG = hypotenuse = $\frac{\sqrt{2}a}{2}$;
4. EH = Side – Parallel to CD = a
5. DE = EF = GH = CH = $\frac{EH-FG}{2}=\left(a-\frac{\sqrt{2}a}{2}\right)\frac{1}{2}=\left(\frac{2-\sqrt{2}}{4}\right)a$
6. BA + AD + DC + CH = a + a + a + $\left(\frac{2-\sqrt{2}}{4}\right)a = \left(\frac{14-\sqrt{2}}{4}\right)a$ = circumference of the inscribed circle (from Gayatri method).
7. Let us try to demarcate the extent of area of the inscribed circle with the help of official π value 3.14159265358… π = 3.14159265358…

   $\frac{\pi}{4}=\frac{3.14159265358}{4}=0.78539816339$
8. $\frac{3a}{4}=\frac{3}{4}=0.75$; Let us suppose 'a' = 1
9. S.No. 7 – S.No. 8 = 0.78539816339 – 0.75 = 0.03539816339
10. The area equal to 0.03539816339 cannot be located here. **It has become impossible.**
11. As an alternate, let us try to locate, the area with the guidance of the 'Circumference of the Gayatri method i.e. $\left(\frac{14-\sqrt{2}}{4}\right)a$, and with this,

    the **Gayatri π value** is $\frac{14-\sqrt{2}}{4}$

12. Let us repeat S.No. 7, 8, 9 with the Gayatri π value $\frac{14-\sqrt{2}}{4}$

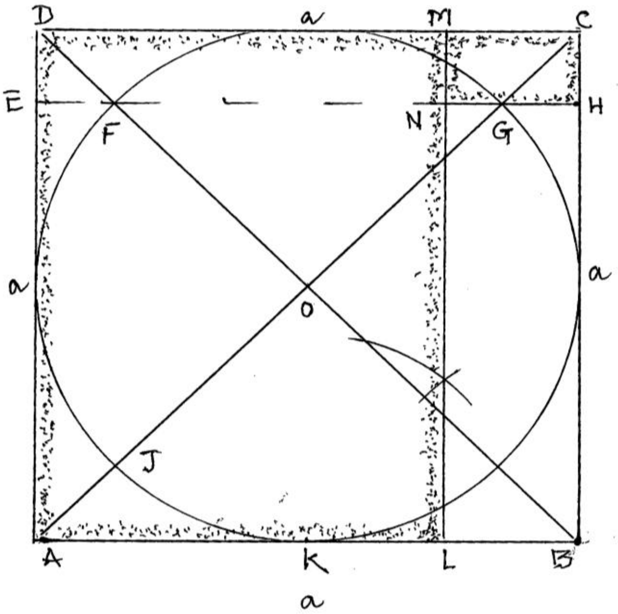
13. $\pi = \frac{14-\sqrt{2}}{4}$; $\frac{\pi}{4} = \left(\frac{14-\sqrt{2}}{4}\right)\frac{1}{4} = \frac{14-\sqrt{2}}{16}$

14. $\frac{3a}{4} = \frac{3}{4}$; where a = 1;

15. S.No. 13 – S.No. 14 $= \frac{14-\sqrt{2}}{16} - \frac{3}{4} = \frac{2-\sqrt{2}}{16}$

16. The area equal to $\frac{2-\sqrt{2}}{16}$ have to be located now. Let us see how

AB = a = 1; K = mid point of AB



17. AB = AK + KB = $\frac{a}{2} + \frac{a}{2}$

Bisect KB into KL and LB = $\frac{a}{4}$

AL = AK + KL = $\frac{a}{2} + \frac{a}{4} = \frac{3a}{4}$

DM = AL = $\frac{3a}{4}$

18. So DM = $\frac{3a}{4}$; Join ML

LB = MC = $\frac{a}{4}$ = NH = MC

19. There are two rectangles ALMD and MNHC

20. Area of ALMD rectangle = AD x AL = $a \times \frac{3a}{4} = \left(\frac{3}{4}\right)a^2$

21. Area of MNHC rectangle = MN x NH = $\left(\frac{2-\sqrt{2}}{4}\right)a \times \frac{a}{4} = \left(\frac{2-\sqrt{2}}{16}\right)a^2$

22. In serial No. 10 we have said, getting an area equal to 0.03539816339 is impossible: With the Gayatri π value $\frac{14-\sqrt{2}}{4}$, getting an area equal to $\frac{2-\sqrt{2}}{16}$ of S.No. 15 is thus possible.

23. **Area of the inscribed circle**

Areas of rectangles ALMD+MNHC = $\left(\frac{3}{4}\right)a^2 + \left(\frac{2-\sqrt{2}}{16}\right)a^2 = \left(\frac{14-\sqrt{2}}{16}\right)a^2$

(S.No. 20) (S.No. 21)

24. Circle and square both can be inscribed and/ or circumscribed with each other. It means, both must be finite entities, having finite magnitudes, and to be represented by finite numbers.

25. Official π value cannot demarcate circle's area. Whereas, Gayatri π value demarcates. So is 3.14159265358… or $\frac{14-\sqrt{2}}{4}$ = 3.14644660942… the real π value ?

26. It is another way of squaring a circle.

III. CONCLUSION

New π value is exact and it is an algebraic number and squaring of circle has be done by demarcating, the area of a circle in a square.

REFERENCES

[1]. Lennart Berggren, Peter Borwein, Jonathan Borwein, *Pi: A Source Book* (Springer, 1996).

[2]. David Blatner, *The Joy of Pi* (Walker/Bloomsbury, 1997).

[3]. Alfred S. Posamantier, *Pi: A mysterious number* (Prometheus Books, 2004).

[4]. RD Sarva Jagannadha Reddy, Pi of the Circle (www.rsjreddy.webnode.com, 2014).