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A HIDDEN TRUTH OF SQUARE ROOT TWO IN CIRCLE, AND ITS ESSENTIAL ROLE IN FINDING CIRCUMFERENCE AND AREA OF A CIRCLE (116th Method on Circle and its real Pi)

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ABSTRACT
Area and circumference of circle are calculated with the help of either square or with the help of triangle or with the help of polygon having many sides. In this paper square root 2 is obtained from two circles and area and circumference of circle are calculated from the same square root two of circle.

KEYWORDS— Circle, circumference, side, square, square root two.

INTRODUCTION
Circle is a beautiful geometrical entity, having a radius, which keeps circumference uniformly away from the centre of the circle. Another basic geometrical entity is square. It is a straight-lined entity. Its area and perimeter are calculated with its side (a) using the formulae a^2 and 4a. The area and circumference of circle are calculated with the help of πr^2 and $2\pi r$, where 'r' is radius and π is a constant.

In this paper, two circles create a right angled triangle and consequential length equal to an irrational number $\sqrt{2}/2$. $\sqrt{2}/2$ plays an essential role in finding the area and circumference of circle. So, here one point is very clear. **There is no π, involved here.** Secondly, the diameter and GB length are enough to find the 4 areas of curvilinear segments LH, HBJ, JK and KAL.

PROCEDURE
Draw a circle with centre O and diameter AB. D is the midpoint of OB. Draw a smaller circle with centre D and diameter OB. Draw a tangent AE on the smaller circle which touches the smaller circle at F. Join FD.

1. Diameter AB = d, AO = OB = radius = $\frac{d}{2}$
2. Smaller diameter OB = $\frac{d}{2}$, OD = DF = smaller radius = $\frac{d}{4}$
3. Triangle AFD is a right angled triangle.

   Triangle AFD : AD = AO + OD = $\frac{d}{2}+\frac{d}{4}=\frac{2d+d}{4}=\frac{3d}{4}$

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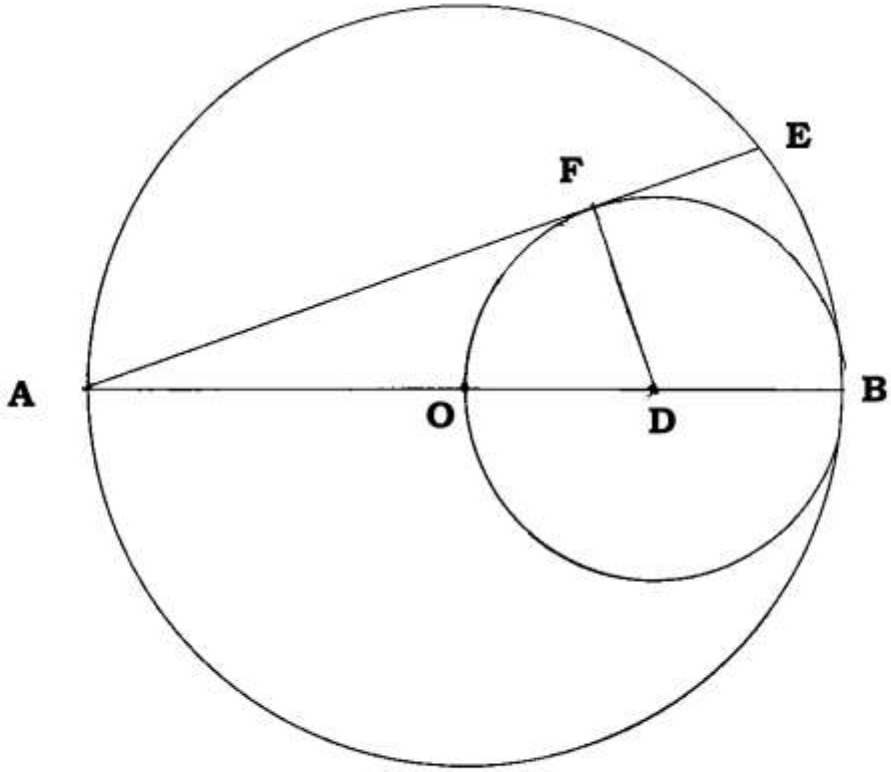

Fig-1

$FD = \frac{d}{4}$; AF = ?

Pythagorean theorem: $AD^2 - FD^2 = AF^2$

$$= \left(\frac{3d}{4}\right)^2 - \left(\frac{d}{4}\right)^2 = AF^2$$

$$AF = \sqrt{\left(\frac{3d}{4}\right)^2 - \left(\frac{d}{4}\right)^2} = \frac{\sqrt{2}d}{2}$$

4. **It is clear that an irrational number $\frac{\sqrt{2}}{2}$ is created by two circles.** In other words, it supports, the new theory that $\sqrt{2}$ is a **hidden truth in circle**. It also gives a clear and first step to find out the length of the circumference of the AB diameter circle, which is larger in size.

5. Fig.2:
AB = diameter, Centre = O

$AF = \frac{\sqrt{2}d}{2}$ of Fig.1 = AF of Fig.2 also = $\frac{\sqrt{2}d}{2}$

6. FB = AB – AF = $\left(d-\frac{\sqrt{2}d}{2}\right)=\frac{2d-\sqrt{2}d}{2}$

7. Bisect FB into FG and GB, FG = GB = $\left(\frac{2-\sqrt{2}}{4}\right)d$

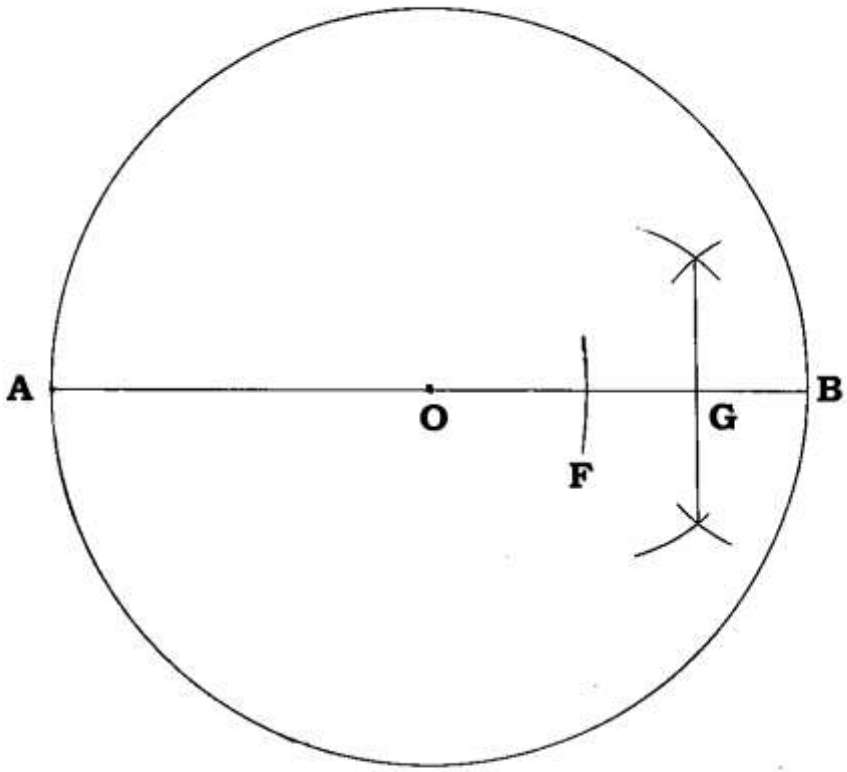

Fig.2

8. Circumference of larger circle whose diameter is 'd' is equal to 3 diameters (3 AB) + GB

$$= 3d+\left(\frac{2-\sqrt{2}}{4}\right)d=\left(\frac{14-\sqrt{2}}{4}\right)d$$

9. We know formula for circumference of a circle is πd.

Where $\left(\frac{14-\sqrt{2}}{4}\right)d = \pi d$

$$\pi=\frac{\left(\frac{14-\sqrt{2}}{4}\right)d}{d}=\frac{14-\sqrt{2}}{4}$$

<u>Part-B : Area of the Circle</u>

10. Draw a perpendicular line on AB at G which intersects circumference at H and J. And HJ is surprisingly equal to $\frac{\sqrt{2}d}{2}$

So, AF = HJ = $\frac{\sqrt{2}d}{2}$

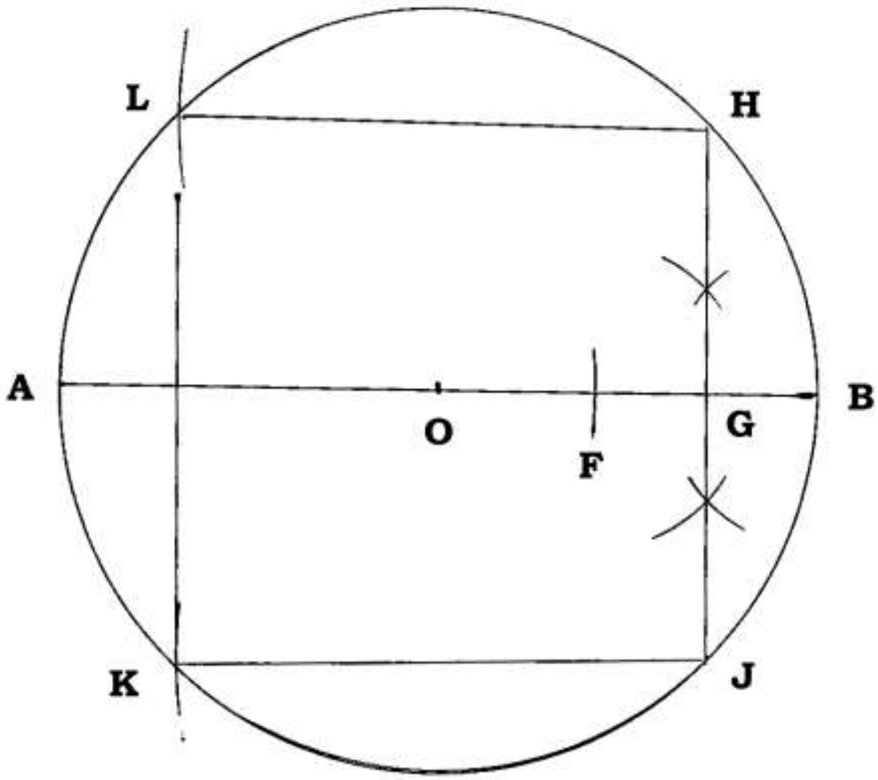

Fig.3

11. HJ is also called as chord of the circle.
12. Four equidistant such HJ chords create a square in the circle

with side = $\frac{\sqrt{2}d}{2}$

Square KJHL, side = KJ = JH = HL = LK = $\frac{\sqrt{2}d}{2}$

Area of the Square = KJHL = LK x KJ = $\frac{\sqrt{2}d}{2} \times \frac{\sqrt{2}d}{2} = \left(\frac{2}{4}\right)d^2 = \frac{d^2}{2}$

13. We know formula for the area of the circle = $\frac{\pi d^2}{4}$

14. The area **in between** the inscribed square KJHL and the circle is
Circle area – Square area

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$$\frac{\pi d^2}{4}-\frac{d^2}{2}=\left(\frac{\pi-2}{4}\right)d^2$$

15. From S. No. 9 we understand π is equal to $\frac{14-\sqrt{2}}{4}$

16. So, the formula for the **in-between area** is $\left(\frac{\pi-2}{4}\right)d^2$

17. In Fig.3, we have the following line segments
    (a) Diameter = AB = d
    (b) AF = $\frac{\sqrt{2}d}{2}$
    (c) Side of square LKJH = AF = KJ = $\frac{\sqrt{2}d}{2}$ and
    (d) GB line segment = $\left(\frac{2-\sqrt{2}}{4}\right)d$ of step 7

18. The following formula is based on the **above line segments** for in between area. **Formula for the in-between area**

$$=\left(\frac{\text{Diameter}+\text{GB length}}{4\,\text{diameters}}\right)\text{Square of diameter}=\left(\frac{AB+GB}{4AB}\right)AB^2$$

$$=\left\{\frac{d+\left(\frac{2-\sqrt{2}}{4}\right)d}{4d}\right\}d^2$$

19. Area of the square = $\left(\frac{\sqrt{2}d}{2}\right)^2=\frac{d^2}{2}$

20. Area of the circle = Square area + in between area

$$=\frac{d^2}{2}+\left\{\frac{d+\left(\frac{2-\sqrt{2}}{4}\right)d}{4d}\right\}d^2=\frac{\pi d^2}{4}$$

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

21. $$\frac{d+\left(\frac{2-\sqrt{2}}{4}\right)d}{4d}=\frac{6-\sqrt{2}}{16}$$

So, $\frac{6-\sqrt{2}}{16}$ is another **circle constant** which, when it is multiplied with **square of the diameter,** gives value to, the **in between area** of square and circle.

CONCLUSION

The length of the **circumference** and **area** of the circle are arrived at, **without using Pi constant**, and are possible with concerned line segments, such as diameter, tangent on a smaller circle etc. In calculating the area of circle, π (= $\left(\frac{14-\sqrt{2}}{4}\right)$) is multiplied with the square of the diameter and divided by 4. Whereas, in finding the in-between area of square and circle, **another new constant** equal to $\frac{6-\sqrt{2}}{16}$ is multiplied with the square of the diameter.

REFERENCES

[1] **Lennart Berggren, Jonathan Borwein, Peter Borwein** (1997), Pi: A source Book, 2nd edition, Springer-Verlag Ney York Berlin Heidelberg SPIN 10746250.
[2] **Alfred S. Posamentier & Ingmar Lehmann** (2004), π, A Biography of the World's Most Mysterious Number, Prometheus Books, New York 14228-2197.
[3] **David Blatner,** *The Joy of Pi* (Walker/Bloomsbury, 1997).
[4] **William Dunham** (1990), Journey through Genius, Penguin Books USA.
[5] **Richard Courant et al** (1996) What is Mathematics, Oxford University Press.
[6] **RD Sarva Jagannada Reddy** (2014), New Method of Computing Pi value (Siva Method). IOSR Journal of Mathematics, e-ISSN: 2278-3008, p-ISSN: 2319-7676. Volume 10, Issue 1 Ver. IV. (Feb. 2014), PP 48-49.
[7] **RD Sarva Jagannada Reddy** (2014), Jesus Method to Compute the Circumference of A Circle and Exact Pi Value. IOSR Journal of Mathematics, e-ISSN: 2278-3008, p-ISSN: 2319-7676. Volume 10, Issue 1 Ver. I. (Jan. 2014), PP 58-59.
[8] **RD Sarva Jagannada Reddy** (2014), Supporting Evidences To the Exact Pi Value from the Works Of Hippocrates Of Chios, Alfred S. Posamentier And Ingmar Lehmann. IOSR Journal of Mathematics, e-ISSN: 2278-3008, p-ISSN:2319-7676. Volume 10, Issue 2 Ver. II (Mar-Apr. 2014), PP 09-12
[9] **RD Sarva Jagannada Reddy** (2014), New Pi Value: Its Derivation and Demarcation of an Area of Circle Equal to Pi/4 in A Square. International Journal of Mathematics and Statistics Invention, E-ISSN: 2321 – 4767 P-ISSN: 2321 - 4759. Volume 2 Issue 5, May. 2014, PP-33-38.
[10] **RD Sarva Jagannada Reddy** (2014), Pythagorean way of Proof for the segmental areas of one square with that of rectangles of adjoining square. IOSR Journal of Mathematics, e-ISSN: 2278-3008, p-ISSN:2319-7676. Volume 10, Issue 3 Ver. III (May-Jun. 2014), PP 17-20.
[11] **RD Sarva Jagannada Reddy** (2014), Hippocratean Squaring Of Lunes, Semicircle and Circle. IOSR Journal of Mathematics, e-ISSN: 2278-3008, p-ISSN:2319-7676. Volume 10, Issue 3 Ver. II (May-Jun. 2014), PP 39-46
[12] **RD Sarva Jagannada Reddy** (2014), Durga Method of Squaring A Circle. IOSR Journal of Mathematics, e-ISSN: 2278-3008, p-ISSN:2319-7676. Volume 10, Issue 1 Ver. IV. (Feb. 2014), PP 14-15
[13] **RD Sarva Jagannada Reddy** (2014), The unsuitability of the application of Pythagorean Theorem of Exhaustion Method, in finding the actual length of the circumference of the circle and Pi. International Journal of Engineering Inventions. e-ISSN: 2278-7461, p-ISSN: 2319-6491, Volume 3, Issue 11 (June 2014) PP: 29-35.

[14] **R.D. Sarva Jagannadha Reddy (2014).** Pi treatment for the constituent rectangles of the superscribed square in the study of exact area of the inscribed circle and its value of Pi (SV University Method*). IOSR Journal of Mathematics (IOSR-JM), e-ISSN: 2278-5728, p-ISSN: 2319-765X. Volume 10, Issue 4 Ver. I (Jul-Aug. 2014), PP 44-48.
[15] **RD Sarva Jagannada Reddy** (2014), To Judge the Correct-Ness of the New Pi Value of Circle By Deriving The Exact Diagonal Length Of The Inscribed Square. International Journal of Mathematics and Statistics Invention, E-ISSN: 2321 – 4767 P-ISSN: 2321 – 4759, Volume 2 Issue 7, July. 2014, PP-01-04.
[16] **RD Sarva Jagannadha Reddy (2014)** The Natural Selection Mode To Choose The Real Pi Value Based On The Resurrection Of The Decimal Part Over And Above 3 Of Pi (St. John's Medical College Method). International Journal of Engineering Inventions e-ISSN: 2278-7461, p-ISSN: 2319-6491 Volume 4, Issue 1 (July 2014) PP: 34-37
[17] **R.D. Sarva Jagannadha Reddy (2014).** An Alternate Formula in terms of Pi to find the Area of a Triangle and a Test to decide the True Pi value (Atomic Energy Commission Method) IOSR Journal of Mathematics (IOSR-JM) e-ISSN: 2278-5728, p-ISSN: 2319-765X. Volume 10, Issue 4 Ver. III (Jul-Aug. 2014), PP 13-17
[18] **RD Sarva Jagannadha Reddy (2014)** Aberystwyth University Method for derivation of the exact π value. International Journal of Latest Trends in Engineering and Technology (IJLTET) Vol. 4 Issue 2 July 2014, ISSN: 2278-621X, PP: 133-136.
[19] **R.D. Sarva Jagannadha Reddy (2014).** A study that shows the existence of a simple relationship among square, circle, Golden Ratio and arbelos of Archimedes and from which to identify the real Pi value (Mother Goddess Kaali Maata Unified method). IOSR Journal of Mathematics (IOSR-JM) e-ISSN: 2278-5728, p-ISSN: 2319-765X. Volume 10, Issue 4 Ver. III (Jul-Aug. 2014), PP 33-37
[20] **RD Sarva Jagannadha Reddy** (2015). The New Theory of the Oneness of Square and Circle. International Journal of Engineering Sciences & Research Technology, 4.(8): August, 2015, ISSN: 2277-9655, PP: 901-909.
[21] **RD Sarva Jagannadha Reddy** (2015). Leonardo Da Vinci's Ingenious Way of Carving One-Fourth Area of A Segment in A Circle. International Journal of Engineering Sciences & Research Technology, 4.(10): October, 2015, ISSN: 2277-9655, PP: 39-47.
[22] **RD Sarva Jagannadha Reddy** (2015). Symmetrical division of square and circle (into 32) is reflected by the correct decimal part of the circumference (0.14644660941…) of circle having unit diameter. International Journal of Engineering Sciences & Research Technology, 4.(11): November, 2015, ISSN: 2277-9655, PP: 568-573.
[23] **RD Sarva Jagannadha Reddy** (2015). Doubling the cube in terms of the new Pi value (a Geometric construction of cube equal to 2.0001273445). International Journal of Engineering Sciences & Research Technology, 4.(11): November, 2015, ISSN: 2277-9655, PP: 618-622.
[24] **RD Sarva Jagannadha Reddy** (2015). Yet another proof for Baudhayana theorem (Pythagorean Theorem) or the diagonal length in terms of Pi. International Journal of Engineering Sciences & Research Technology, 4.(12): December, 2015, ISSN: 2277-9655, PP: 601-607.
[25] **RD Sarva Jagannadha Reddy** (2015). The Diagonal – circumference-Pi of Simplest Relation. International Journal of Engineering Sciences & Research Technology, 4.(12): December, 2015, ISSN: 2277-9655, PP: 772-776.
[26] **RD Sarva Jagannadha Reddy** (2015), Pi of the Circle (III Volumes), at www.rsjreddy.webnode.com.