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New Method of Computing π value (Siva Method)

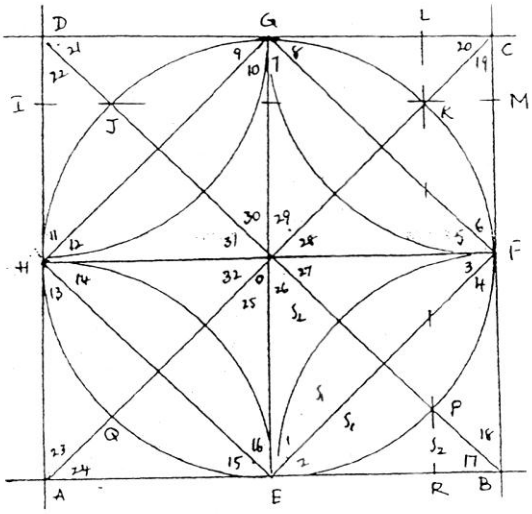
RD Sarva Jagannada Reddy

I. Introduction

πequal to 3.1415926… is an approximation. It has ruled the world for 2240 years. There is a necessity to find out the **exact** value in the place of this approximate value. The following method givesthe **total** area of the square, and also the **total** area of the inscribed circle. πderived from this area is thus exact.

II. Construction procedure

Draw a circle with center ‘0’ and radius *a*/2. Diameter is ‘a’. Draw 4 equidistant tangents on the circle. They intersect at A, B, C and D resulting in ABCD square. The side of the square is also equal to diameter ‘a’. Draw two diagonals. E, F, G and H are the mid points of four sides. Join EG, FH, EF, FG, GH and HE. Draw four arcs with radius *a*/2 and with centres A, B, C and D. Now the circle square composite system is divided into 32 segments and number them 1 to 32. 1 to 16 are of one dimension called S_1 segments and 17 to 32 are of different dimension called S_2 segments.



III. Calculations:

ABCD = Square; Side = a, EFGH = Circle, diameter = a, radius = a/2

Area of the S_1 segment = $\left(\frac{6-\sqrt{2}}{128}\right)a^2$; Area of the S_2 segment = $\left(\frac{2+\sqrt{2}}{128}\right)a^2$;

Area of the square = 16 S_1 + 16S_2 = $16\left(\frac{6-\sqrt{2}}{128}\right)a^2 + 16\left(\frac{2+\sqrt{2}}{128}\right)a^2 = a^2$

Area of the inscribed circle = 16S_1 + 8S_2 = $16\left(\frac{6-\sqrt{2}}{128}\right)a^2 + 8\left(\frac{2+\sqrt{2}}{128}\right)a^2 = \left(\frac{14-\sqrt{2}}{16}\right)a^2$

General formula for the area of the circle $\frac{\pi d^2}{4} = \frac{\pi a^2}{4} = \left(\frac{14-\sqrt{2}}{16}\right)a^2$; where a= d = side = diameter

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

IV. How two formulae for S_1 and S_2 segments are derived ?

$16\ S_1 + 16\ S_2 = a^2$ = area of the Square … Eq. (1)

$16\ S_1 + 8\ S_2 = \frac{\pi a^2}{4}$ = area of the Circle … Eq. (2)

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(1) – (2) ⇒ $8S_2 = a^2 - \frac{\pi a^2}{4} = \frac{4a^2 - \pi a^2}{4}$ = $S_2 = \frac{(4-\pi)a^2}{32} = \frac{a^2}{32}(4-\pi)$

(2)x 2⇒ $32\ S_1 + 16\ S_2 = \frac{2\pi a^2}{4}$ … Eq. (3)

$16\ S_1 + 16\ S_2 = a^2$ … Eq. (1)

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(3) – (1) $16S_1 = \frac{\pi a^2}{2} - a^2$ = $S_1 = \frac{a^2(\pi-2)}{32} = \frac{a^2}{32}(\pi-2)$

V. Both the π values appear correct when involved in the two formulae

a) Official π value = 3.1415926…

b) Proposed π value = 3.1464466… = $\frac{14-\sqrt{2}}{4}$

Hence, another approach is followed here to decide **real**π value.

VI. Involvement of line-segments are chosen to decide real π value.

A line-segment equal to the value of (π - 2) in S_1 segment's formula and second line-segment equal to the value of (4 - π) in S_2 segment's formula are **searched** in the above construction.

a) Official π : π - 2 = 3.1415926… - 2 = 1.1415926….

Proposed π : π - 2 = $\frac{14-\sqrt{2}}{4} - 2$ = $\frac{6-\sqrt{2}}{4}$

The following calculation gives a line-segment for $\frac{6-\sqrt{2}}{4}$ and no line-segment for 1.1415926..

IM and LR two parallel lines to DC and CB; OK = OJ = Radius = $\frac{a}{2}$; JOK = triangle

JK = Hypotenuse = $\frac{\sqrt{2}a}{2}$

Third square = LKMC; KM = CM = Side = ?

KM = $\frac{IM - JK}{2} = \left(a - \frac{\sqrt{2}a}{2}\right)\frac{1}{2} = \left(\frac{2-\sqrt{2}}{4}\right)a$; Side of first square DC = a

DC + CM = $a + \left(\frac{2-\sqrt{2}}{4}\right)a = \left(\frac{6-\sqrt{2}}{4}\right)a$

b) Official π = 4 - π= 4 – 3.1415926… = 0.8584074….

Proposed π = 4 - π = $4 - \frac{14-\sqrt{2}}{4} = \frac{2+\sqrt{2}}{4}$

No line-segment for 0.8584074… in this diagram.

MB line-segment is equal to $\frac{2+\sqrt{2}}{4}$. How ?

Side of the first square CB = a

MB = CB – CM = $a - \left(\frac{2-\sqrt{2}}{4}\right)a = \left(\frac{2+\sqrt{2}}{4}\right)a$

VII. Conclusion:

This diagram not only gives two formulae for the areas of S_1& S_2 segments andalso shows two line-segments for (π - 2) and (4 - π). Line-segment is the soul of Geometry.