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Exact value of pi π = (17- 8√3)

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Abstract: *In this paper, I show that exact area of circle = (πr^2) = (17 - 8√3) r^2. I found that the exact value of pi is = (17- 8√3).My findings are based on geometrical constructions, formula and proofs.*

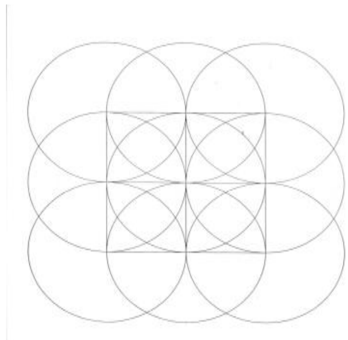
I. INTRODUCTION

Is it possible or impossible?
100% exact value of pi, 100% exact area of circle, area of circle = area of square
Yes, it is Possible!
We know that, where C /D = A/R^2 = approximate value of pi = 3.1415926535897…which is endless value.
C = circumference of circle, D = diameter of circle, A = area of circle, R = radius of circle,
If we calculate C / D we cannot measure end point of circumference. So it will give approximate results.
I started research to find exact area of circle using A /R^2 method.

There are different proofs to find the old value of pi but no one get 100% exact answer.
Like using number series, Trigonometry, Dividing circle into infinite parts, as practically we can't measure endpoint etc. In order to find 100% exact area of circle I found the new method.
I have made number of proofs but here I am giving simple proof out of it.

Reason why I am 100% sure about my research is that I estimated pi value by number of different algebraic methods. Why should we discuss pi is transcendental or algebraic? This is not important. But we are more concentrated on calculating 100% exact answer which is most important.
New methods are also discovered .i.e. algebraic table method. By all the methods the answer remains same.

<u>Basic Figure</u>



Modified figure (1 & 2)

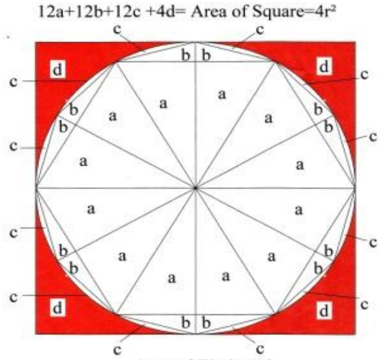


Fig. 1

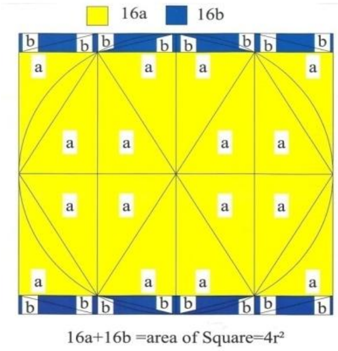


fig. 2

From fig. 1 & 2

Note: let a, b, c & d each part shows area

Area of square = (12a + 12b + 12c + 4d) = (16a + 16b) = $4r^2$

(12a + 12b + 12c + 4d) – (16a + 16b) = 0

= (- 4a - 4b + 12c + 4d) = 0

i.e. (4a + 4b = 12c + 4d) (a + b) = (3c+d) equation no. 1

From fig. no. 2

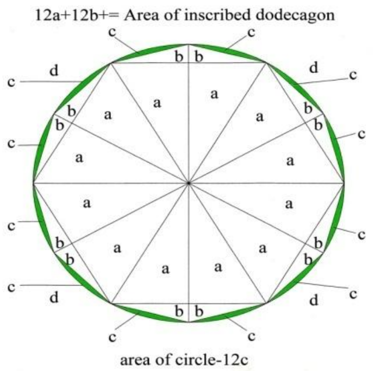
16a = $[2r \times 2(\sqrt{3}/2) r] = (2\sqrt{3}) r^2$ a $= (2\sqrt{3}) r^2/16$ $= (0.125\sqrt{3}) r^2$

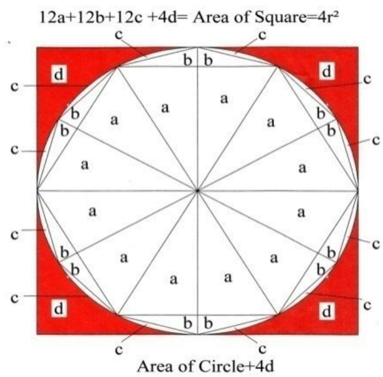
16b = $[2r – 2(\sqrt{3}/2) r] \times 2r = (4 - 2\sqrt{3}) r^2$ b $= (4 - 2\sqrt{3}) r^2/ 16$ $= (0.25 – 0.125\sqrt{3}) r^2$

Problems faced during the research of pi that:

How to estimate the exact values of part c & part d?

I found number of equations for calculating area of square = $4r^2$.Few of them is mentioned in the following table. On the basis of these equations I estimated the exact area of circle in following manner.





Area of inscribed dodecagon (12a + 12b) = $3r^2$
= area of circle – 12c

area of square = (12a + 12b + 12c + 4d) = $4r^2$
= area of circle + 4d

I have geometric proofs for all of the following equations

S. r. no.	Equations of area of square = $4r^2$	Equations total = … $4r^2$
1	12a + 12b + 12c + 4d =$4r^2$	12a + 12b + 12c + 4d = $4r^2$
2	64b + 12c + 8d =$4r^2$	12a + 76b + 24c + 12d = $2(4r^2)$
3	4a + 100b – 18c = $4r^2$	16a + 176b + 6c + 12d = $3(4r^2)$
4	-8a + 120b + 8d = $4r^2$	8a + 296b + 6c + 20d = $4(4r^2)$
5	32a – 96b + 24c =$4r^2$	40a + 200b + 30c + 20d = $5(4r^2)$
6	20a – 12b + 6c = $4r^2$	60a + 188b + 36c + 20d = $6(4r^2)$
7	96b – 6c + 4d = $4r^2$	60a + 284b + 30c + 24d = $7(4r^2)$

8	48a – 208b + 48c = $4r^2$	108a + 76b + 78c + 24d = $8(4r^2)$
9	24a – 40b + 12c = $4r^2$	132a + 36b + 90c + 24d = $9(4r^2)$
10	128b – 24c = $4r^2$	132a + 164b + 66c + 24d = $10(4r^2)$
11	-20a + 172b + 12d = $4r^2$	112a + 336b + 66c + 36d = $11(4r^2)$
12	12a + 44b – 6c = $4r^2$	124a + 380b + 60c + 36d = $12(4r^2)$
13	28a – 68b + 18c = $4r^2$	152a + 312b + 78c + 36d = $13(4r^2)$
14	8a + 72b – 12c = $4r^2$	160a + 384b + 66c + 36d = $14(4r^2)$
15	4a + 68b + 4d = $4r^2$	164a + 452b + 66c + 40d = $15(4r^2)$
16	60a – 292b + 66c = $4r^2$	224a + 160b + 132c + 40d = $16(4r^2)$
17	104a – 600b + 132c = $4r^2$	328a – 440b + 264c + 40d = $17(4r^2)$
18	18a + 2b + 3c = $4r^2$	346a – 438b + 267c + 40d = $18(4r^2)$
19	36a – 124b + 30c = $4r^2$	382a – 562b + 297c + 40d = $19(4r^2)$
20	48c + 16d = $4r^2$	382a – 562b + 345c + 56d = $20(4r^2)$
Total area of 20 square =	382a – 562b + 345c +56d = $20(4r^2)$	

In the following proof I used area of inscribed dodecagon.
How I am getting the values of c & d for that see the following examples
Area of square = (12a + 12b + 12c + 4d) main equation

(Area of 15 square – area of 10 square) = (164a + 452b + 66c + 40d) – 10(12a + 12b + 12c + 4d)
= area of 5 square = (164a + 452b + 66c + 40d) – (120a + 120b + 120c + 40d)
= 44a + 332b – 54c
= 44a + 332b + area of 4.5 inscribed dodecagon – area of 4.5 circle
= 44a + 332b + $4.5(3r^2)$ – area of 4.5 circle
Area of 5 square + area of 4.5 circle = 44a + 332b + $4.5(3r^2)$
Area of 4.5 circle = $44(0.125\sqrt{3})\, r^2 + 332(0.25 – 0.125\sqrt{3})\, r^2 + 13.5r^2$ - area of 5 square
= $(5.5\sqrt{3})\, r^2 + (83 – 41.5\sqrt{3})\, r^2 + 13.5r^2 – 5(4r^2)$
= $(96.5 – 36\sqrt{3})\, r^2 – 20r^2$
= $(76.5 – 36\sqrt{3})\, r^2$
Area of circle = $(76.5 – 36\sqrt{3})\, r^2 /4.5$
= $(17- 8\sqrt{3})\, r^2$

One more example
(Area of 12 square – area of 9 square) = (124a + 380b + 60c + 36d) - 9(12a + 12b + 12c + 4d)
= area of 3 square = (124a + 380b + 60c + 36d) – (108a + 108b + 108c + 36d)
= (16a + 272b – 48c)
= 16a + 272b + area of 4 inscribed dodecagon – area of 4 circle
= 16a + 272b + $4(3r^2)$ – area of 4 circle
Area of 3 square + area of 4 circle = 16a + 272b + $4(3r^2)$
Area of 4 circle = $16(0.125\sqrt{3})\, r^2 + 272(0.25 – 0.125\sqrt{3})\, r^2 + 12r^2$ - area of 3 square
= $(2\sqrt{3})\, r^2 - (68 - 34\sqrt{3})\, r^2 + 12r^2 – 3(4r^2)$
= $(80 – 32\sqrt{3})\, r^2 – 12r^2$
= $(68 – 32\sqrt{3})\, r^2$
Area of circle = $(68 – 32\sqrt{3})\, r^2 /4$
= $(17- 8\sqrt{3})\, r^2$

Found the value of 3c & d
Area of square = $4r^2$ Area of circle = $(17 - 8\sqrt{3})\, r^2$
(Area of square – area of circle) = 4d)
= $4r^2 – (17 - 8\sqrt{3})\, r^2 = (8\sqrt{3} – 13)\, r^2$ d = $(2\sqrt{3} – 3.25)\, r^2$

Area of square = 16a+16b = $4r^2$
(a + b) = (3c+d) = $(4r^2/16)$ = o.25r^2
(a + b) – d = 3c
= $[0.25 – (2\sqrt{3} – 3.25)] r^2$ = 3c = $(3.5 -2\sqrt{3}) r^2$

a = $(0.125\sqrt{3}) r^2$ b = $(0.25 – 0.125\sqrt{3}) r^2$ 3c = $(3.5 - 2\sqrt{3}) r^2$ d = $(2\sqrt{3} – 3.25) r^2$
By using value of (a, b, c & d) in the above equations we get same answer = $4r^2$ & total …$4r^2$

I have prepared all examples of this type but answer remains same.
Conclusions:-
Exact area of circle = $(17 - 8\sqrt{3}) r^2$
Exact value of pi $\pi = (17 - 8\sqrt{3})$

REFERENCES

Exact area of equilateral triangle formula = $(\sqrt{3} \div 4) \times side^2$
Basic Algebra & Geometry concept, History of pi (π) from internet
Complete thesis of my research titled as ''Exact value of pi '' is being published in following journals:
IOSR(international journal of scientific research) journal of mathematics in May-June 2012.
IJERA(international journal of Engineering research and applications) in July-August 2013.
Soft copy of my thesis is now also available on internet and one can get it by making search with following key words:
"Laxman Gogawale.
"Pi value Gogawale.