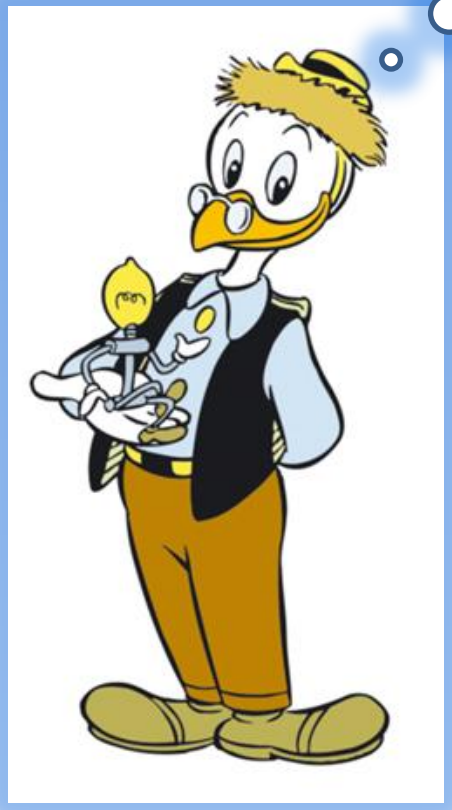
“The greatness of a population is measured by the ideas it owns."

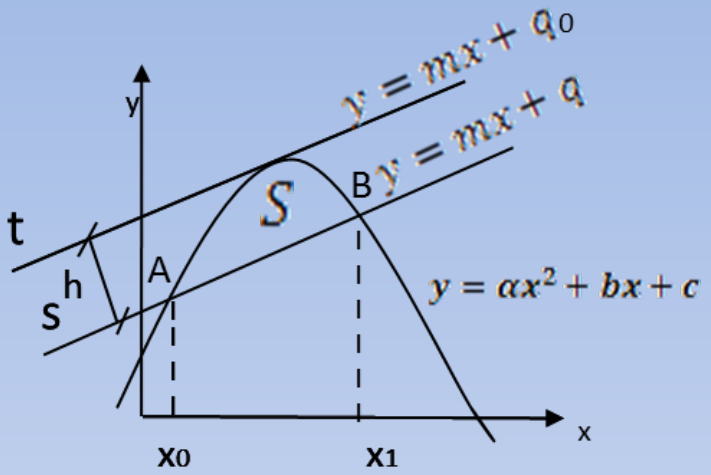


The Hellenistic Age

The big difference between Hellenistic science and previous science is the introduction of the scientific method. It has allowed the achievement of a technological level equal to that of 17th-century Europe.

Integrals

Archimedes of Syracuse (Syracuse, 287 b.C. – Syracuse, 212 b.C.), a mathematician, an engineer, a physicist and an ancient Greek inventor (Siceliot), was one of the greatest scientists of history.



π

Greek «Pi»

Greek «Pi» is a mathematical constant which is indicated with π , which is used a lot in science. Since antiquity a lot of civilizations have tried to define its value.

Babylonians

$A = {C^2}/{12}$

π = 3… But it's by defect!

$A = (8/9d)^2$

π =3,160… But it's by excess!

Egyptians

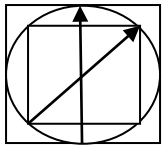
Greek «Pi»

Archimedes understood that the measurement of the circle was comprehended between the perimeters of an inscribed and a circumscribed polygon. The more sides the polygons have, the closer one gets to the exact value of π.

Let's imagine a circle whose diameter equals 1 and two squares, one inscribed and another circumscribed.

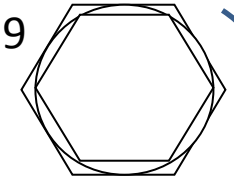
The perimeter of the inscribed square is $4 \cdot \frac{1}{\sqrt{2}} = 2{,}828$. The perimeter of the circumscribed square is $4 \cdot 1 = 4$,

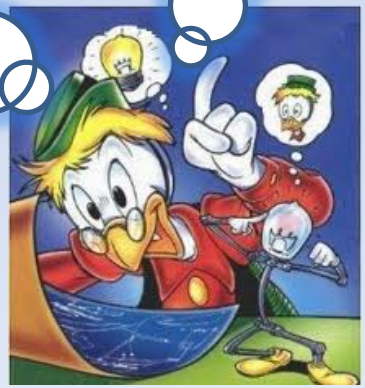
therefore $2{,}828 < \pi < 4$



If we consider an inscribed and a circumscribed hexagon…

… $3{,}0 < \pi < 3{,}21539$





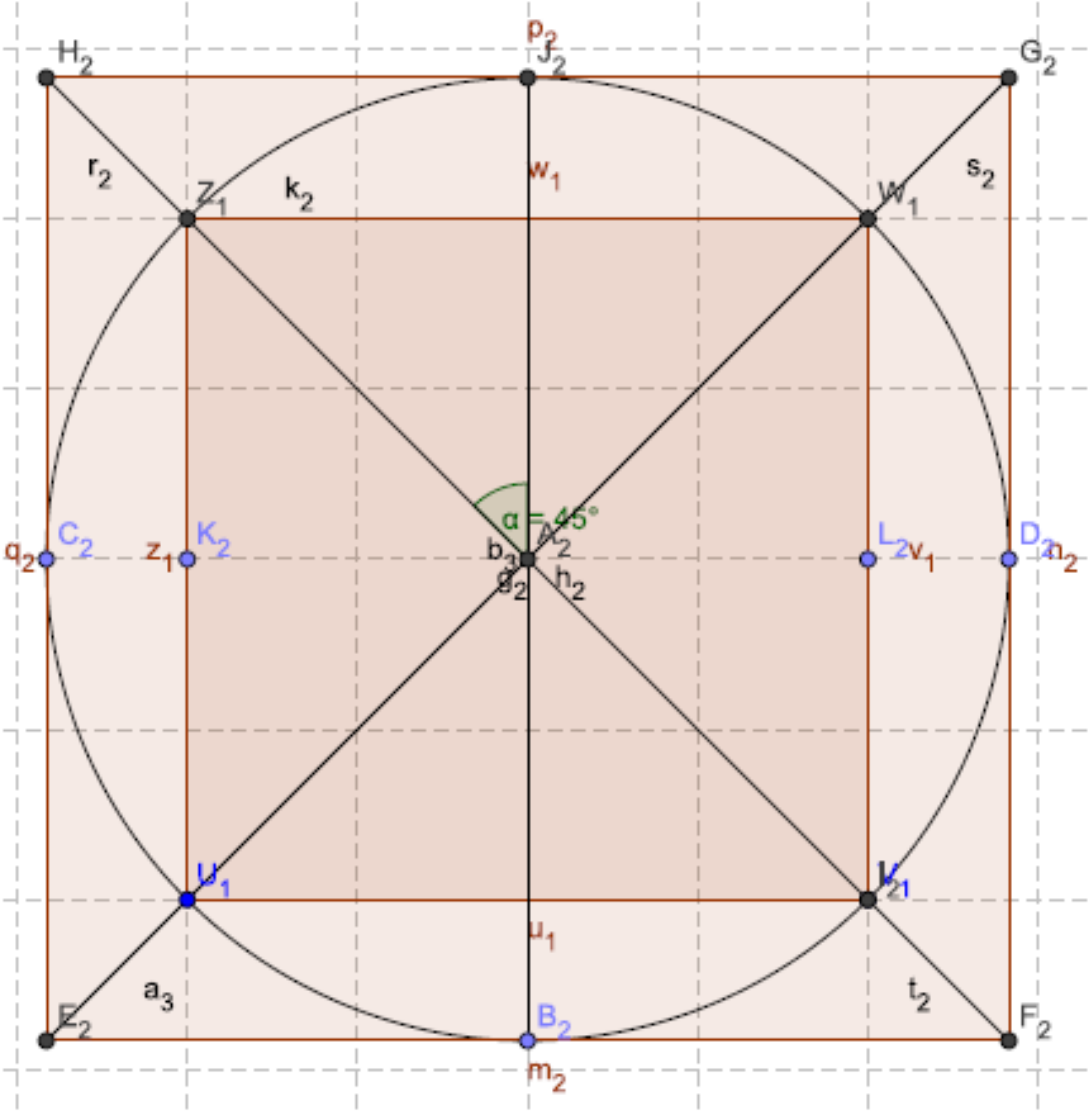
Greek «Pi»

Then Archimedes progressively doubled the sides of the two polygons up to two 96-side polygon. He noticed that the more sides the polygons had, the more defined the value of π …

… 3,140 < π < 3,142

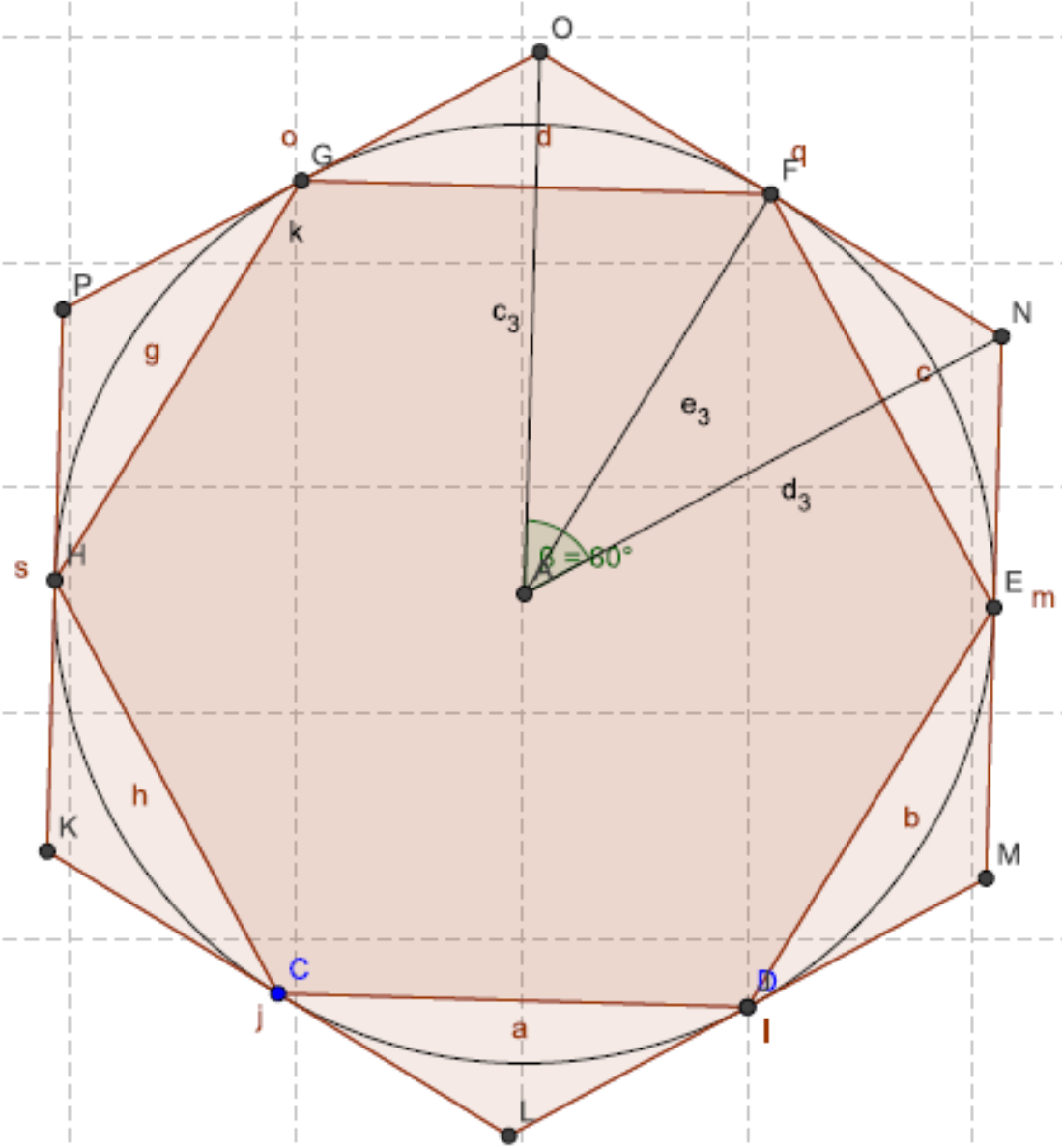
Today we know that…

(12.46, 6.9)

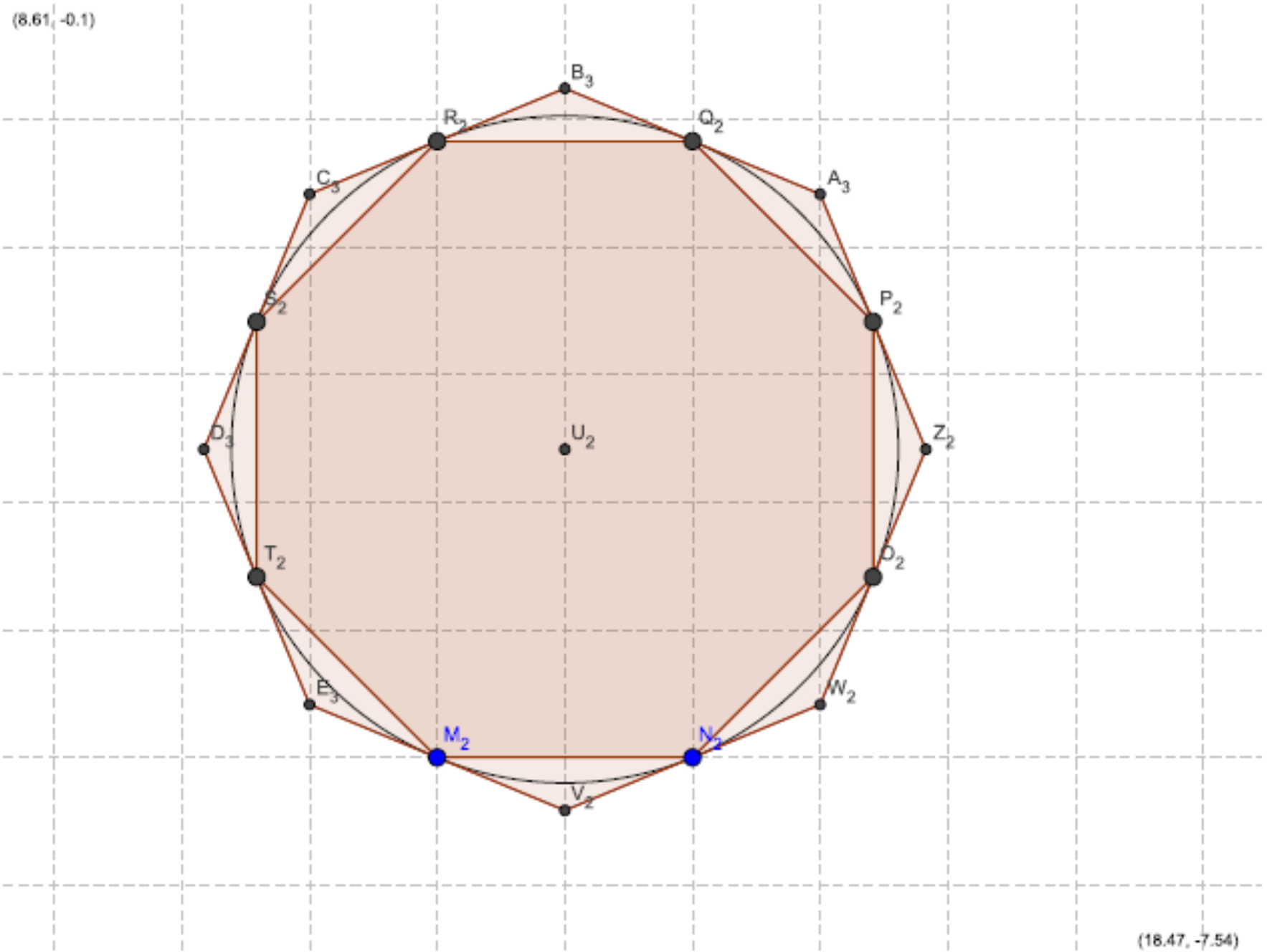


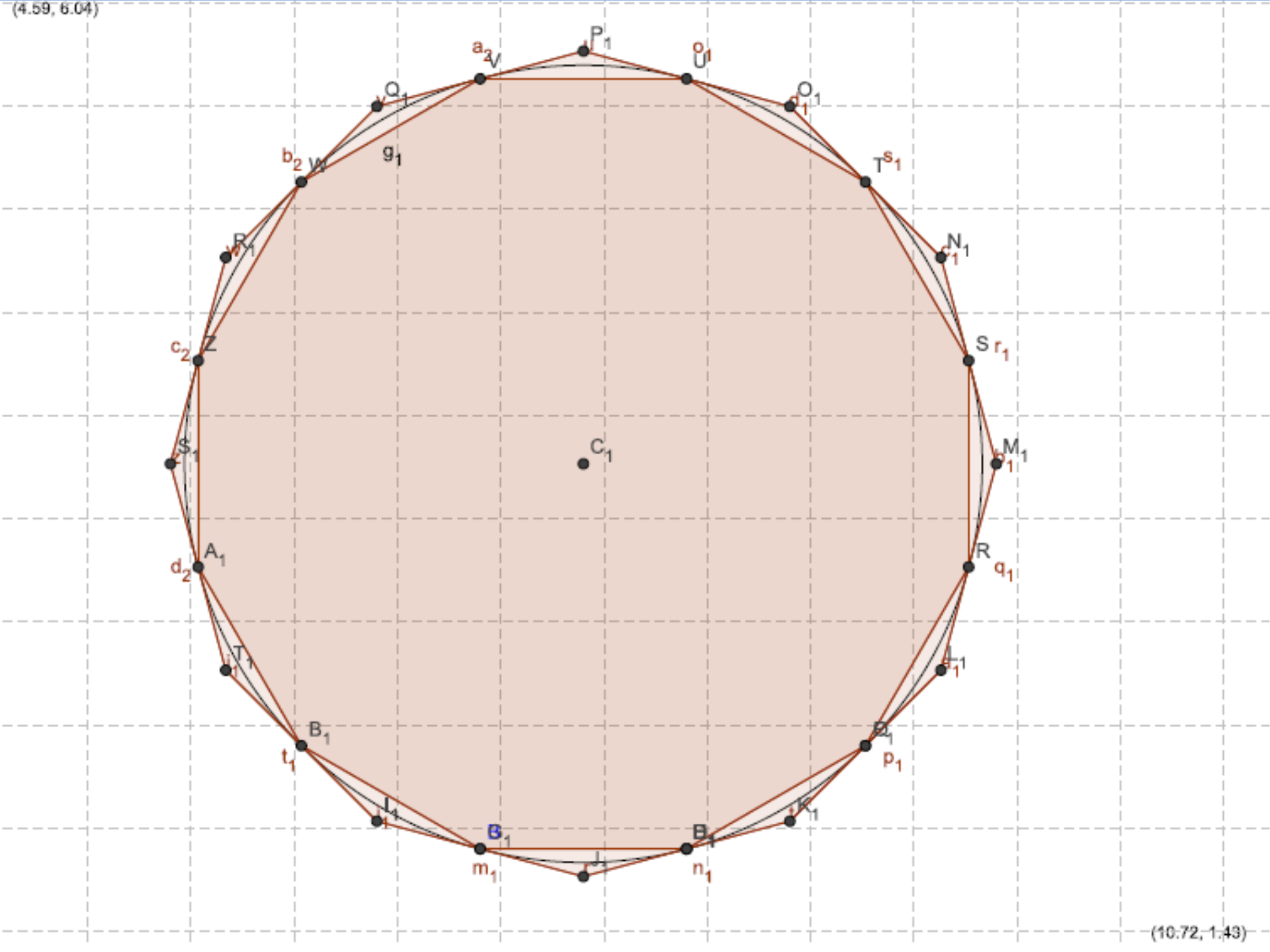
(18.03, 2.7)

(1.44, -0.46)



(9.59, -6.61)


(8.61, -0.1)
B_3
R_2
Q_2
C_3
A_3
S_2
P_2
D_3
U_2
Z_2
T_2
O_2
E_3
W_2
M_2
N_2
V_2
(18.47, -7.54)


(4.59, 6.04)
P1
a2
V
U
o1
Q1
O1
b2
W
g1
T
s1
R1
N1
c2
Z
S
r1
S1
C1
M1
A1
d2
R
q1
T1
L1
B1
t1
Q
p1
I1
K1
B1
B1
m1
n1
J1
(10.72, 1.43)

HOW TO CALCULATE THE VALUE OF π THROUGH THE PERIMETER OF THE INSCRIBED AND CIRCUMSCRIBED POLYGONS

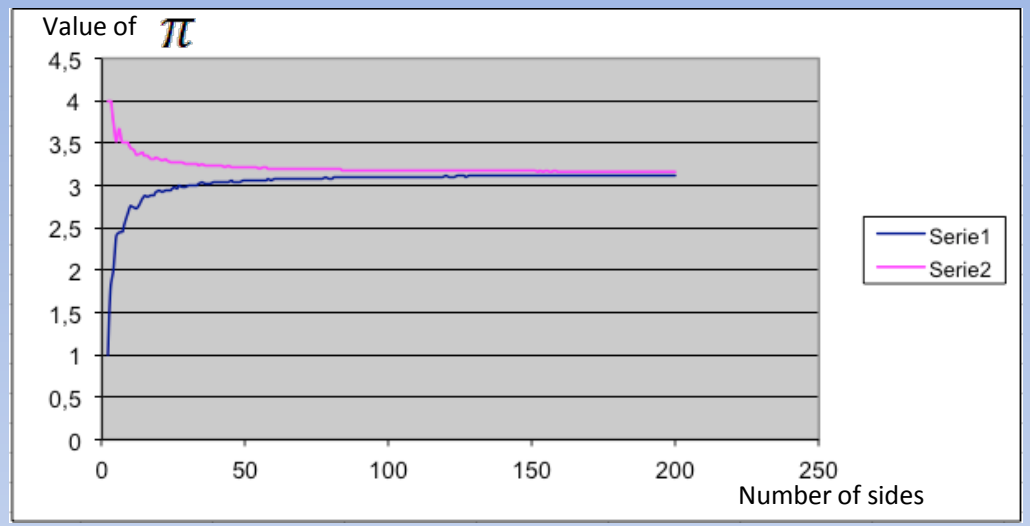
Number of sides	Side measure of the inscribed polygon	Side measure of the circumscribed polygon	Perimeter of the inscribed polygon	Perimeter of the circumscribed polygon	VALUE OF π		
6	1,00000000000000	1,15470053837925	6,00000000000000	6,92820323027551	3,00000000000000	<π<	3,46410161513776
12	0,51763809020504	0,53589838486225	6,21165708246050	6,43078061834694	3,10582854123025	<π<	3,21539030917347
24	0,26105238444010	0,26330499517479	6,26525722656248	6,31931988419500	3,13262861328124	<π<	3,15965994209750
48	0,13080625846029	0,13108692563048	6,27870040609373	6,29217243026287	3,13935020304687	<π<	3,14608621513143
96	0,06543816564355	0,06547322082595	6,28206390178102	6,28542919929074	3,14103195089051	<π<	3,14271459964537
192	0,03272346325297	0,03272784427062	6,28290494457092	6,28374609995965	3,14145247228546	<π<	3,14187304997982
384	0,01636227920787	0,01636282680759	6,28311521582372	6,28332549411370	3,14155760791186	<π<	3,14166274705685
768	0,00818120805247	0,00818127650157	6,28316778429664	6,28322035320938	3,14158389214832	<π<	3,14161017660469
1.536	0,00409061258233	0,00409062113844	6,28318092645610	6,28319406864305	3,14159046322805	<π<	3,14159703432153
3.072	0,00204530736068	0,00204530843019	6,28318421199854	6,28318749754270	3,14159210599927	<π<	3,14159374877135
6.144	0,00102265381403	0,00102265394772	6,28318503338432	6,28318585477019	3,14159251669216	<π<	3,14159292738510
12.288	0,00051132692372	0,00051132694044	6,28318523873077	6,28318544407723	3,14159261936538	<π<	3,14159272203861
24.576	0,00025566346395	0,00025566346604	6,28318529006738	6,28318534140400	3,14159264503369	<π<	3,14159267070200
49.152	0,00012783173224	0,00012783173250	6,28318530290154	6,28318531573569	3,14159265145077	<π<	3,14159265786784
98.304	0,00006391586615	0,00006391586618	6,28318530611007	6,28318530931861	3,14159265305504	<π<	3,14159265465931
196.608	0,00003195793308	0,00003195793308	6,28318530691221	6,28318530771434	3,14159265345610	<π<	3,14159265385717

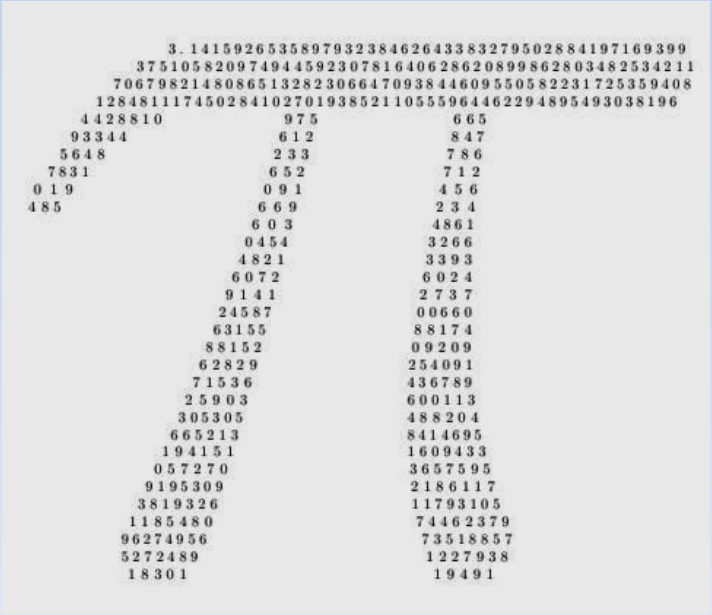
DIFFERENT INTERVALS OF π

Number of sides	Value of π
6	3... < PI < 3.46410161...
12	3.10582854... < PI < 3.21539031...
24	3.13262861... < PI < 3.15965994...
48	3.13935021... < PI < 3.14608622...
96	3.14103195... < PI < 3.1427146...
192	3.14145247... < PI < 3.14187305...
384	3.14155761... < PI < 3.14166275...
768	3.14158389... < PI < 3.14161018...
1536	3.14159047... < PI < 3.14159704...
3072	3.14159211... < PI < 3.14159375...
6144	3.14159252... < PI < 3.14159293...
12288	3.14159262... < PI < 3.14159272...
24576	3.14159265... < PI < 3.14159267...
49152	3.14159265... < PI < 3.14159266...
98304	3.14159266... < PI < 3.14159266...
196608	3.14159266... < PI < 3.14159266...

GRAPHIC OF THE APPROXIMATION OF π

				Area of the inscribed polygon	Area of the circumscribed polygon
2	3,035276		2	1	4
3	3,084253		3	1,777778	4
4	3,104496		4	2	3,75
5	3,115106		5	2,4	3,52
6	3,121471		6	2,444444	3,666667
7	3,12564		7	2,44898	3,510204
8	3,128544		8	2,5625	3,5
9	3,130663		9	2,666667	3,506173
10	3,132265		10	2,76	3,44
11	3,13351		11	2,743802	3,438017
12	3,134501		12	2,722222	3,361111
13	3,135305		13	2,769231	3,360947
14	3,135967		14	2,836735	3,387755
15	3,136521		15	2,88	3,36
16	3,13699		16	2,859375	3,34375
17	3,13739		17	2,878893	3,307958
18	3,137736		18	2,888889	3,320988
19	3,138037		19	2,914127	3,3241
20	3,1383		20	2,94	3,31
21	3,138533		21	2,920635	3,292517
22	3,138739		22	2,950413	3,305785
23	3,138924		23	2,94896	3,289225
24	3,139089		24	2,944444	3,270833
25	3,139238		25	2,976	3,264
26	3,139372		26	2,970414	3,272189
27	3,139495		27	2,990398	3,281207
28	3,139606		28	2,984694	3,265306
29	3,139708		29	2,98692	3,248514
30	3,139802		30	3	3,253333
31	3,139888		31	2,992716	3,246618
32	3,139967		32	3,007813	3,253906
33	3,14004		33	3,008264	3,247016
34	3,140108		34	3,017301	3,242215
35	3,140172		35	3,030204	3,24898
36	3,14023		36	3,015432	3,234568
37	3,140285		37	3,027027	3,234478
38	3,140337		38	3,019391	3,227147
39	3,140385		39	3,032216	3,234714
40	3,14043		40	3,04	3,2325
41	3,140472		41	3,031529	3,224271
42	3,140512		42	3,036281	3,22449
43	3,140549		43	3,037317	3,221201
44	3,140585		44	3,047521	3,227273
45	3,140618		45	3,051852	3,223704
46	3,14065		46	3,043478	3,215501
47	3,14068		47	3,047533	3,215935
48	3,140708		48	3,046875	3,211806
49	3,140735		49	3,052062	3,213661
50	3,140761		50	3,0576	3,2096






"That's all Folks!"