THE

MEASURE OF THE CIRCLE.

PERFECTED IN JANUARY, 1845,

BY

JOHN DAVIS.

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THE MEASURE OF THE CIRCLE.

THE USE AND IMPORTANCE OF THE MEASURE, DISCOVERED IN JANUARY, 1845.

THE globe is divided into 360 degrees; each degree into 69½ miles; how can it be known what the 360th part is? A degree is a 360th part; a mile is a 69½ part of a degree; a yard is a 1760th part of a mile; a foot is a third part of a yard; an inch is a twelfth part of a foot; a barleycorn is a third part of an inch. Now, these are parts which are all unknown, and have been since the world began, as may be supposed.

I therefore say that all measures are imperfect, and, without a perfect quadrature of the circle, must remain so. I find the table of long measure is all imperfect, and so it is with all measurements, of all descriptions. There is nothing in shape to represent the noble works of Supremacy, known to man, that can be mathematically measured: such as land, if in a circular form; casks containing liquids; steamboat boilers; a grindstone. These cannot, by mathematics, be correctly measured.

Being encouraged to make this discovery by the large offers and appropriations by all governments, I devoted my best endeavors to effect a perfect quadrature; and have, as I believe, to the satisfaction of all who may examine my work, and to my own, beyond all possible doubt. As I have learned, this measure has been the strife and anxiety of all the most learned men that have lived since the world began; and, in defiance of all, it has slept in oblivion until the year 1845, when discovered, as is represented in this work.

I will set forth some of the objections that were made to me, to prove the impossibility of this measure, by different persons. A Mr. Clifford, the ninth wrangler of Cambridge University, said it was an utter impossibility, for it was a true figure of eternity; and, as eternity never could be measured, no more could a circle. My reply was, "I admit it to be a true figure of eternity, as there is neither beginning nor end to it; but there is a great difference in measuring it, for I can get at either side of a circle, and neither side of eternity." The gentleman replied, "Well, that does make a material difference." A Professor Olmsted said he thought it to be an impossibility, for it had been tried hundreds and thousands of years. My reply was, that it must be in nature, because I could get wrong upon the extreme, either way; and there must be a point between those two extremes that must be right.

And I say, in confidence, I have found the point.

I was advised to introduce my work at Cambridge, in England. I did so; and was told that the impossibility was so great that a man might as well try to shoot the moon.

I was recommended to G. B. Arry, professor royal at Greenwich. I called on this gentleman. He replied to me that it was not worth while for me to puzzle my brains about the measure of the circle, for it was measured as near as it ever could be; and he did not see what use it was, or ever could be, to them.

Now, it seems to me that this gentleman must be in an error, and grossly mistaken; for I cannot see how he can pretend to hold out to the people a complete traverse of the stars, without the knowledge of the measure of the circle, unless he may think it as well to teach the world a falsehood as the truth. His situation in life ought to warrant to the people better ability, and different expressions.

I now come to some facts as to the use and principles.

It is often said, in the construction of a steam engine, that the power is not equal to the calculation. They say the cause is, the steam does not properly condense; and they allow fifteen pounds' weight of air to each and every square inch. Now, what can be expected, when they know not how many inches their cylinder contains?

My experience as a mechanic has taught me the use and importance of this measure. I have been engaged and employed as a superintendent, having the care and sole management of cotton, linen, woollen, and silk machinery, and have gained the approbation of my employers, my management being such as to save to them, yearly, a large amount. They said they could not comprehend how I could manage to such perfection; for when I had perfected a thing, it was sure to answer the purpose. This perfection I arrived at by the measure of the circle, unknown to them.

The expression was made use of to one of my employers, in a cotton manufacturing village, "How is it that it does not cost you one half to keep your machinery in order that it does the rest of us?" The answer was, "When Davis calculates, it is sure to come right; while others have to do their work five or six times over."

I was called on to measure a circular stair rail. The gentleman wanted to know if I could calculate, by figures, the exact length of the rail. My reply was, that I could, if he gave me the height of the well. He gave me the height and diameter of his well. I gave him the length of the rail. He said I was wrong; it was but so long. "Well," said I to him, "then your rail is that much too short." "It is," he said; "I have tried it." This I consider to be a demonstration by mathematics that cannot be performed except by the perfect quadrature of the circle.

It is said that Sir Isaac Newton's opinion with respect to the mechanical powers was, that whatsoever was gained in time was lost in power; and whatsoever was gained in power was lost in time. This maxim does not hold good in all cases. Sir Isaac was well aware that gravitation was not known; neither can it be, without the measure of the circle; which when perfected, Sir Isaac's maxims are not correct, on account of the want of this measure — the long-sought solution of the perfect quadrature of the circle.

With these facts and circumstances, I shall leave to whoever may be interested in my welfare and interest to do for me what conscience may dictate to an honest heart. I ask or claim nothing but what good reasoning may, with sound judgment, honestly demand. I think I know the value and importance of this work, as my forefathers have, in all ages of the world. Utterance refuses expression, to paint in letters the utility and magnitude of this measure, which has been so long sought for.

It appears, through and by the wisdom of God, that this circular principle is what he has put forth in his wonderful creation of all things; and why this measure has slept in oblivion, unknown to man, is known only to God.

This measure will and must prove a great benefit to mankind, when understood, as it is the basis and foundation of mathematical operations; for, without a perfect quadrature of the circle, measures, weights, &c., must still remain hidden and unrevealed facts, which are and will be of great importance to rising generations. The improvements that will arise from this measure fifty years hence I cannot paint in imagination.

THE PRINCIPAL RULES.

I think that, after people become satisfied that my work is right, it will be but one hour's labor for the scholar to learn all that is necessary in practice. I will, before I lay down the work in the book, lay down the principal rules for the learner, that he may see it in the commencement as well as in the last pages of my book.

The use of the measure of the circle is to find the circumference of any circle, great or small, in order to correct and make right all weights and measurements, which are wrong, and have been since the world began.

The proportion the diameter has to the circumference is as 6 to 19. The difference of as 7 to 22, or as 6 to 19, is as $\frac{1}{132}$ is to $\frac{1}{133}$. This makes linear measure $75\frac{3}{4}$, square measure $1.52\frac{1}{2}$, cubic measure 2.29 hundredths per cent. astray. This makes the foot rule near $\frac{1}{10}$ of an inch too short; the yardstick near $\frac{3}{10}$ too short.

A mathematical inch is the 38th part of a circle 12 inches in diameter.

Rule 1*st*. To find the circumference of any circle, great or small.—Multiply the diameter by $9\frac{5}{10}$, (this is my ratio, derived from as 6 to 19,) and divide the product by 3; this gives you the perfect circumference, in all cases. Suppose your circle is 12 inches in diameter:—

$$\begin{array}{r} 12 \\ 9.5 \\ \hline 108 \\ 6 \\ \hline 3\,)\,114 \\ \hline 38, \text{ circumference.} \end{array}$$

Rule 2*d*. To find the area of the same circle.—Take 3 times the radius, by once the radius; this gives the square inches. Divide the square inches by 3 raised to its 4th power, or biquadrate. Then add the 4th power, or biquadrate, to the square. This gives the perfect area, in all cases. Suppose the diameter is 12 inches, radius 6:—

$$\begin{array}{r} 6 \\ 3 \\ \hline 18 \\ 6 \\ \hline 3\,)\,108 \\ \hline 3\,)\,36 \\ \hline 3\,)\,12 \\ \hline 4, \text{ power.} \end{array} \qquad \begin{array}{r} \text{Add to } 108 \\ 4 \\ \hline 112, \text{ area.} \end{array}$$

Rule 3d. — Or you may take $\frac{7}{9}$ of the square of the diameter; that will give the perfect area, in all cases. Suppose the diameter is 12 inches: —

```
     12
     12
    ———
    144
      7
   ————
9 ) 1008
   ————
    112, area.
```

Rule 4th. Having the circumference, to find the diameter. — Divide the circumference by 19, and multiply the quotient by 6, which gives the diameter, in all cases. Suppose the circumference is 38: —

```
19 ) 38 ( 2
     38   6
     —— ——
      0  12, diameter.
```

Rule 5th. — Let the cooper take 3 times the diameter, with one third the radius; his head will just fill.

Rule 6th. — Cut a thin strip of brass or tin, — the thinner the better, — 38 inches long, form a perfect circle, and the diameter is 12 inches.

Rule 7th. Having the area, to find the circle that bounds it. — Suppose any number of figures as an area; for instance, let it be 448; divide by 28; subtract the quotient from the given sum; divide the remainder by 3; then extract the square root, which will be the radius of the circle that bounds the figures. The square root of any number of figures operated on in this way will be the radius of the circle, in all cases.

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     144 ( 12, √        28 ) 448 ( 16        448
     1                       28               16
     ———                     ———             ———
22 ) 044                     168          3 ) 432
     ———                     168             ———
      44                     ———              144
      ——                       0
       0         Radius, 12 × 2 = 24.
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MEASURE OF THE CIRCLE.

Time is prefigurative of the number 6; so, as time is measured by a circle, I take that number to measure a circle.

Suppose a circle to be 12 inches in diameter. I take my radius, and multiply 12, diameter, by ratio $9\frac{5}{10}$; the product is 114; divide this by 3, which gives 38, the circumference.

Proof.—I begin with a hexagon, each side and radius being of equal length, say six inches. 6 multiplied by 6 is equal to 36; this is the sum of the 6 sides of the hexagon. I call every polygon 36 inches, when it is 12 inches in diameter. I begin with a figure having 4 sides, it being easy to understand. Take a strip of paper 36 inches long, and $\frac{1}{4}$ of an inch wide; cut it into strips of 9 inches each, and place them so as to form a square; the four corners will then be vacant. To supply these, I take $\frac{1}{6}$ of the radius, which is equal to one inch, and, for variety, call it the 7th. So I square the 7th by the number of sides. Multiply 4 by 4, $= 16$, square $\frac{1}{4}$. I add 1 for each angle, to fill the vacant corners, which lengthens the square from 9 to $9\frac{1}{2}$ inches. $9\frac{1}{2}$ multiplied by 4 is 38, which is the circumference, when curved to a circle, gaining 2 inches. As every polygon will gain 2 inches, if worked right, I add 2 to 36, which gives 38, circumference.

I now begin with 6 sides and square the 7th, thus: 6 multiplied by 6 is equal to 36; square sixth coned thirds. Add 1 for each side, which is equal to 2; 2 added to 36 is equal to 38, the circumference.

I now take 8 sides, and square the 7th, thus: $8 \times 8 = 64$, the 8th coned, $\frac{1}{4}$. Add $\frac{1}{4}$, equal side, $= 2$. 2 added to 36 is 38, the circumference.

I take 10 sides, and square the 7th, thus: $10 \times 10 = 100$, tenth coned fifth, $\frac{1}{5}$ for each side. 2 added to 36 equal 38, the circumference.

I take 12 sides, and square the 7th, thus: $12 \times 12 = 144$, twelfth coned sixth, $\frac{1}{6}$ each side. 2 added to 36 equals 38, the circumference.

This is to prove that the diameter is to the circumference as 6 to 19. Now, I take 6 for my diameter, and suppose it to be formed into a hexagon. The 6 sides equal 18 inches, and 18 multiplied by 18 is equal to 324. Add the square of the diameter, 36, to 324, = 360, the number of degrees in a circle. Now, the square root of 360 is equal to $18\frac{36}{37}$, or $\frac{1}{18}$; as there are no corners wanting to a circle, it leaves 19 inches for the measure of the circle. The circumference of the circle is 19 inches; but the square root of 360 lacks $\frac{1}{37}$; so you see my diameter is 6 inches, and my circumference is 19, which makes it as 6 to 19. The measure of the circle is but linear measure; therefore 36 makes an inch on a line, in this case, as is now used. Now, in extracting the square root of 360, it lacks 1 of filling the square which is superfluous in a circle, as no corners are wanting.

I will now show how I came by my ratio.

I take the 19, and divide it by 6, and when divided, it will come to 3 whole numbers, and $166\frac{2}{3}$, decimal. Now, multiply $3.166\frac{2}{3}$ by 3. 3 times $\frac{2}{3}$ is 2 whole numbers in decimals. I multiply by 3, in order to bring it to whole numbers, so as not to use fractions; and, as I multiply this product by 3, I must, after multiplying the diameter by the ratio, divide by 3.

$$
\begin{array}{r}
12 \\
9.5 \\
\hline
108 \\
6 \\
\hline
3\,)\,114 \\
\hline
38
\end{array}
$$

38, the circumference.

THOMAS JEFFERSON.

I find, in a work published by B. L. Raynor, in New York, in 1832, entitled "The Report of Thomas Jefferson to Congress, on Coins, Weights, and Measures, in 1790," that Mr. Jefferson says, in relation to all weights and measures, that "all are imperfect under the present system." The report from the secretary of state, containing a plan for a uniform system of coins, weights, and measures, on page 311 of this book, was executed with most astonishing despatch, considering the intricacy of the subject, and novelty of the experiment. In sketching the principles of his system, Mr. Jefferson was dependent on the guide of his own genius, as no example to dictate or direct his researches existed. It is somewhat remarkable that two of the principal governments of Europe were also engaged at this period on the same subject.

The first object that presented itself to his inquiries was the discovery of some measure of invariable length, as a standard. There exists not in nature, as far as has been hitherto observed, a single object, accessible to man, that presents one uniform dimension.

The globe of the earth might be considered as invariable in all its dimensions, and that its circumference would furnish an invariable measure; but no one of its circles, great or small, is accessible to admeasurement, in all its parts; and the various trials to measure different portions of them have resulted in showing that no dependence can be placed on such operations, for a certainty. Matter, then, by its mere extension, furnishes nothing invariable. Its motion is the only remaining resource.

The motion of the earth on its axis, though not absolutely uniform and invariable, may be considered as such, for all human purposes. It is measured, obviously, but unequally, by its departure from a given meridian of the sun, and its return to that meridian, constituting a solar day. Throwing together the inequalities of solar days, a mean interval, or solar day, has been found, and divided by general consent into 86,400 parts, called seconds of time.

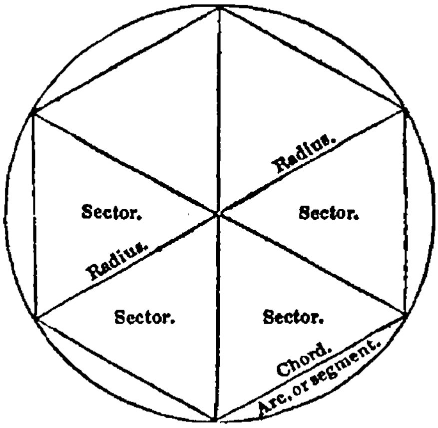
Such a pendulum, then, becomes itself a measure, of determined length, to which all others may be referred, as a standard. But even the pendulum was not without its uncertainty, as the period of its vibration varied in different climates or latitudes. To obviate this objection, he proposed the standard might refer to a particular latitude; and that of 38 degrees being the mean latitude of the United States, he adopted it.

THE CIRCLE.

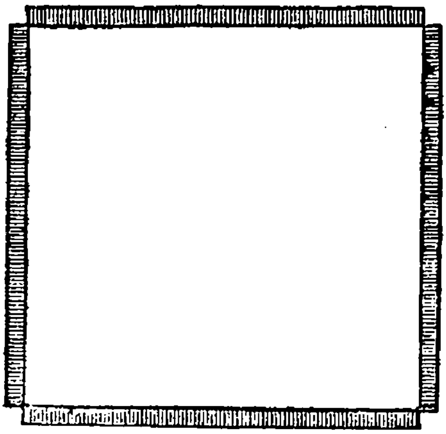
The circle is one of the noblest representations of Deity, in his noble works of human nature. It bounds, determines, governs, and dictates space, bounds latitude and longitude, refers to the sun, moon, and all the planets, in direction, brings to the mind thoughts of eternity, and concentrates the mind to imagine for itself the distance and space it comprehends. It rectifies all boundaries; it is the key to information of the knowledge of God; it points to each and every part of God's noble work; it divides east from west, north from south, with all its variations so beautiful; it brings to the thoughts of man the eternity and incomprehensibility of that space and distance which none can explore or determine. Nothing but imagination can cope with its extent, bounded as it is by the most extreme, unseen and unsought distance that minds can imagine. It has neither beginning nor end; its bounds are unknown; its area cannot be told by numbers; no mouth can reveal its magnitude; it is what contains all human flesh and blood; it contains all the improvements susceptible to the ingenuity, science, and activity of the human family; it brings to mind that eternity of bliss and happiness where the weary are at rest, and from whence no traveller returns; it contains monuments of marble and stone, in memory of those who have sought its quadrature in all ages of this world; it is the companion of every man, woman, and child; it enters the families of all the earth; it is the mediator of honesty, harmony, and content, in all; it rectifies those principles which are calculated to comfort and console honesty to the bosom of all. Its want of correctness has been the strife and anxiety of all the learned, and the lovers of science, since the world began. The wrongs which man has done to man, for want of a perfect measure, are numerous. Immense sums of money, with much time and anxiety, have been spent by all nations for its perfection; and no one nation, perhaps, is worthy of more respect for its exertions than France.

Its proportion is now found. It can be measured to perfection. It can no longer slumber, for its equality can now be expressed.

DIAGRAMS OF CIRCLE.

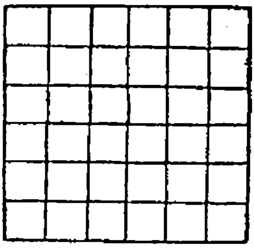


This is a hexagon, having 6 equal sides.

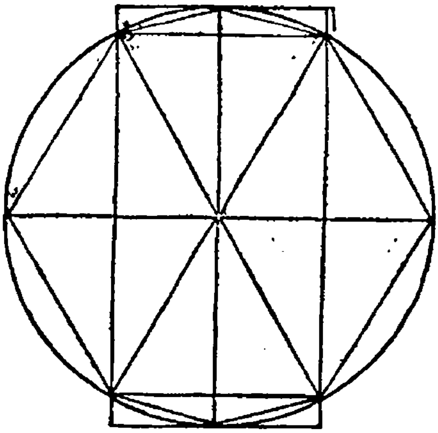


This is to describe the four strips of paper set forth in the work, supposed to be 9 inches square, leaving the vacant corners as described.

The hexagon is what I measure the circle by, it being the only figure known by which the circle can be measured, and the number 6 the only number.



This is an inch divided into sixths.



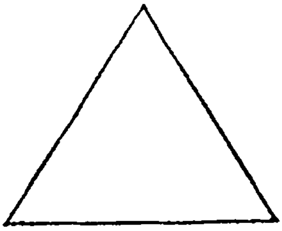
This is an oblong square, 6 by 3 inches.

$$\begin{array}{r} 18 \\ 6 \\ \hline 3\,)\,108 \\ \hline 3\,)\,36 \\ \hline 3\,)\,12 \\ \hline 4 \end{array}$$

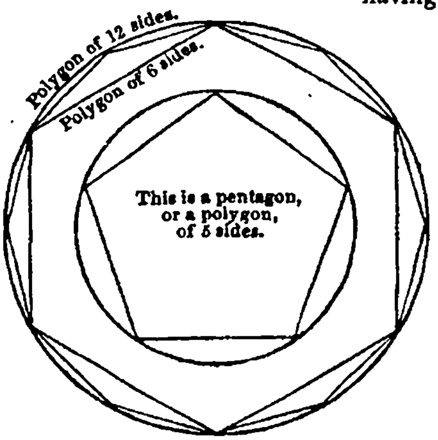
This is the 4th power, or biquadrate. Add this to the square, and it gives the area of the circle.

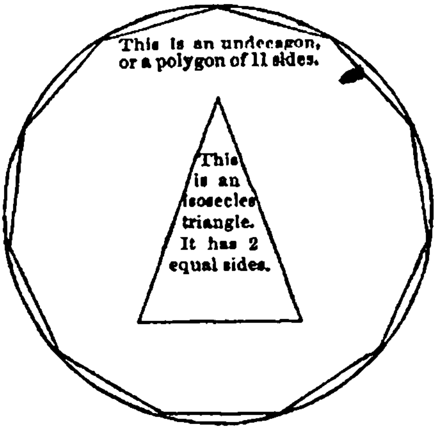
$$12\text{, diameter.}\quad \begin{array}{r} 108 \\ 4 \\ \hline 112 \end{array}$$

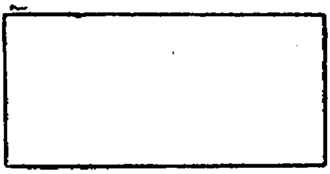
The question has been asked by many, why some other figure will not answer as well as the hexagon. The hexagon is equal in all its parts, and no other figure is. Had I taken any other, it would have carried me into surds, which would be beyond comprehension.



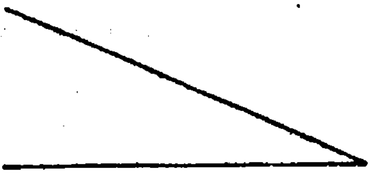
An equilateral triangle, having 3 equal sides.



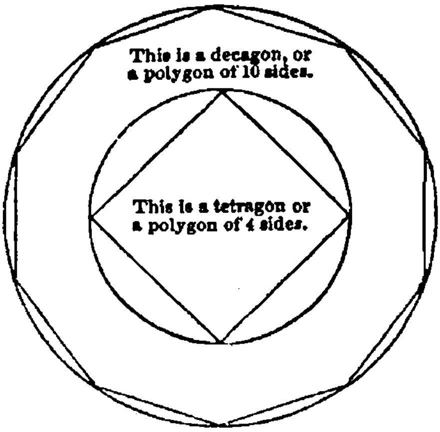


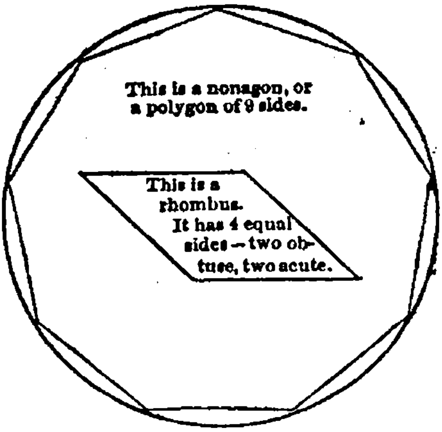


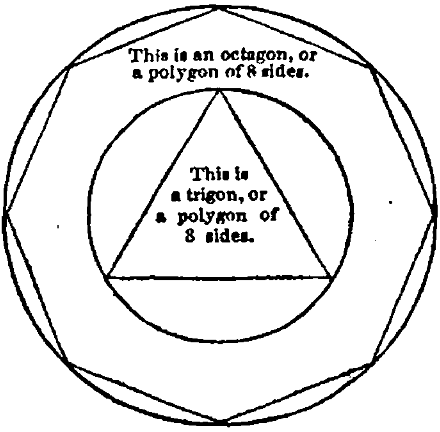
This is a rectangle, having 4 sides, and 4 right angles.

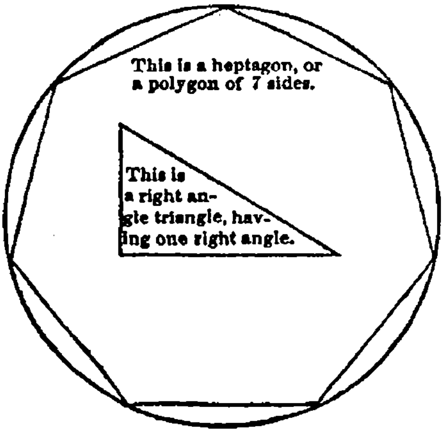


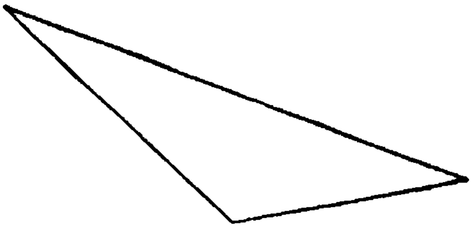
An acute angle, sharper than a right angle.



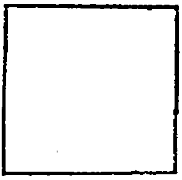








An obtuse angled triangle, having one obtuse angle.



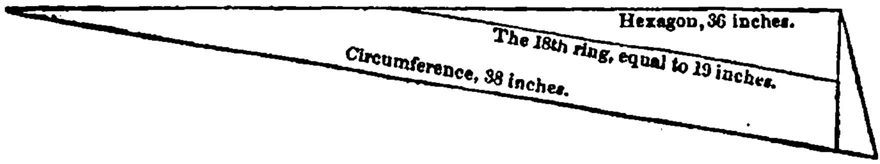
A rectangle, having 4 equal sides.

TO MEASURE A CIRCLE BY RINGS.

Suppose the diagram is a triangle, $\frac{1}{6}$ of an inch scale. To measure this angle, I divide the circle into 36 rings, each ring $\frac{1}{6}$ of an inch wide, and take the measure of the 18th ring, which is as follows: Take 112, which is the area of the circle, 12 inches being the diameter. Now, to find this area, I take the square of the radius, which is 6 inches, and multiply it by 6, $= 36$; multiply this 36 by 3, $= 108$; divide this 108 by 3, $= 36$; divide this 36 by 3, $= 12$, which is the cube, or third power; divide this 12 by 3, $= 4$, which is the biquadrate; then I add the biquadrate to the square, 108, and it gives the perfect area, thus: $108 + 4 = 112$, area of circle.

Now I multiply this area, 112, by 6, which throws the area into a strip 672 inches long, and $\frac{1}{6}$ of an inch wide; this I divide by 36, the number of rings in the circle; this gives the average length of each ring, on a straight line, which is $18\frac{4}{6}$ inches, but on a curve it is 19 inches. Now, this 18th ring, is, when lengthened out, $18\frac{4}{6}$ inches, but when brought to a circle, 19 inches. The reason for this is, that when you change this straight line to a circle, you take, in order to make the concave, $\frac{2}{6}$ of an inch from the inside, which goes to the length of the ring, to make it 19 inches. Now I will show the length of the first and second ring. Take the diameter of the first ring, which is 36, multiply it by 9.5, $= 342$; divide this by 3, $= 114$, length of the first ring. For the second ring I take 35, and multiply it by 9.5, $= 110.833\frac{1}{3}$. Now, in order to make the work shorter, I take the 18th ring, as being the average length of the 36 rings, which I have shown above, and multiply its measure, 19 inches, by the radius, 6 inches, thus: $19 \times 6 = 114$ inches, area of the angle, but not of the circle, as I shall prove. The circumference of the outside ring is 38 inches; multiply this by 3, which gives 114. Second ring, $110.833\frac{1}{3}$, which is just $3\frac{1}{6}$ less, equal to $1\frac{1}{18}$ on a circle, but only 1 on a straight line. So the triangle measures $\frac{1}{18}$, which is equal to $\frac{2}{36}$ too long. I therefore take twice 36, which is equal to 2 inches, from 114, which leaves 112, area of circle.

This is a diagram one sixth of an inch scale.

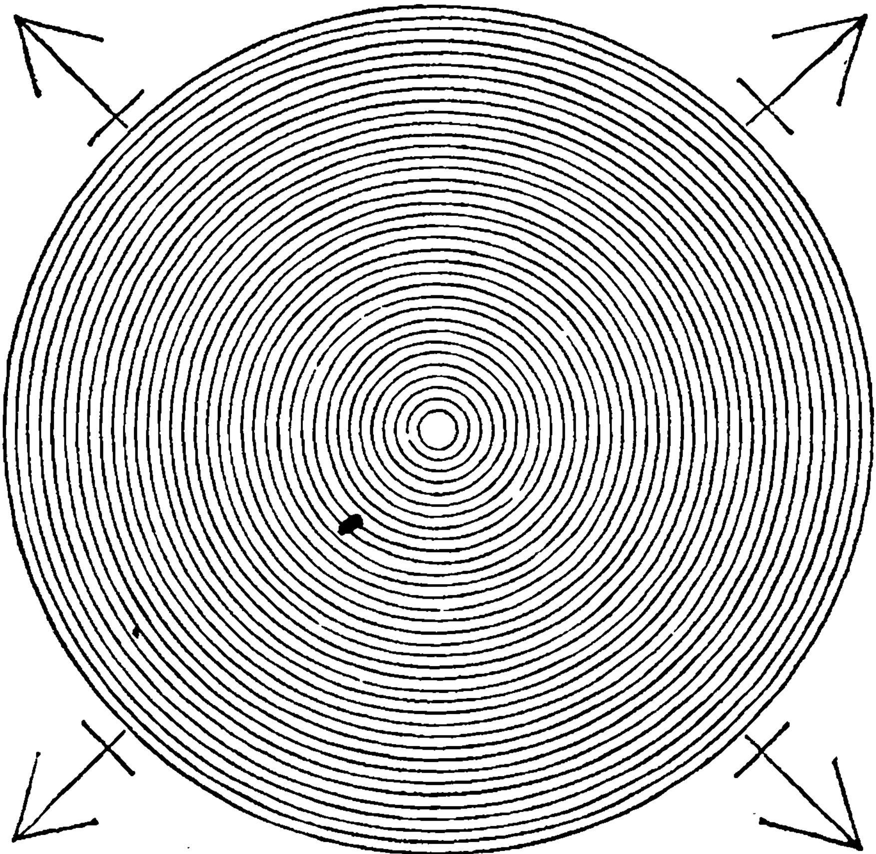


This is the measure of the 36 rings, ⅙ of an inch scale.

114.
110.833⅓
107.666⅔
104.5
101.333⅓
98.166⅔
95.0
91.833⅓
88.666⅔
85.5
82.333⅓
79.166⅔
76.0
72.833⅓
69.666⅔
66.5
63.333⅓
60.166⅔
57.0
53.833⅓
50.666⅔
47.5
44.333⅓
41.166⅔
38.0
34.833⅓
31.666⅔
28.5
25.333⅓
22.166⅔
19.0
15.833⅓
12.666⅔
9.5
6.333⅓
3.166⅔

Each and every one of these rings loses in length one inch and $\frac{1}{18}$. Every ring is one inch and $\frac{1}{18}$ shorter inside than on the outside.

Time being prefigurative of the number 6, I take that number to measure the circle. Suppose my radius is 6 inches, by



$\frac{1}{6}$ of an inch; then my circle will be 12 inches, which, brought to a hexagon, will measure 36 inches, equal to the square of the radius. Now, I divide one side of the hexagon into 36 squares, and, supposing my radius fixed by one corner to a point at the centre of the circle, I move the other end just its width, which is $\frac{1}{6}$ of an inch on a straight line, which gives the biquadrate, equal to $\frac{1}{36}$ of the radius; and, as it doubles on a circle, it is equal to $\frac{1}{18}$ gained on the side of the hexagon, equal to $\frac{2}{36}$, which added to 36 degrees, make 38, the circumference, or $6\frac{1}{3}$ inches for $\frac{1}{6}$ of the circle.

So 6 prefigures time; time, with its square, with the biquadrate conically added, measures the circle; therefore, to 3 times the diameter, equal 36, add the square root of the biquadrate, equal 2, which gives the circumference. Also, to 3 times the square of the radius, 108, add the biquadrate, 4, which gives 112, the perfect area of the circle.