# Adoption of Multiple Bases within Number Strings

To solve rounding errors and unrepresentable irrational numbers

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In decimal, 10 ÷ 3 = 3.33333333 (an infinite length fraction). If you multiple again by 3, you will never reach the original number 10. This is a problem.

This is a fault of the counting system (base 10)
However in other bases, such as duodecimal (base 12)
12 ÷ 3 = 4 - A perfect integer.

We are used to using different bases in everyday life, i.e. computers use binary (base 2) and our time keeping uses multiple bases including Base 12 or 24 for counting hours.

In fact the 24 hour clock time of: 15:39 is in fact 3 separate bases:
15 = Base 24
3 = Base 6
9 = Base 10
So could be represented as:
$15_{24}{:}3_{6}9_{10}$

So we are used to reading a single string of numbers in multiple bases.

Decimal integers are not the problem it is only fractions that fail for certain numbers.
Now, a number after the decimal changes its value depending on its base.
For example: 1÷2 in Base10 is $0.5_{10}$, but 1÷2 in Base12 = $0.6_{12}$

Therefore, if we use the mixed base example of the clock and the changing number of the fractional, we can represent previously unrepresentable numbers perfectly.

So now $10_{10} \div 3_{10} = 3_{10}.4_{12}$ - A perfect answer.

If we assume the default base is still decimal, we need only represent bases that lie outside that default, so this equation could actually be represented as:

$$10 \div 3 = 3.4_{12}$$

We can take this further. For irrational numbers i.e. π (pi) = 3.14159265
This decimal form of the number continues to infinity, yet the value itself is finite.
i.e. π = the ratio of the circumference of a circle to its diameter.

It equals this exactly, yet the decimal system cannot represent it exactly.
So if we now accept that we can mixes bases for either a string of numbers or a series of numbers, why not change the base of π to π itself?

For calculations involving π, make the base of that number π.

So the equation for the area of a circle $\pi r^2$ becomes:

$1_{\pi}r^2$

This can be applied to all irrational numbers.