MATHEMATICS
BOOK 4

HAPPINESS

IS

MATHEMATICS

MATHEMATICS
BOOK IV

VENNS & LOGIC
ORDERS OF INTERSECTS ~ PASCAL Δ

STATISTICAL MECHANICS — STATISTICS
RANDOMNESS ; PROBABILITY — CHANCE

SET THEORY
PARTITIONS
In How many ways can we generalize
CORRELATIONS ~ PARAMETERIZATIONS
GENERALIZATION ~~w~~ ABSTRACTION

MISC MATH
GROWTH CURVES
INFORMATION
DEGREES OF SEPARATION
SOME ARITHMETICS + FORMULAE
ZIPF's LAW

GEOMETRY
ARCHIMEDES ⟷ COSMOS
VOLUMES
PYRAMIDOLOGY [Special Note Books]
TILINGS "
STARS ~ POLYGONS "

TOPOLOGIES
H ~ SPACE
FORM ~ FORCE

CELLULAR AUTOMATA
CONRAD's LIFE
WOLFRAM : 4 CLASSES

~~FRACTAL DIMENSION~~

FORMULAE + DEFINITIONS
LOGS
$\binom{n}{m}$
TRANSFORMS

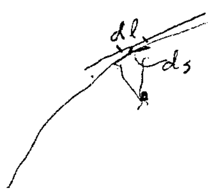
Arrangements
Permutations
Combinations

FOR SETS

FIND:

PARTITIONS
CONFIGURATIONS
ARRANGEMENS
INTERSECTS
...

In the calculus as $\varepsilon \to 0$, the curve $\to$ tangent — a straight line
but at some point before $\to$ a ds line segment
can there be an arc of a circle? — where is center?
what is the radius?



VENNS

Scraps for Logic

The Improbability channel Part III · 2000 #100
also 2000 #77, #78

2004 # 21, #22, # 64, #31 ✓

2001 Feb 8 Time & Logic

ET BELL Quote 2004 ? Note 15 ✓

1999 #54 XCM
2000 #69 "
2000 #73 ✓
1995 #52 ✓
WHEN SET 2002

John Venn (1834–1923) pub. diagrams 1880
Euler 1707–~~43~~

04-09-19

PARAMETERS & LOGIC

A parameter ⇒ ∃ ≥2 values or choices; V = # of value

If V=1, no parameter

Species: V

Dyadic e.g. true | false 2

Eigen [discrete] e.g. energy level N

Spectral [continuous] e.g. frequencies ∞

Parameters come into existence at 2 values with

V = # of choices or value afforded by a parameter

Examples:

Legal Parameters

Dyadic Guilty | Not Guilty

Prison | Parole

each ⊃ the parameter # of years

A dyadic parameter ⊃ common eigen parameter

Ontological Parameters

Exists | Not Exists

Perceived | Not Perceived

E

Noumena | Phenomena reality

$\bar{P}$ — P

Nothingness | Illusion Hallucination

$\bar{E}$

Fiction, Imagination ⇒ Different kind of existence

material, mental, spirits

i.e. existence is not a dyadic parameter

Epistemological parameter of predicted | not predicted

Predicted

Wrong Theory | Correct Theory

Not observed — Observed

Serendipity Discovery

Not Predicted

What is the relation between dyadic parameter and symmetry?

Economic Parameters

Logical Parameters

True | False

Venn Diagrams of Quadrads?

IDENTIFICATION

THEMES01.WPD LOGIC NOVEMBER 22, 2000

SOME BASIC PROBLEM AREAS ~~I~~

I CONTAINMENT

I. The Species of Containment:

SCALAR CONTAINMENT (1)

Open Containment (2)

(3) Euclidean Containment: One parameter containment

genealogical containment (4) Matroshka Containment: Iterated one parameter containment ~ regression?

Closed Containment

Each generation as a dimension in P-B

One Parameter Mutual Containment: ==> Equality

Cross Parameter Mutual Containment:

Self Containment [Self Reference]

Looped Matroshka Containment: "Strange Loops" Ur~~aborus of Blake~~

Bi-Cross Parameter Mutual Containment

part-whole polarizations

~~meta-genii~~

NOTES:

(1) *Scalar containment is taken to mean static or time free containment.

(2) *Open containment infers open below and open above, no self imposed bounds

(3) *Euclidean containment is conventional geometric or algebraic containment, A>B

(4) *Matroshka refers to nested Russian dolls. e.g. modular heirarchies, fractal organization

*Closed containment infers self bounding Hofstaders genii meta-genii

*Mathematical equality is meaningful only if a single parameter is involved. If a generalized Pauli Exclusion Principle is valid, [no two entities take on identical values for all parameters], then total equality infers non-existence. In between, equality in more that one parameter ~~leaves~~ exit the mathematical domain of quantity and enters the domain of quality.

*Examples of cross parameter mutual containment would be: genotype containing phenotype and phenotype containing genotype. Holograms, in which the whole contains the parts and each part contains the whole.

*The Pope declaring himself infallible is a self contained or self referential proposition. While such a proposition may have validity within the system, its validity cannot be supported outside the system without additional linkages.

uroborus *The Jeffersonian notion of sovereignty is a closed loop. The executive at the top, below, the levels of national ministers, ...local ministers... down to the people, whose sovereignty loops back over the executive. Time is involved in this loop, and is strictly not scalar. A scalar example is implied in Blake's Augeries of Innocence, "To see a World in a Grain of Sand and a Heaven in a Wild Flower, Hold Infinity in the palm of your hand and Eternity in an hour". ~~Hofstadter~~ ~~Godel, Escher, Bach~~

*This is very difficult. Could it be what would be meant if Blake's line were rendered, Hold Eternity in the palm of your hand and Infinity in an hour ?

NOTE15.WPD   See updated version 2004 #03 in Scraps 2004   October 5, 2004

ANOMALIES, ANTINOMIES, AND ARISTOTLE

Is it not possible that some of our exasperating antinomies are beyond resolution so long as we persist in that particular mathematics–the only one we have at present–which is based on Aristotelean logic? Will the difficulties ever be cleared up by traditional reasoning, or are they waiting for some new minds, not respectful of authority, to circumvent the contradictions by building inclusive mathematics on a many valued logic?

–E. T. Bell

(from The Place of Rigor in Mathematics, American Mathematical Monthly, v 41, 1934)

Today there are many who feel that no small part of mankind's problems and conflicts have been created by our way of thinking. What we think is determined and delimited by how we think. Many of the scientific paradoxes, legal anomalies, and political "Orwellisms" that have challenged us in the past few decades can be attributed to our dyadic, "us/them" mode of thinking. If even mathematics is in trouble because of Aristotelean thinking, then it seems most important to extend Bell's questioning to a broader domain. Make them more inclusive by replacing the term mathematics in his quotation with the more comprehensive concept, mode of thinking. Hence:

Is it not possible that some of our exasperating antinomies are beyond resolution so long as we persist in that particular mode of thinking –the only one we practice at present–which is based on Aristotelean logic? Will the difficulties ever be cleared up by traditional reasoning, or are they waiting for some new minds, not respectful of authority, to circumvent the contradictions by building a more inclusive mode of thinking based on a many valued logic?

It should be noted that multivalued logics have been around for some time. Hindu thinking has long included certain species of four valued logic, for example allowing statements to be, True, False, Neither true nor false, Both true and false. In the West, before mathematicians began exploring multi-valued logics in the early 20th century, all was Aristotelean. Maybe, we should allow for an exception or two: Scottish courts allow in addition to guilty or not guilty, the option, not proven. And for our zero sum win/lose games, when overtime is inconvenient, we have allowed the third alternative of a tie. But Aristotle's rule in the West remains mostly unchallenged.

DISK ~~MIX~~ CANDESS

NOT IN SCRAPS

WHENSET.WPD 2002-05-14

WHEN AN ELEMENT, WHEN A SET ?

Sources of the question
- in the law: One of the central features of jurisprudence is the element/set question
  - no belief vs assorted beliefs
  - local standards as elements vs the internet
  - the law vs the uniqueness of each incident
  - The first amendment as a set

Sets
- groupings, clusterings to simplify decisions
- single parameter groupings vs multi parameter groupings
- sets of distinguishable elements vs. sets of indistinguishable elements
- Maxwell-Boltzman statistics vs Einstein-Bose statistics

in epiontology the set of the repetitive vs the rare, unique
Science deals only with those events that can be assigned to the set of the repetitive
assignment to sets to simplify decisions
reduction to T/F, us/them, LXM

Pulsing (as in traffic) a form of assignment to a set
Pulsed traffic flows faster than unpulsed or random traffic
Should pulsing be orderly [uniform] or random?

Does the same multiplicity criterion arise with the concept of Fact?

Relations of the unique to the random

ONLY WHEN EVENTS CAN BE ASSIGNED TO SETS, CAN THE CONCEPT OF TRUE OR FALSE BE APPLIED. That is, isolated events in themselves are neither true nor false, it is only when by some mode of parameterization they can be assigned to a set, that they then can take on such attributes as true/false, exist/not exist, good/evil, etc.

True/False,, Good/Evil,, etc are not attributes of events or entities, they are attributes of sets.

The intrinsic variety in events does not permit them to processed by human logic. Consequently we assign events to classes to reduce the variety and make them tractable with our information processing capacities. That is, the world is too complex for us to treat without reduction of phenomena to sets and ultimately to dichotomic sets. Then such ideas as true or false can be applied. But ultimately such concepts as true/false, good/evil, existence/non-existence have no meaning.

Human thinking:
- Step one: assignment to a set
- Step two: seek parameters that reduce assignments to a pair of dichotomic sets, that is to two opposing sets. [the origin of 'not' in our logic]

for Cog

Zero dimensional set point, element, individual, event, anecdote

One dimensional set line, (~~cause~~), parameter, spectrum

linear cause effect.

Two dimensional set area, position, direction, dialectics, dialogue

3 volume, compromise

4 x^4 4-volume, synthesis

⋮

n All sets are $n \leq 4$

A TRUE-FALSE TEST September 1, 1995

1. Is the following sentence true or false?

   Their are two errors in this sentense.

2. Is the following sentence true or false?

   Their are three errors in this sentense.

3. Is the following sentence true or false?

   Their are four errors in this sentense.

The first sentence is clearly true. The third sentence is clearly false.

It is the second sentence that is ambiguous. It may be interpreted in two ways. There are two spelling errors in sentence 2. The sentence says that there are three errors therefore the sentence is false. However, saying that there are three errors when there are only two is itself an error, therefore there are three errors and the sentence is true.

If errors are restricted to content, such as spelling, and wrong word then sentence 2 is false. If meaning is also included, and two levels are considered, the level of content and the level of meaning, then sentence 2 becomes true.

We have here an example of a statement that is both true and false, depending on how it is viewed. Such propositions arise when levels or classes are involved. From this it follows that Aristotle's logic which is based on the Law of the Excluded Middle, viz, every proposition is either true or false, is limited to one level discussions. Aristotle's logic is a "horizontal logic" and when the vertical is present a different logic is required.

In a logic which can include the vertical, i.e. multiple levels, an operator is required that corresponds to the horizontal operator, NOT. Maybe this is the operator NO, or possibly the Zen MU, ~~if~~ taken as an operator.

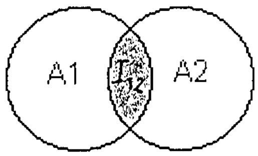


Figure 1

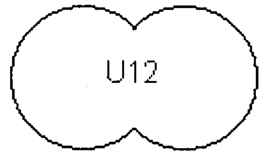


Figure 2

Different Initial Conditions or different paths?

The union U_{12} of the two areas A_1 and A_2 is the sum of the two areas minus their intersect (shaded area), I_{12}. [Figure 1 and Figure 2]

1) $U_{12} = A_1 + A_2 - I_{12}$

The union of three areas A_1, A_2, A_3 may be found by adding the area A_3 to the union U_{12} and subtracting their intersect S, (the shaded area) [Figure 3]

2) $U_{123} = U_{12} + A_3 - S$

But S is composed of two areas I_{13} and I_{23}, like $I_{12,}$ with an intersect of **w** [Figure 4], therefore,

3) $S = I_{13} + I_{23} - w$

Combining 1), 2), and 3) 4) $U_{123} = A_1 + A_2 + A_3 - (I_{12} + I_{13} + I_{23}) + w$

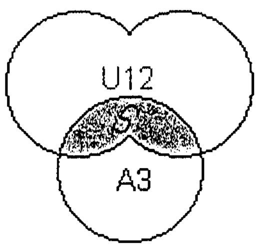


Figure 3

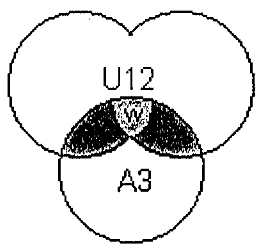


Figure 4

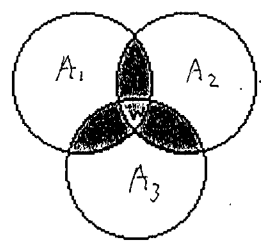


Figure 5

Alternatively, considering Figure 5, the union U_{123} is equal to $A_1 + A_2 + A_3$ minus the shaded area. This shaded area is $I_{13} + I_{23}$ - w, as in Figure 4, plus I_{12} - w. Combining, we get

5) $U_{123} = A_1 + A_2 + A_3 - (I_{12} + I_{13} + I_{23}) + 2w$

Which is correct Equation 4) or Equation 5) ? 4 ✓

Fig 5: w 3 deep → level 1

I_{ij} is 2 deep

$-3I_{ij}$ adds + w

Answer: Eq 4

LOGIC

Order of intersect

e = 4					
	0	1	2	3	4
	1	4	6	4	1

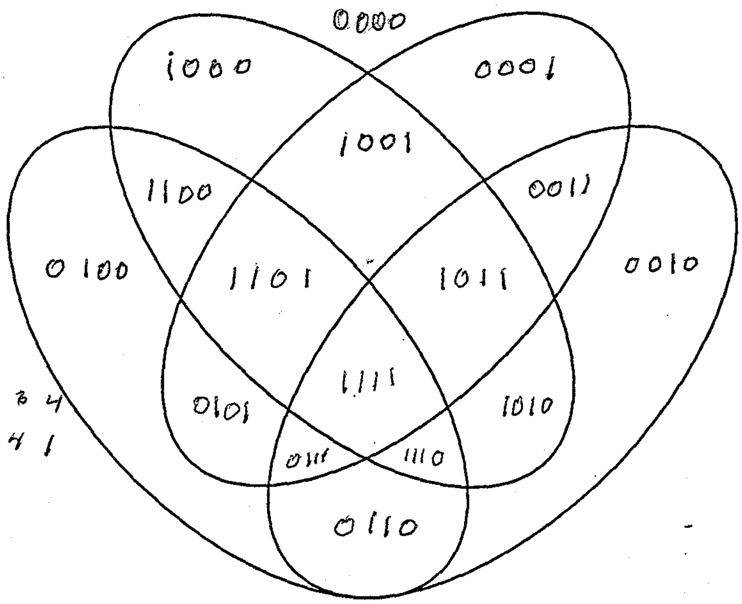
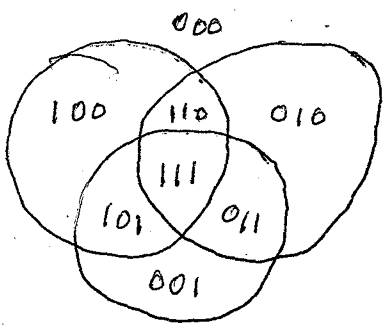


Figure 1.6. Venn's own diagram for four sets (1880).

DOMAINS or ZONES

$2^4 = 16$

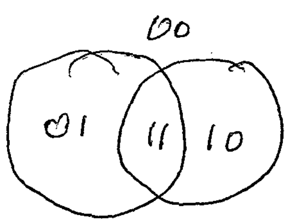
e = 3				
	0	1	2	3
	1	3	3	1



$2^3 = 8$

OCTADS

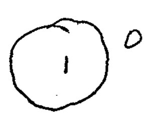
e = 2			
	0	1	2
	1	2	1



$2^2 = 4$

QUADRADS
EASTERN THINKING

e = 1		
	0	1
	1	1



$2^1 = 2$

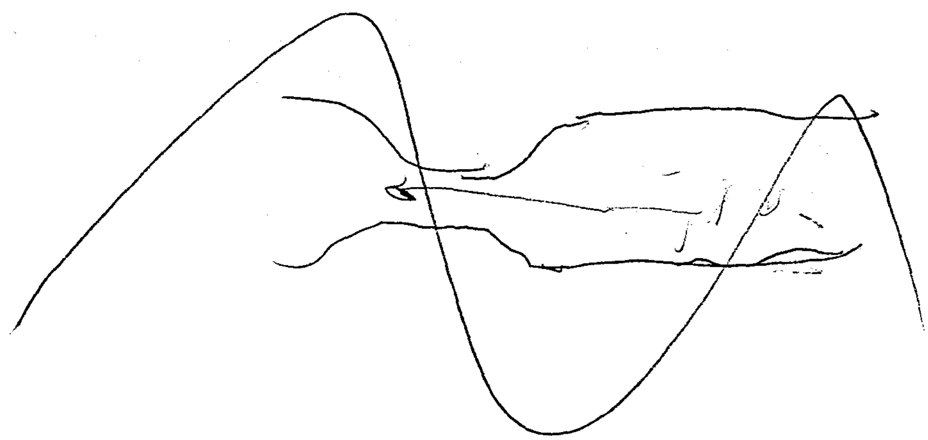
DYADIC, 2 LOBES
COMPUTERS
Aristotle

e = 0, ϕ

a.

$2^0 = 1$

NOTHINGNESS



VENN: NUMBER OF ORDER OF INTERSECTS OF ORDER K

ALL ORDERS TOTAL	N = # of elements		TOTAL PASCAL
0	0	1	1
0	1	1 1	2
1	2	1 2 1	4
4	3	1 3 3 1	8
11	4	1 4 6 4 1	16
26	5	1 5 $\boxed{10}$ 10 5 1	32
57	6	1 6 15 20 15 6 1	64
120	7	1 7 21 35 35 21 7 1	128
$2^n-(n+1)$	n		2^n

restricted defn

7^o 6^o 5^o 4^o 3^o 2^oorder

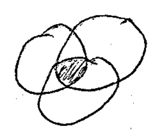
full definition
content $\equiv 000\cdots 1$
1^0order no inter just set
2^0order overlap of 2
" of 3
3^0 " etc
ZONES

Total # of order N $= 2^N$

2^0 order $\cap$ means 2 elements 

e.g. 5

order	0	1	2	3	4	5
#	1	5	10	10	5	1

3^0 order $\cap$  etc.

The number of intersects order K, elements N

$k=2$ 2 order $\frac{n!}{2!(n-2)!} = P(n,2)$

$k=3$ 3 order $\frac{n!}{3!(n-3)!} = P(n,3)$

e.g. $P(5,3) = \frac{5!}{3!\,2!} = \boxed{10}$

. . .

$k=k$ k^{th} order $\frac{n!}{k!(n-k)!} = P(n,k)$

\# INTERSECTS — above
\# PARTICIONS — Bell Numbers
\# CONFIGURATIONS

full defn, restricted defn

$\cap$	N	I	P	C	ZONES $= 1+I+N = \cap$
4	2	1	2	2	4
8	3	4	5	9	8
16	4	11	15		16
32	5	26	52		32
64	6	57	203		

BELL NUMBERS

Formulae Combinations Permutations

1 2 5 15 52 . . .
1 3 7 10 37
2 5 20 27
5 20
15

THE BELL TRIANGLE

A Bell Triangle is constructed on a triad of three initial numbers. These three numbers must be such that the third is equal to the difference of the first two. The first two numbers are on the top line of the triangle, their difference, the third number, on the second line:

```
1 2        1 0        1 1        0 1        2 5        3 3
 1          1          0          1          3          0
```

The rules for the construction of the triangle state that the last (right most) number on the top line is brought down to the line below the last entry. The third line in the case below:

```
1 2        1 0        1 1        0 1        2 5        3 3
 1          1          0          1          3          0
  2          0          1          1          5          3
```

The line above the bottom line is then filled in by a number such that the number in the bottom line is the difference of the two numbers in the line above.

```
1 2        1 0        1 1        0 1        2 5          3 3
 1 3        1 1        0 1        1 0            3 8          0 3
  2          0          1          1          5            3
```

This process is repeated until the top line is reached:

```
1 2 5      1 0 1        1 1 0        0 1 1      2 5 133 3
                                                 0
 1 3        1 1        0 1          1 0            3 8          0 3
  2          0          1            1          5            3
```

Again the right most number is brought to the bottom and the process repeated:

```
1 2 5      1 2 5      1 2 5           1 2 5 15
 1 3        1 3                 1 3 10          1 3 10
  2                  2 7          2 7             2 7
   5          5                    5               5
```

(The example immediately above is the original Bell Triangle. Other examples are based on alternate initial triads.)

VENN

$Z = N + I + 1 = 2^N$

CONFIGURATIONS

restricted defn

N			I	C	P	Z
2	O O OO	2	1	2	2	4
3	O O O 1 OO O 3 1 II OOO 3 2 II 1 with III 1 no III	4 intersects 3 (II), 1 (III) ab ac bc Partitions OOO 1 OO O 3 1	4	9	5	8
			11		15	

4

O O O O   1
a b c d

OO OO   3

OO O O   6

OOO O   12

OOOO   12

[illegible]

full   1

ɛPEkk|ídd (½ 2222222°»5à L° 15 cà 52°Lk 2ũd ½ 12½ ddd22 ad2222a d22DR

A VENN YANGHUI

N = the number of primary elements
R = the number of intersects of order K (maximum intersect configuration

order K →	0	1	2	3	4	T#
Values in table $= R(k,N)$ N						
0	1					1
1	1	1				2
2	1	2	1			4
3	1	3	3	1		8
4	1	4	6	4	1	16

$$T_N = 2^N$$

$R_0 \equiv 1$

$R_1 = N$

$R_2 = \frac{N!}{2!(N-2)!}$

$R_3 = \frac{N!}{3!(N-3)!}$

$R_4 = \frac{N!}{4!(N-4)!}$

$R_K = \frac{N!}{K!(N-K)!}$

R_K

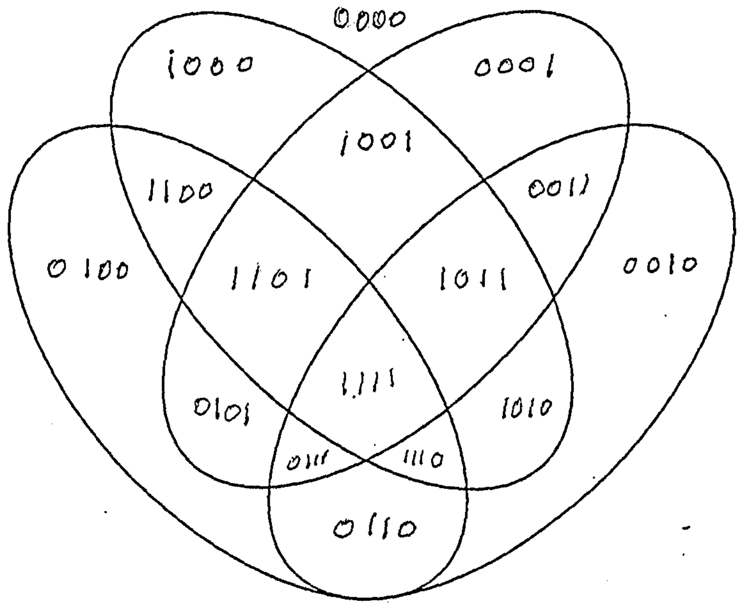
$R_0 \equiv 1$

$R_1 = N$

$R_2 = \frac{N!}{2!(N-2)!}$

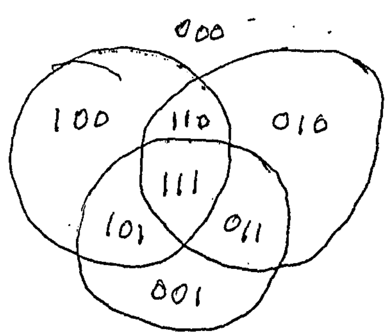
The above is identical to the Pascal Yanghui

i.e. The Pascal Triangle gives the number of the order of intersects in Venn diagram

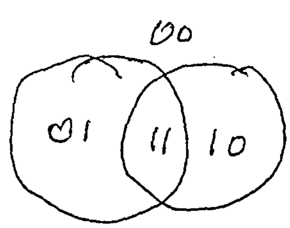


$2^4 = 16$

Figure 1.6. Venn's own diagram for four sets (1880).



$2^3 = 8$



$2^2 = 4$

$2^1 = 2$

a.

$2^0 = 1$

SETS

SET THEORY
AND
SEARCH FOR PATTERNS
SEE ALSO
ORDINANS IN MODULARIZATION NOTE BOOK

Set of replicating Δ's:
Fibonacci F_n
2^n

The F set and 2^n set have few # values member in common, e.g. 2, 8, ...?
But the sets formed on the Δ's and Σ's attributes important here
DO THESE SETS COINCIDE [For all $\Xi\Delta$'s $\Sigma - 1$?

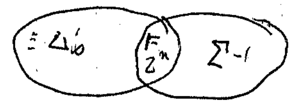
Set of Summations:

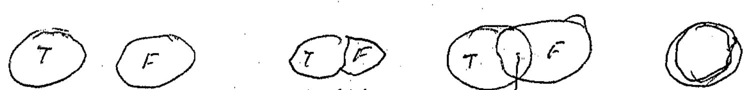
These 2 member sets have $\cap = \cup$

$$\sum F_\nu = F_{\nu+2} - 1$$

$$\sum 2^n = 2^{n+1} - 1$$

In general correlation w set membership





neither | LXM | both | $T \equiv F$

Future | Present | Past

THE OPPOSITE OF EVERY GREAT TRUTH IS A GREAT TRUTH

THE US/THEM PARADOX

There are many modular hierarchies with which we identify ourselves and find meaning. Population modules: me, my family, my clan, ...; Place modules: home, neighborhood, region,...; Political modules: party, country, allies, ...; Belief modules: cult, sect, religion,...; Genetic modules: race, species, genus, ...; and many others. There is even an hierarchy among the types of modules, but assignments of the order in that meta-hierarchy vary by individual choice. It has been noted that the extent of spiritual growth of individuals can be measured by the extent of each domain of modules by which they identify themselves. The child starts with me; the sage ends with an all inclusive domain of domains in which all living beings are themselves but a sub module. We become what we include in our domains of identity.

However, in becoming what we include, we also define and limit ourselves by what we exclude. This leads us to an "Us/Them" view of the world and in the process closes us off from the vast richness of our excluded "Them". But we do not see it this way. Rather we choose to define a "them", not as all that is excluded by us, but as another delimited set with differently ordered modules. The reciprocity of this operation by "them" leads us to our present us/them worldview of two conflicting "us's" and "thems", each cut off from their vast excluded "Thems". We see here how important it is to distinguish between "them" and "Them". Our "Them" contains "them" and their "Them" contains "us". And both "us's" are so limited that it is absurd for an "us" to seek to destroy or convert its "them".

On the other hand, there is one positive aspect to the present us/them world view. Namely, the existence of an "us" inspires "me's" to move up the modular ladders. While armies clash in darkness, the comradery, loyalty, and sacrifice within each army, move individual soldiers to higher modules. Many moving to a module above their present "us". It is a paradox that conflict to preserve existing "us's" is a path to transcending these same "us's". But as it has been said, An "us" that seeks to preserve its life shall lose it, but an "us" willing to sacrifice itself shall find a new Life.

DISK NOTES

NOT IN SCRAP

WHENSET.WPD 2002-05-14

WHEN AN ELEMENT, WHEN A SET ?

Sources of the question

in the law: One of the central features of jurisprudence is the element/set question

no belief vs assorted beliefs

local standards as elements vs the internet

the law vs the uniqueness of each incident

The first amendment as a set

Atheism a mandatory set

set of beliefs

Sets

groupings, clusterings to simplify decisions

single parameter groupings vs multi parameter groupings

sets of distinguishable elements vs. sets of indistinguishable elements

Maxwell-Boltzman statistics vs Einstein-Bose statistics

~~W~~ Atheism as not-set

in epiontology the set of the repetitive vs the rare, unique

Science deals only with those events that can be assigned to the set of the repetitive

assignment to sets to simplify decisions

reduction to T/F, us/them, LXM

Pulsing (as in traffic) a form of assignment to a set

Pulsed traffic flows faster than unpulsed or random traffic

Should pulsing be orderly [uniform] or random?

Standardization and set theory

Relations of the unique to the random

ONLY WHEN EVENTS CAN BE ASSIGNED TO SETS, CAN THE CONCEPT OF TRUE OR FALSE BE APPLIED. That is, isolated events in themselves are neither true nor false, it is only when by some mode of parameterization they can be assigned to a set, that they then can take on such attributes as true/false, exist/not exist, good/evil, etc.

True/False,, Good/Evil,, etc are not attributes of events or entities, they are attributes of sets.

The intrinsic variety in events does not permit them to processed by human logic. Consequently we assign events to classes to reduce the variety and make them tractable with our information processing capacities. That is, the world is too complex for us to treat without reduction of phenomena to sets and ultimately to dichotomic sets. Then such ideas as true or false can be applied. But ultimately such concepts as true/false, good/evil, existence/non-existence have no meaning.

Human thinking:

Step one: assignment to a set

Step two: seek parameters that reduce assignments to a pair of dichotomic sets, that is to two opposing sets. [the origin of 'not' in our logic]

MATHEMATICS

Experiments with ~~equations~~ printing   WORD PERFECT 8.0   CODICES DISK

$$\nabla^2\Psi = \frac{\partial^2\Psi}{\partial x^2} + \frac{\partial^2\Psi}{\partial y^2} + \frac{\partial^2\Psi}{\partial z^2}$$

If $\quad f(x) = \int_0^\infty e^{-xt} g(t)dt \qquad$ then $\quad g(x) = \frac{1}{2\pi i}\int_{a-i\infty}^{a+i\infty} e^{xt} f(t)dt$

$$\cos(x+y) = \cos(x)\cos(y) - \sin(x)\sin(y)$$

$$\sum_{k=1}^{n} k = n(n+1)/2$$

$$\lim_{n\to\infty}(1+\tfrac{1}{n})^n = e$$

$$\begin{pmatrix} a_1 & a_2 \\ b_1 & b_2 \end{pmatrix} = 0$$

$$\begin{Vmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{Vmatrix} = 0$$

$$y'' + (a + b\cos 2x)y = 0 \qquad \begin{Vmatrix} a & b & c \\ d & e & f \end{Vmatrix} = 0$$

$$m = m_o / \sqrt{1 - v^2 / c^2}$$

$$(A \cup B)' = A' \cap B' \quad \text{and} \quad (A \cap B)' = A' \cup B'$$

Law of the Excluded Middle

$a + -a = 1$

Everything (1) is either a or (+) not a (-a)

Every proposition is either true or false $\quad p \vee -p$

$p \cup p'$

Central Limit Theorem

Fractal Dimension

Derivatives

$$\frac{de^x}{dx} = e^x$$

$$\frac{da^x}{dx} = a^x \ln a$$

$$\frac{d\,g(u,v)}{dx} = \frac{\partial g}{\partial u} \cdot \frac{du}{dx} + \frac{\partial g}{\partial v} \cdot \frac{dv}{dx}$$

if $g = u^v$

$$\frac{dg}{dx} = u^v \left[\frac{v}{u} \frac{du}{dx} + \ln u \frac{dv}{dx} \right]$$

Statistics

1^o moment = average or arithmetic mean $\bar{x} = \frac{1}{N}\sum_{i=1}^{N} x_i$

2^o moment = dispersion σ_x

3^o moment = skewness α_3

4^o moment = kurtosis α_4

Mean = $\bar{x}$

Mode = value occuring most frequently

Median = divides area into two equal parts

Harmonic Mean = $\dfrac{1}{\frac{1}{N}\sum_{1}^{N}\left(\frac{1}{x_i}\right)}$

Geometric Mean = $\left[\prod_{1}^{N}(x_i)\right]^{\frac{1}{N}}$, $\log GM = \frac{1}{N}\sum \log x_i = AM[\log x_i]$

Growth Curves & Ogives

Iteration or recursion?

Mean Deviation $= \frac{1}{N}\sum f_i |x_i - \bar{x}|$

Standard Deviation: $\sigma_x = \left[\frac{1}{N}\sum f_i (x_i - \bar{x})^2\right]^{1/2}$

Variation

Dispersion

$\alpha_r = \frac{1}{N}\sum f_i\left(\frac{x_i - \bar{x}}{\sigma_x}\right)^r$

$\alpha_1 = 0$

$\alpha_2 = 1$

On Spheres:

$\exists$ 4π steradians solid angle in a sphere

$\exists$ 720 spherical degrees "

$\exists$ $\frac{4\pi \times 180^2}{\pi^2}$ square degrees " $= \frac{129600}{\pi}$ sq.° $= 41252.9613$ sq.°

Circle $\exists$ 2π radians

$\exists$ 360 degrees

sp deg ~ str

720 ~ 4π

OBLATE SPHEROIDS

PROLATE SPHEROIDS

Notation

$$\binom{n}{m} = \frac{n!}{m!\,(n-m)!} = {}_nC_m$$

= The number of combinations of n things taken m at a time.

$$\Gamma(z+1) = z\,\Gamma(z)$$

$$\Gamma(z) = \int_0^\infty t^{z-1} e^{-t}\,dt$$

$$\Gamma(n) = (n-1)!$$

$$\Gamma(1) = 1$$

$$B(a,b) = \frac{\Gamma(a)\Gamma(b)}{\Gamma(a+b)} = \int_0^1 x^{a-1}(1-x)^{b-1}\,dx$$

$$\sim \frac{1}{\binom{n}{m}}$$

$${}_nP_m = \frac{n!}{(n-m)!}$$

= The number of permutations of n things taken m at a time

$$m!\,{}_nC_m = {}_nP_m$$

Null

Inverses: $+$ $-$ A $-A$ $A+(-A)=0$ ①

with 1 quantity, A $\exists$ 2 inverses

$\times$ $\div$ A $\frac{1}{A}$ $A\times\left(\frac{1}{A}\right)=1$ ②

with 2, A, B $\exists$ 4 A^B, B^A

2 inverses

$\wedge$ A^B $\sqrt[B]{A}=A^{\frac{1}{B}}$ $(A^B)^{1/B}=A$ ③

A^B $\log_A(A^B)$ $\log_A A^B = B$ ④

with 3 how many inverses?

Mix of ① and ②

A $-\frac{1}{A}$ $A\times\left(-\frac{1}{A}\right)=-1$ ⑤

1° Symmetry → negative numbers
2° Symmetry → rational number
3° Symmetry → irrational number
4° Symmetry → ?
5° Symmetry → imaginary number

i has 2 symmetries

Note: $i+(-i)=0$
$i\times(-i)=1$
$i\times\left(\frac{1}{i}\right)=1$
$i+\frac{1}{i}=0$

$e^{i\pi}=-1$, $e^{i\frac{\pi}{2}}=\sqrt{-1}=i$,

$\left(e^{i\frac{\pi}{2}}\right)^i = i^i = e^{-\pi/2}$

$\left(e^{i\frac{\pi}{2}}\right)^{\frac{1}{i}} = i^{\frac{1}{i}} = e^{\pi/2}$

$\left(e^{i\frac{\pi}{2}}\right)^{-i} = i^{-i} = e^{\pi/2}$

$(e^i)^{(i\frac{\pi}{2})}$

$i^{\frac{1}{i}} = i^{-i}$

$i^{\frac{1}{i}+i} = i^{-i}\cdot i^{i} = i^0 = 1$

Logarithms

I $\log_a N = \frac{1}{\log_N a}$ $\log_a N = x$ $a^x=N$ $\log_N a = y$ $N^y=a$ $N^{yx}=N^1 \therefore xy=1$ and $(\log_a N)(\log_N a)=1$

II $\log_a N = \log_b N \cdot \log_a b$

$\log_a N = x$ $a^x=N$

$\log_b N = y$ $b^y=N$

$\log_a b = z$ $a^z=b$ $a^{zy}=N=a^x \therefore zy=x$

or $(\log_a b)(\log_b N)=\log_a N$

III $$\log_a N = \frac{\log_b N}{\log_b a}$$

IV $$\log_a N = \frac{1}{\log_N a}$$

Logarithms

$$a^x = b^y$$

$$x \log_c a = y \log_c b$$

$$x = y \log_a b \qquad y = \frac{x}{\log_a b} = x \log_b a$$

$$x \log_b a = y \qquad \therefore \log_b a = \frac{1}{\log_a b}$$

$$10^x = b^y$$

$$x = y \log_{10} b \quad , \quad y = \frac{x}{\log_{10} b}$$

Know $\log_{10} x = k \qquad 10^k = x$

Find $\log_a x = u \qquad a^u = x$

$$10^k = a^u$$

$$k = u \log_{10} a \qquad u = \frac{\log_{10} x}{\log_{10} a}$$

$$\log_a x = \frac{\log_{10} x}{\log_{10} a} \quad \text{or} \quad \log_{10} x = \log_a x \cdot \log_{10} a$$

$$\log_{10} x \cdot \log_a 10 = \log_a x$$

EXPONENTS

$$a^n \cdot a^m = a^{n+m}$$

$$(a^n)^m = a^{n \cdot m}$$

$$a^{n^m} = a^{(n^m)} \text{ or } (a^n)^m = a^{nm}$$

e.g. $2^{4^3} = 2^{64}$ or 2^{12}

$\cancel{\log}\ \ln(i) = x, \quad e^x = i, \quad e^{e^x} = e^i$

$i \ln(i) = ix$

$i^i = e^{ix} \qquad$ if $x = \frac{\pi}{2}$, $i^i = 1$

GROWTH CURVES or S curves
Sigmoidal curve

General Form

$$y = y_0 \left[1 - \frac{A}{r} e^{-kt}\right]^r$$

$$\frac{\dot{y}}{y} = rk \left[\left(\frac{y_0}{y}\right)^{1/r} - 1\right]$$

$$\frac{\ddot{y}}{y} = rk \left[\frac{r-1}{r}\left(\frac{y_0}{y}\right)^{1/r} - 1\right]$$

4 parameters: r, y_0, A, k ; $A > 0$, $k > 0$

r is the form parameter

$r = -1$, the logistics curve

$r = \infty$, Gompertz —— $y = y_0 \exp(-A e^{-kt})$

$r = 3$, von Bertalanfy

S-curve $\dot{A} \propto A(P - A)$

Growth curves are geodesics
in an hyperbolic space

They can de-modulate a carrier
($\sim$ diode)
i.e. extract one level
from another

$$\dot{x} = kx(1 - x)$$

INFORMATION

- A measure of the delocalisation of the state of the system in the space of all possible events.

(WHAT SPACE is THIS ?)
P+H ? ...

- Neg entropy   Szilard
- Bit definition
- Surprise   Shannon
- Frozen in form
- Information is at the boundaries - Bateson [Boundary of the Boundary is zero] - Wheeler
- Useful Data
- Length of description

DISCRETE INTEGRATION

$\Delta^2 \Sigma = A$ $\sim \frac{d^2y}{dx^2} = A$

$\Delta \Sigma_i = C_1 + NA$ $\sim \frac{d^2y}{dx} = Ax + c_1$

$\Sigma_i = C_0 + NC_1 + \frac{N(N-1)}{2!} A$ $\sim y = c_0 + c_1 x + \frac{Ax^2}{2}$

IN General

$$\Sigma = K_0 + \frac{N!}{(N-1)!} K_1 + \frac{N!}{(N-2)!\,2!} K_2 + \frac{N!}{(N-3)!\,3!} K_3 + \cdots$$

"OCCULT NUMBERS"

666 = DCLXVI largest possible number with six symbols

$108 = 2^2 \cdot 3^3$

Copy to BOOK ONE

Sq	Factor		Σ
3 •	1	9	9
	2	18	9
	3	27	9
6 •	4	36	9
	5	45	9
	6	54	9
	7	63	9
	8	72	9
9 •	9	81	9
	10	90	9
	11	99	18
	12	108	9
	13	117	9
	14	126	9
	15	135	9
12 •	16	144	9
	17	153	9

$\frac{1}{18}$	6		6		
$\frac{1}{12}$	9		9		
$\frac{1}{9}$	12		3		
$\frac{1}{6}$	18		9		
$\frac{1}{4}$	27		9		
$\frac{1}{3}$	36		9		3
$\frac{1}{2}$	54		9		
1	108		9	9	9
2	216	$= 6^3$	9		18
3	324		9		27
4	432		9		36
5	540		9		45
6	648		18		108
7	756		18		126
8	864		18		144
9	972		18		162
10	1080		9		90

17
34
51
68
85
102
119
136
153

Math

Six Degrees of Separation

A game of one-up-manship popular a few years ago was to be able, through people you knew, to reach the President of the United States in fewer phone calls than anyone else who was present. One fellow knew someone who was an intimate of the President, he thus claimed that he could reach the President in two phone calls--1) to his friend, 2) his friend to the President. *Hey, since we know you that puts us three phone calls from the President.* So it went..

It is commonly claimed that any two people on the planet are six or fewer degrees of separation from each other (i.e. six or less phone calls in the above sense). This seems to be a reasonable surmise as illustrated in the following two tables:

TABLE 1. GLOBAL POPULATION = 5 BILLION

DEGREE =	1	2	3	4	5	6	7
N =	5 BILLION	71,000	1700	266	87	41	24

TABLE 2. GLOBAL POPULATION = 6 BILLION

DEGREE =	1	2	3	4	5	6	7
N =	6 BILLION	78,000	1800	278	90	42	25

In these tables N stands for the average number of people one knows or the number of phone calls each person in the chain would have to make in order to reach everyone on earth. Thus, if the world population is six billion, in order to reach everyone with six degrees, each person would have to make 42 phone calls. With five degrees, 90 phone calls. etc.

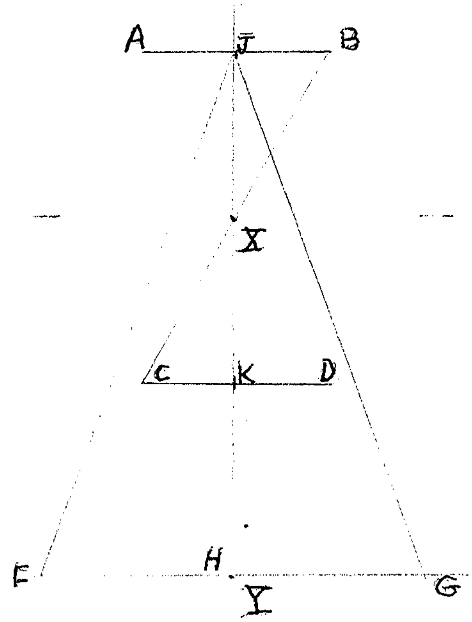
The tables are prepared using the equation, $N^d = P$, where P is the global population and d is the number of degrees. N is found by evaluating,

$$N = antilog(logP/d)$$

GEOMETRY

NONAGON.WP6 97/04/30; 97/05/12

THE RULER AND COMPASS CONSTRUCTION OF A NONAGON



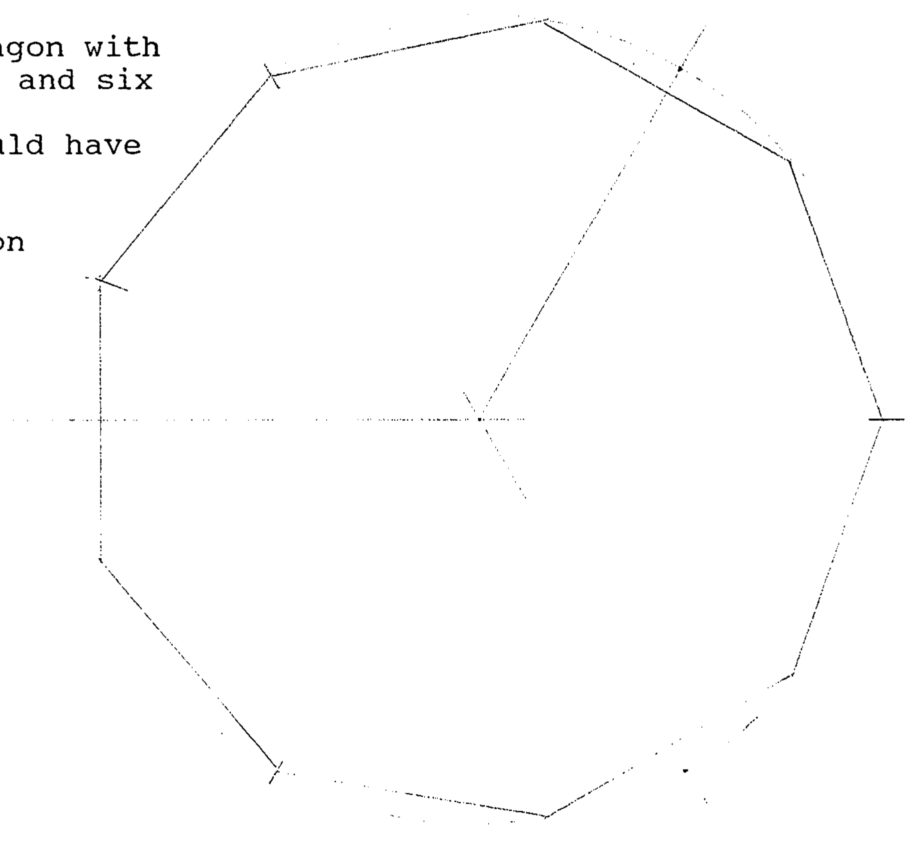
PART I.
- o Construct the circle X of radius R.
- o Divide its circumference into six parts.
- o Connect AB, midpoint J. Connect CD, midpoint K.
- o Construct circle Y with radius R tangent to CD at K.
- o Connect J with the ends of the diameter FG.
- o The angle FJG will be equal to $40°.20782 = 40°12'$

The projection of BC on line JH is = 2R cos 30°.
$\cos 30° = \sqrt{3}/2$; $JH = R(1+\sqrt{3})$
$\tan FJH = R/R(1+\sqrt{3}) = 1/(1+\sqrt{3})$
angle FJH = $20°.10391$

PART II.
- o Divide a circle into 3 parts.
- o Layout angle FJH on both sides of the three radii.
- o Bisect the remaining arcs.

This results in a nonagon with three sectors of $40°.2$ and six sectors of $39°.9$
(The exact nonagon would have nine sectors of $40°$)

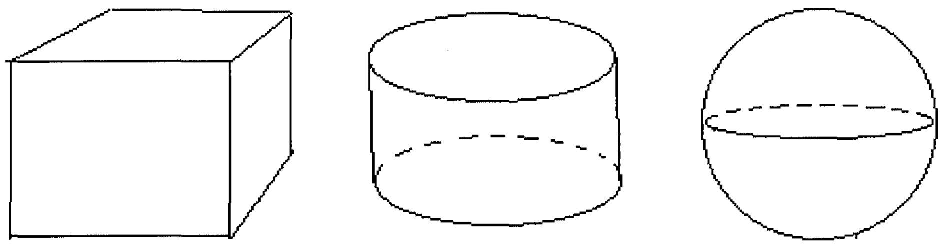
Note: This construction fortuitously evolved while working on a tiling problem.



Replace with cylinder R length

hemisphere R

cone R height



Edge of Cube = 2R
Volume of Cube = $8R^3$

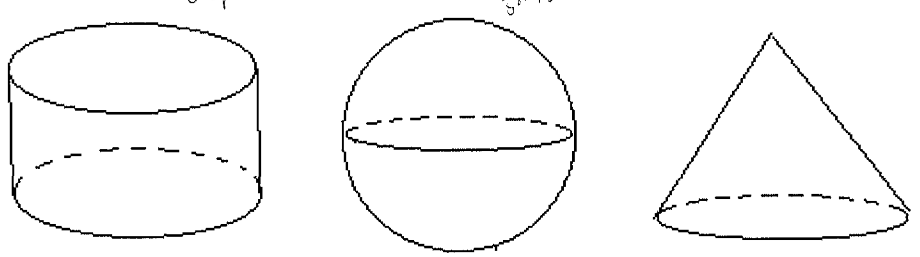
Radius of Cylinder = R
Height of Cylinder = 2R
Volume of Cylinder = $2\pi R^3$

Radius of Sphere = R
Volume of Sphere = $4\pi R^3/3$

Replace with circumscribed cube $8R^3$

sphere $\frac{4}{3}\pi R^3$

inscribed cube $\frac{8}{3^{3/2}}$



Radius of Cone = R
Height of Cone = 2R
Volume of Cone = $2\pi R^3/3$

VOLUME RATIOS:

	CUBE	CYLINDER	SPHERE	CONE
CUBE	1	π/4	π/6	π/12
CYLINDER	4/π	1	2/3	1/3
SPHERE	6/π	3/2	1	1/2
CONE	12/π	3	2	1

3.8193186

2 cyl: $I_2 = \frac{16}{3}$; $V_2 = 4(\pi - \frac{4}{3})$

3 cyl: $I_3 = 4(4-\sqrt{8})$; $V_3 = 6\pi - 3I_2 + I_3 =$

$\frac{\text{cube}}{I_2} = \frac{3}{2} = \frac{\text{cyl}}{\text{sphere}}$ $\frac{\text{cube}}{\text{cyl}} = \frac{4}{\pi} = \frac{I_2}{\text{sphere}}$

page 2 I_2 I_3 V_2, V_3 R

CUBES and SPHERES

edge = 2, radius = 1

	VOL	V/8 $e=\frac{1}{2}, R=\frac{1}{2}$
Cube	8	1
Inscribed sphere	$\frac{4}{3}\pi$	$\frac{\pi}{6}$
Inscribed cube	$\frac{8}{3^{3/2}}$	$3^{-3/2}$
I Sp		$3^{-3/2}\frac{\pi}{6}$
I Cu		3^{-3}
		⋮

		$\div 8$ $e=1, R=\frac{1}{2}$
Cube	8	1
Circumscribed sphere	$\frac{4}{3}\pi\, 3^{3/2}$	$\frac{\pi}{6} 3^{3/2}$
Cir cube	$8\, 3^{3/2}$	$3^{3/2}$
cir sp		$\frac{\pi}{6} 3^{3}$
cir cu		$3^{9/2}$

~~e=1 R=½~~

VOLUME

$3^{9/2}$

$3^{9/2}\frac{\pi}{6}$

$3^3 = 27$

$3^3\frac{\pi}{6}$

$3^{3/2}$

$3^{3/2}\frac{\pi}{6}$

$e=1$ 1

$R=\frac{1}{2}$ $\frac{\pi}{6}$

$3^{-3/2}$

$3^{-3/2}\frac{\pi}{6}$

$3^{-3} = \frac{1}{27}$

$3^{-3}\frac{\pi}{6}$

$3^{-9/2}$

VOLUME ratios

$\frac{\text{CUBE}}{\text{INS SP}} = \frac{6}{\pi} = 1.9098593$

$\frac{\text{SPHERE}}{\text{INS CUBE}} = 3^{3/2}\frac{\pi}{6} = \sqrt{3}\,\frac{\pi}{2} = 2.720699$

$\sqrt{3}\frac{\pi}{2} \cdot \frac{\pi}{6} = 1.4245547$

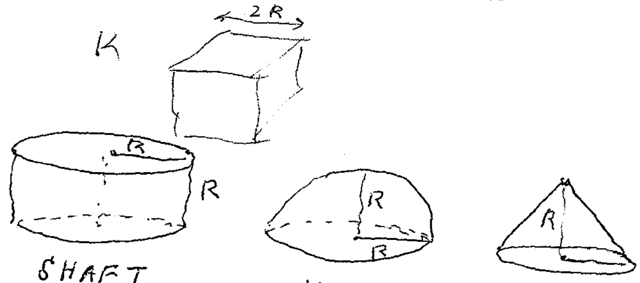
$3^{3/2} = 5.196524 = \sqrt{27}$

Cube to cube $\sqrt{27}$

sphere to sphere $\sqrt{27}$

ARCHIMEDES

K



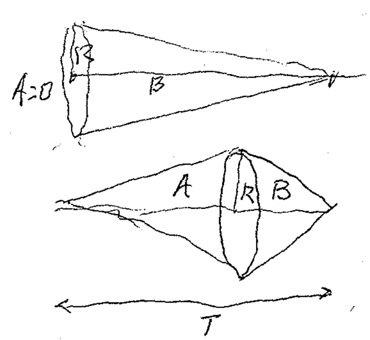
	SHAFT	HEM	R CONE
V:	πR^3	$\frac{2}{3}\pi R^3$	$\frac{1}{3}\pi R^3$
V	1	2/3	1/3
V	3/2	1	1/2
V	3	2	1
includes base S	$4\pi R^2$	$3\pi R^2$	$\sqrt{2}\pi R^2$
S	1	$\frac{3}{4}$	$\frac{1}{\sqrt{8}}$
S	4/3	1	$\sqrt{2}/3$
S	$\sqrt{8}$	$3/\sqrt{2}$	1

VISUALIZATION
and
SYMBOLIZING
(NOTATION)
MACROS,

		V
SHAFT − HEM = SPA		$\frac{1}{3}\pi R^3$
SHAFT − CONE = CHARGE		$\frac{2}{3}\pi R^3$
HEM − CONE = BOWL		$\frac{1}{3}\pi R^3$

VOLUME UNIT OF CONE

CONE = 1	SPA = 1
HEM = 2	BOWL = 1
SHAFT = 3	CHARGE = 2



The volume of the two cones is invariant with position of the base.

$$V_{A+B} = \frac{\pi R^2 T}{3}$$

I_2

TWO INTERSECTING CYLINDERS

VOLUME OF CONTAINING CUBE $= 8R^3 = V_K$

VOLUME OF EACH CYLINDER $= 2\pi R^3 = V_c$

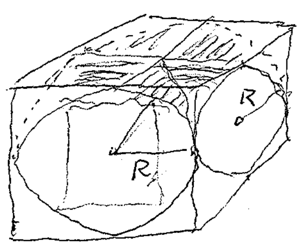
VOLUME OF THE 2 CYLINDER INTERSECT $= V_I = \frac{16}{3}R^3$

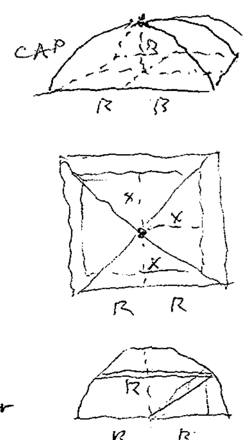
VOLUME OF 2 CYLINDER UNION $V_U = \left(4\pi - \frac{16}{3}\right)R^3$

Volume outside $V_o = \left(\frac{40}{3} - 4\pi\right)R^3$

circles without π

cf lunes





$$V_I = 2\int_{y=0}^{R} 4x^2\,dy$$

$$x^2 = R^2 - y^2$$

$$V_I = 8\int_{y=0}^{R}(R^2 - Y^2)\,dY = 8\left[R^3 - \frac{R^3}{3}\right] = \frac{16}{3}R^3$$

2 CYLINDER VOLUME

union $V_U = 2V_c - V_I = 4R^3\left(\pi - \frac{4}{3}\right)$

$V_{U\,union\,2} = V_U = 7.2330373\,R^3$

V_o = Volume outside the 2 cylinder within the cube $= V_K - V_U = V_o$

$$V_K - V_U = V_o = 8R^3 - 4R^3\left(\pi - \frac{4}{3}\right)$$

$$= 4R^3\left(\frac{10}{3} - \pi\right) = 0.7669627\,R^3$$

$\frac{R}{\sqrt{2}}$ $\frac{R^3}{\sqrt{8}}$

$$V_I = 5.\bar{3}\,R^3$$

$$\frac{V_I}{V_K} = \frac{2}{3} \quad \left(\text{cf } \frac{\text{HEMISPH}}{\text{CYLINDER}} = \frac{2}{3}\right)$$

~~What is the largest cube ⊂ double cap?~~ Inner Cube $V_k = \sqrt{8}\, R^3$ ✓

Summary: Volume of outer cube $8R^3 = V_K$

Intersect Volume of 2 cylinders $V_2 = \frac{16}{3} R^3 = 5.\bar{3} R^3$

Intersect Volume of 3 cylinders $V_3 =$

$V_{cap} = \frac{2}{3}\left(4 - \frac{5}{\sqrt{2}}\right) R^3 = 0.30964441\, R^3$ ✓

$V_6 = 6 V_{cap} = 4\left(4 - \frac{5}{\sqrt{2}}\right) R^3 = 1.8578644\, R^3$ ✓

$V_3 = V_k + V_6 = 4.6862915\, R^3 = 16\left(1 - \frac{1}{\sqrt{2}}\right) R^3$

$\frac{V_K}{V_2} = \frac{3}{2}$ ✓, $\frac{V_K}{V_k} = \sqrt{8}$ ✓

$\frac{I_2}{I_3}$ $\frac{V_2}{V_3} = 1.2159095$

$V_K - V_2 = \frac{8}{3} R^3 = \frac{1}{3} V_K = 2.\bar{6}\, R^3$ ✓

$V_K - V_3 = \frac{16}{\sqrt{2}} - 8 = 3.3137085\, R^3$ ✓

$\frac{V_K - V_3}{V_K - V_2} = 1.2426407$

$V_2 - V_3 = 16\left(\frac{1}{\sqrt{2}} - \frac{2}{3}\right) = 0.6470418\, R^3$

Volume of a cylinder: $V_T = 2\pi R^3 = 6.2831853\, R^3$ ✓

$2V_T = 4\pi R^3 = 12.566371\, R^3$ ✓

$U_2 = 2V_T - V_2 = 7.2330373$ ✓ < 8

$V_K - V_2 = 2.\bar{6}$

$V_K - (2V_T - V_2) = 0.7669627$ ✓

$3V_T = 6\pi R^3 = 18.849556\, R^3$

$V_k - 2\pi = 1.7168147$

$3V_T - 2V_3 = 9.4769729 > 8$

$\Delta = 0.6470418 <$

$3V_T - V_2 - V_3 = 8.8299311 > 8$

$3V_T - 2V_2 = 8.1828892 > 8$

Union Volumes $U_1 = 2\pi R^3 = V_T$

2 cylinders $U_2 = 2V_T - V_2$

3 cylinders $U_3 = 3V_T - ?$

$3V_T - 3V_2 = 2.8495559$

$3V_T - 3V_3 = 4.7906814$

~~$3V_T - 3V_2 - 2V_3 =$ negative~~

$V_1 = 2\pi R^3$, $V_2 = \frac{16}{3} R^3$, $V_3 = 16\left(1 - \frac{1}{\sqrt{2}}\right) R^3$

$U_3 = 6\pi - \frac{16}{\sqrt{2}}$

Wrong

~~Do~~ Octagonal ~~Prisims~~

Correct: ↓

$U = 3V_T - 3V_2 + V_3$

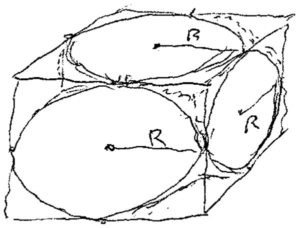
$= 7.5358474$

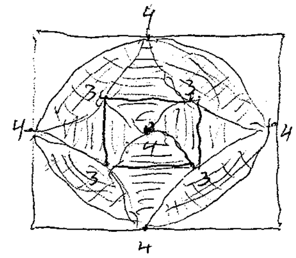
$V_o = 8 - U = 0.4641526$

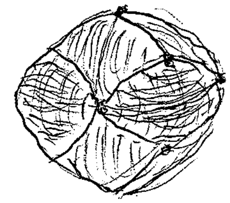
3 Intersecting Cylinders in a cube

INNER CUBE 3's are vertices
Outer cube 4's are face centers

I_3







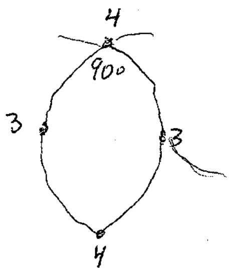
circles without π

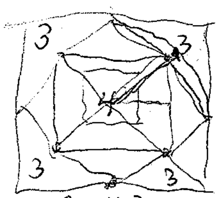
The 3 cylinder intersect is a solid consisting of 12 cylindrical faces
14 vertices, 24 edges
Each face is four edged
Each face has two 3 vertices and two 4 vertices

In effect there is an inner cube with 6 bi-cylindrical "caps"
The caps terminate at the "3" vertices

The volume of a cap: V_c

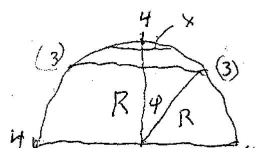
$$\int_{y=\frac{R}{\sqrt{2}}}^{R} 4x^2\,dy$$





45° on 4-3 but not on R circle

45° wrong



error in size of cap?

$$V_c = 4\int_{\frac{R}{\sqrt{2}}}^{R} (R^2 - y^2)\,dy =$$

$2 - \frac{5}{\sqrt{8}} = 0.232233$

$E + 2 = V + F$ [EULER]

$24 + 2 = 14 + 12$

$$V_c = 4R^2\left[R - \frac{R}{\sqrt{2}}\right] - \frac{4}{3}\left[R^3 - \frac{R^3}{\sqrt{8}}\right] = 0.3096441R^3$$

$$= 4R^3\left[1 - \frac{1}{\sqrt{2}} - \frac{1}{3} + \frac{1}{3\sqrt{8}}\right] = \frac{4}{3}R^3\left(2 - \frac{5}{\sqrt{8}}\right)$$

Volume of the inner cube, k

$$V_k = (R\sqrt{2})^3 = \sqrt{8}R^3$$

$$V_6 = \text{six caps} = 6V_c = 8R^3\left(2 - \frac{5}{\sqrt{8}}\right) = 1.8578643$$

$$I_3 = \sqrt{8} + 8\left(2 - \frac{5}{\sqrt{8}}\right)$$

$$V_I = V_k + V_6 = \sqrt{8}R^3\left(1 + \sqrt{8}\left(2 - \frac{5}{\sqrt{8}}\right)\right) = 4.6862914$$

$= 16 + \sqrt{8} - 5\sqrt{8}$

$= 16 + \sqrt{8}(-4)$

$V = 16 - 8\sqrt{2} = 8(2 - \sqrt{2})$

Volume of the intersect $= V_k + V_6 = \sqrt{8}R^3(2\sqrt{8} - 4) = (16 - 4\sqrt{8})R^3$

$4(4 - \sqrt{8})$

$8(2 - \sqrt{2})$

V_{I_3} " $I_3 = 4.6862916R^3$

Summary: Outer Cube $V_K = 8R^3$

$V_{3C} = 6\pi R^3$

16

$$= 16 - \frac{16}{\sqrt{2}} = 16\left(1 - \frac{1}{\sqrt{2}}\right)$$

$= 4.6862915$

union

$$V_{3c} = 3 \cdot 2\pi R^3 - 2V_I = [6\pi - 2(16 - 4\sqrt{8})]R^3 = 9.4769727$$

9.3725828

X

must be < 8

$$V_I = (16 - 4\sqrt{8})R^3 = 4.6862916R^3$$

$$V_k = \sqrt{8}R^3$$

$\therefore V_I$ too small

ERROR

$V_k \uparrow$ $V_c \downarrow$ $V_6 \downarrow$

or $V_c \uparrow$ $V_6 \uparrow$ $V_k \downarrow$

ATHROSMATICS
WHOLES AND PARTS

$6\pi - I_2 - I_3 = V_{U3}$

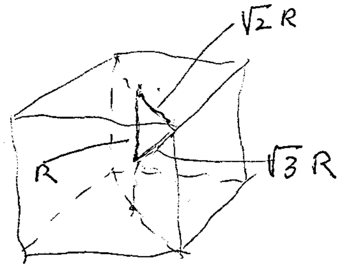
$6\pi - \frac{16}{3} - (16 - 4\sqrt{8}) =$

$6\pi + 4\sqrt{8} - (\frac{4\cdot 16}{3}) = 8.8290281 > 8$

± 2.13

I_n 6.3 ≠ I_3 4.6862916 OK smaller

cube side 2R



smaller external sphere radius = $\sqrt{3}R$

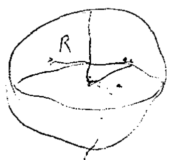
largest internal sphere radius = R

$$V_x = \frac{4\pi R^3 \sqrt{3}^3}{3}$$

$$V_N = \frac{4}{3}\pi R^3$$

$$\frac{V_N}{V_x} = \frac{1}{3\sqrt{3}}$$

The largest cube inside a sphere of radius R



$$s = \frac{2R}{\sqrt{3}}$$

$V_{U_3} - \sqrt{8} = 6$ cap

$= 4.7074204$

$\div 6 = 0.7845701$

$= V_{cap}$

Next

cube-cap sequence

Then

cube - 3cyl intersect sequence

$6\pi - 2I_2 =$

$6\pi - \frac{32}{3}$

8.1828842

recheck cube-sphere containment sequence

		radius	side
S_0	$\frac{4}{3}\pi R^3$	R	
C_0	$8R^3$		2R
$3^{3/2}S_0 = S_1$	$\sqrt{3}^3 S_0$	$\sqrt{3}R$	
C_1	$\sqrt{3}^3 C_0$		$2\sqrt{3}R$
$(3^{3/2})^2 = S_2$	$3^3 S_0$	3R	
$C_2 = 3^3 C_0$			

...

$(3^{3/2})^{n-1} S_0 = S_n$

$3^{\frac{3}{2}n} C_0 = C_n$

Try $V_{U_3} = 3cyl - 3I_2 + I_3$

$V_{U_3} = 6\pi - 3I_2 + I_3$

$6\pi R^3 - 3(\frac{16}{3})R_3 + (16 - 4\sqrt{8})R^3$

$V_{U_3}\ R^3[6\pi - 16 + 16 - 4\sqrt{8}] = (6\pi - 4\sqrt{8})R^3 \doteq 7.5358475\ R^3$

$V_0 = 8R^3 - 7.535R^3 = 0.4641525\ R^3$

Adopt

SUMMARY

$R=1$ VOLUMES

K = cube
C = cylinder
S = sphere
k inscribed cubes

U UNION
I INTERSECT
U_3 = 3 cylinder
U_2 = 2 cylinder
I_3 = 3 cylinder
I_2 = 2 cylinder

I

$K \quad 8$

$C \quad 2\pi = 6.2831853$

$S \quad \frac{4}{3}\pi = 4.1887902$

$k_1 \quad \sqrt{8} = 2.8284271$

$k_s \quad \left(\frac{2}{\sqrt{3}}\right)^3 = 1.5396007$ — inner cube of sphere

II

$2C \quad 4\pi = 12.566371$

$I_2 \quad \frac{16}{3} = 5.\bar{3}$

$U_2 = 2C - I_2 = 7.2330373$

$k_2 = \sqrt{8}$

III

$3C \quad 6\pi = 18.849556$

$I_3 \quad 16 - 8\sqrt{2} = 4.6862916 = 8(2-\sqrt{2})$

$U_3 = 3C - 3I_2 + I_3 = 6\pi - 8\sqrt{2} = 7.5358475$

$k_3 = \sqrt{8}$ inner cube

$V_{cap} = \frac{2}{3}\left[4 - \frac{5}{\sqrt{2}}\right] = 0.3096444 \; \cancel{= 1.8578644}$

$6V_{cap} = 16 - 10\sqrt{2} = 1.8578644$

ORDER BY VOLUME:

$K > U_3 > U_2 > C > I_2 > I_3 > S > k_i > k_s$

Make a Matrix

$K - U_3 = 0.4641525$ $\qquad K - U_2 = 0.7669627$

$U_3 - U_2 = 0.3028102$ $\qquad K - I_2 = 2.\bar{6}$

$U_2 - C = 0.949852$ $\qquad K - I_3 = 3.3137085$

$C - I_2 = 0.949852$ $\qquad U_2 - I_2 = 1.899704$

$I_2 - I_3 = 0.6470417$ $\qquad U_3 - I_3 = 6\pi - 16 = 2.8495559$

$I_3 - S = 0.4975014$

$S - k_i = 1.3603631$

$k_i - k_s = 1.2888264$

$\theta = 54.7356°$

RATIOS

$\frac{K}{C} = \frac{4}{\pi} = \frac{I_2}{S}, \quad \frac{C}{S} = \frac{3}{2} = \frac{K}{I_2} \quad \frac{K}{S} = \frac{6}{\pi}$

$\frac{K}{k} = \sqrt{8}$

$\frac{3(2-\sqrt{2})}{2} = \frac{I_3}{I_2} = 0.8786797 = \cancel{3 - \frac{4\sqrt{2}}{3}} \; \cancel{3 - \frac{\sqrt{8}}{3}}$

alt $[U_3] = 3C - 3I_2 + 2I_3 = 12.222139$
$= 6\pi + 16(1-\sqrt{2}) = 12.222139 > 8$

$\frac{U_2}{U_3} = \frac{2}{3}\,\frac{3\pi - 4}{3\pi - 4\sqrt{2}}$

VOLUMES $\quad R = 1$

OUTER CUBE $K = 8$, CYLINDER $C = 2\pi$

2 cylinder Intersect $I_2 = \frac{16}{3}$

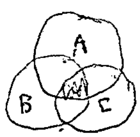
2 cylinder Union $= 2 \cdot C - I_2 = 4\pi - \frac{16}{3}$

3 cylinder Intersect = inner cube, k + 6 caps, b

$$k = \sqrt{8}, \quad b = \frac{4}{3}\left(2 - \frac{5}{\sqrt{8}}\right), \quad 6 \cdot b = 16 - 5\sqrt{8}$$

$$I_3 = k + 6 \cdot b = 16 - 4\sqrt{8} = 4.6862916$$

7.5358475



$$U_3 = 3 \cdot C - 3 I_2 + I_3 \checkmark = 6\pi - 3\left(\frac{16}{3}\right) + 16 - 4\sqrt{8} = 6\pi - 4\sqrt{8}$$

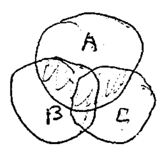
$$\text{or} + 2 I_3 \times = 6\pi - 3\left(\frac{16}{3}\right) + 2(16 - 4\sqrt{8}) = 6\pi + 16 - 8\sqrt{8}$$

12.222139

$U = A + B + C$
$\quad - (A \cap B) - (A \cap C) - (B \cap C) + W$

But $U_3 < K = 8$

$W =$



$A + B - (A \cap B)$
$A + C - (A \cap C)$
$B + C - (B \cap C)$

$\div 2 \quad A + B + C - \left[\frac{(A \cap B) + (A \cap C) + (B \cap C)}{2}\right]$

Cube & Sphere
Iterated
Inscribed

	E or R	V
K	2	8
S	1	$\frac{4}{3}\pi$
K	$\sqrt{3}$	$3\sqrt{3}$
S	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{3}}{2}\pi$
K	$\frac{3}{2}$	$\frac{9}{8}$
S	$\frac{3}{4}$	$\frac{9}{16}\pi$
K	$\frac{3\sqrt{3}}{4}$	$\frac{81}{64}\sqrt{3}$
S	$\frac{3\sqrt{3}}{8}$	$\frac{27}{128}\sqrt{3}\pi$

INSCRIBED CUBES and SPHERES

· E = edge R = radii

SIZE

$$\frac{E}{R} = 2, \quad \frac{R}{e} = \frac{\sqrt{3}}{2}, \quad \frac{R}{r} = \sqrt{3}, \quad \frac{E}{e} = \sqrt{3}$$

$$\text{VOLUME} \quad \frac{K}{S} = \frac{6}{\pi}, \quad \frac{S}{k} = \frac{\sqrt{3}\pi}{2}, \quad \frac{S}{s} = 3^{3/2}, \quad \frac{K}{k} = 3^{3/2}$$

Set R = 1   Vol

$E = 2$ ✓ 8 ✓

$R = 1$ ✓ $\frac{4}{3}\pi$ ✓

$e = \sqrt{3}$ ✓   ✓ $3\sqrt{3}$ ✓

$r = \frac{\sqrt{3}}{2}$ $\frac{\pi}{2}\sqrt{3}$ ✓

Cube inscribed in sphere of radius R

edge $= \sqrt{3}\,R$

$V = 3^{3/2} R^3$

Sphere inscribed in cube of edge E

$R = \frac{E}{2}$

$V = \frac{4}{3}\pi\frac{E^3}{8} = \frac{\pi}{6}E^3$

Cube inscribed in cylinder   Radii all = R

edge $= \sqrt{2}\,R$

volum $= \sqrt{8}\,R^3$

Cube inscribed in (cylamid = V

edge $= \sqrt{2}R$

vol $= \sqrt{8}R^3$

Cube inscribed in (spheramid =

edge $= \sqrt{2}\,R$

vol $= \sqrt{8}R^3$

9/11 report states the obvious

AUSTIN, Texas

The congressional report by the committees on intelligence about 9/11 partially made public last week reminds me of the recent investigation into the crash of the Columbia shuttle — months of effort to reconfirm the obvious.

In the case of the Columbia, we knew from the beginning a piece of insulation had come loose and struck the underside of one wing.

MOLLY IVINS

So, after much study, it was determined the crash was caused by the piece of insulation that came loose and struck the underside of the wing.

Likewise in the case of 9/11, all the stuff that has been blindingly obvious for months is now blamed for the fiasco.

The joint inquiry focused on the intelligence services, concluding that the FBI especially had been asleep at the wheel.

And that, in turn, can be blamed at least partly on the fact that the FBI, before 9/11, had only old green-screen computers with no Internet access. Agents wrote out their reports in longhand, in triplicate. Although the process is not complete, the agency is now upgrading its system: Many agents finally got e-mail this year.

My particular *bete noir* in all this is the INS (Immigration and Naturalization Service), which distinguished itself by granting visas to 15 of the 19 hijackers, who never should have been given visas in the first place. Their applications were incomplete and incorrect. They were all young, single, unemployed males, with no apparent means of support — the kind considered classic overstay candidates. Had the INS followed its own procedures, 15 of the 19 never would have been admitted.

The incompetence of the INS was underlined when it issued a visa to Mohammad Atta, the lead hijacker, six months after 9/11. In the wake of the attacks, the Bush administration promised to increase funding for the INS, to get the agency fully computerized with modern computers and generally up to speed. All that has happened since is that INS funding has been cut.

Much attention is being paid to the selective editing of the report, apparently to protect the Saudis. I think an equally important piece of the report is on the bureaucratic tangle that prevents anyone from being accountable for much of anything.

The CIA controls only 15 percent to 20 percent of the annual intelligence budget. The rest is handled by the Pentagon, despite widespread agreement that it needs to be centralized. The Bush administration has ignored these calls, mostly because Defense Secretary Donald Rumsfeld doesn't want to give up any power.

Time magazine reports, "It was striking that the Pentagon came under such heavy fire in last week's bipartisan report for resisting requests made by CIA director Tenet before 9/11, when the agency wanted to use satellites and

All the could-haves, would- haves and should-haves in the report are so far afield from the Patriot Act it might as well be on another subject entirely.

other military hardware to spot and target terrorists in Afghanistan."

But the most striking thing about this report is that none of its conclusions and none of its recommendations have anything to do with the contents of the Patriot Act, which was supposedly our government's response to 9/11. All the could-haves, would-haves and should-haves in the report are so far afield from the Patriot Act it might as well be on another subject entirely.

Once again, as has often happened in our history, under the pressure of threat and fear, we have harmed our own liberties without any benefit for our safety. Insufficient powers of law enforcement or surveillance are nowhere mentioned in the joint inquiry report as a problem before 9/11. Yet Attorney General John Ashcroft now proposes to expand surveillance powers even further with the Patriot II Act. All over the country, local governments have passed resolutions opposing the Patriot Act and three states have done so, including the very Republican Alaska.

The House of Representatives last week voted to prohibit the use of "sneak and peek" warrants authorized by the Patriot Act. The conservative House also voted against a measure to withhold federal funds from state and local law-enforcement agencies that refuse to comply with federal inquirers on citizenship or immigration status.

All kinds of Americans are now waking up to fact that the Patriot Act gives the government the right to put American citizens in prison indefinitely, without knowing the charges against them, without access to an attorney, without the right to their confront accusers, without trial. Indefinitely.

The report was completed late last year, but its publication was delayed by endless wrangles with the administration over what could be declassified. Former Georgia Sen. Max Cleland, who served on the committee, said the report's release was deliberately delayed by the White House until after the war in Iraq was over because it undercuts the rationale for the war. The report confirms there was no connection between Saddam Hussein and al-Qaida.

"The administration sold the connection to scare the pants off the American people and justify the war," Cleland said. "What you've seen here is the manipulation of intelligence for political ends."

Molly Ivins' column is distributed by Creators Syndicate.

horizontal ratios 1, 2, 3

$8 \cdot \frac{2}{3}$ horizontal diff $\frac{8}{3}$

3 2 1

$\frac{24}{3}$

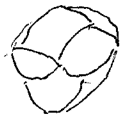
$\frac{2}{3}$

$0.\bar{6}$

$2-\sqrt{2}$

0.5857864

$\frac{4}{\pi}$ $\frac{4}{\pi}$



$\frac{4}{\pi} = 1.2732396$

$\frac{\pi}{6}$

0.5235988

$V_3 = 8(2-\sqrt{2}) = 16 - 4\sqrt{8} = 2K - 4k$

$\sqrt{3} = 1.7320508$

$\frac{6\pi}{3}$

cone

3 2 1

Horizontal diff $\frac{2\pi}{3}$ $8 \cdot \frac{\pi}{6}$

cube inscribed in cylinder

edge $= \sqrt{2}R$

$V = \sqrt{8}R^3$

continue with inscribing cube

~~$8(2-\sqrt{2}) = 4.6862915$~~

$\frac{16\pi}{3} = 16.755161$

$\frac{4}{\pi} + \sqrt{3} = 3.0052904$

~~$8(2-\sqrt{2}) \times \frac{4}{\pi} = 5.9667719$~~

$\frac{64\pi}{9} = 22.340214$

$\Delta = 5.5850535$

~~$\frac{\frac{16}{3}}{8(2-\sqrt{2})} = 1.138071$~~

~~$\frac{8(2-\sqrt{2})}{\frac{4}{3}\pi} = 1.1187698$~~

vertical Differences

$8 - 2\pi = 1.7168147$ (3)

$\frac{16}{3} - \frac{4\pi}{3} = 1.1445431$ (2)

$\frac{8}{3} - \frac{2\pi}{3} = 0.5722716$ (1)

$2/3$ $2-\sqrt{2}$ $\frac{\pi}{6}$

~~vertical~~ Ratios all all equal $\frac{4}{\pi}$

Ratio $2/3$ 1

$2-\sqrt{2}$ 1.1380712 1

$\frac{\pi}{6}$ 1.2732396, 1.1187697 1

Δ

$2/3$ $2-\sqrt{2}$ $\frac{\pi}{6}$

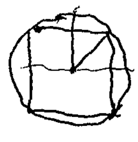
$2/3$ 0

$2-\sqrt{2}$ 0.0808802 0

$\frac{\pi}{6}$ 0.5235988 ; 0.0621876 0

THE VOLUME COMMON TO TWO INTERSECTING CYLINDERS OF EQUAL RADII, AXES ORTHOGONAL

$$2\text{ cyl},\ V_2 = 8\int_0^R x^2\,dy \qquad x^2 = R^2 - y^2$$



$$V_2 = 8\int_0^R (R^2 - y^2)\,dy = 8R^3 - 8\int_0^R y^2\,dy$$

$$V_2 = 8R^3 - \frac{8}{3}R^3 = \frac{16}{3}R^3 = \frac{2}{3}\text{ outer cube}$$

no π!

THE VOLUME COMMON TO THREE INTERSECTING CYLINDERS

$$V_3 = V_c + 6\cdot 4\int_{R/\sqrt{2}}^{R} x^2\,dy = V_c + 24\int_{R/\sqrt{2}}^{R}(R^2 - y^2)\,dy$$

$V_c = \sqrt{8}\,R^3$

$$V_3 = V_c + 24\left[R^2\left(R - \frac{R}{\sqrt{2}}\right) - \frac{1}{3}\left(R^3 - \frac{R^3}{\sqrt{8}}\right)\right]$$

$$V_3 = R^3\left\{\sqrt{8} + 24 - \frac{24}{\sqrt{2}} - 8\left(1 - \frac{1}{\sqrt{8}}\right)\right\}$$

no π!

$$V_3 = 16R^3\left(1 - \frac{1}{\sqrt{2}}\right) = (2\cdot 8 - 4\sqrt{8})R^3 = 2\cdot\text{outer cube} - 4\cdot\text{inner cube}$$

Ex Cube $8R^3$ — $8 - 2\pi$ = space outside cyl inside cube

Cyl $2\pi R^3$

Bicyl $\frac{16}{3}R^3$ — $8 - \frac{16}{3}$ = " " Bicyl " "

Tricyl $16\left(1 - \frac{1}{\sqrt{2}}\right)R^3$ — $8 - 16\left(1 - \frac{1}{\sqrt{2}}\right)$ = " " Tricyl " "

in Sphere $\frac{4}{3}\pi R^3$ — $8 - \frac{4}{3}\pi$ = " " sphere " "

In Cube $\sqrt{8}\,R^3$ ($2\sqrt{2}$) — $8 - \sqrt{8}$ (8) = Space outside small cube inside large cube

Cube $e = 2$

$V = \frac{16}{2}$

2cyl $\frac{16}{3} = \frac{16}{2+1}$

3cyl $\frac{16}{2+\sqrt{2}}$

let $\beta = \left(1 - \frac{1}{\sqrt{2}}\right)$

$$\frac{\text{EX CUBE}}{\text{BiCyl}} = \frac{3}{2}, \quad \frac{\text{CYL}}{\text{IN SPHERE}} = \frac{3}{2}$$

$$V_3 = 3\text{CYL} = 16\beta R^3 = (16 - 4\sqrt{8})R^3 = 2\cdot 8 - 4\sqrt{8}$$

$$\boxed{V_3 = 3\text{CYL} = 2(\text{XCUBE}) - 4(\text{INCUBE})}\ \checkmark$$

Ex Sphere $= \sqrt{8}\,\frac{4}{3}\pi R^3$

$$\frac{\text{X SPHERE}}{\text{CYL}} = \frac{2}{3}\sqrt{8}$$

Tricyl $= 8(2 - \sqrt{2})R^3 = \frac{16}{2+\sqrt{2}}R^3$

Space outside V_3

$K - [2K - 4k]$

$= 4k - K$

Every repeating decimal can be expressed by the quotient of two integers.

10/99 = 0.10 10 10 10 10 10 10 10 10 10 10 ...
110/909 = 0.121 0 121 0 121 0 121 0 121 0 121 ...
1110/9009 = 0.12321 0 12321 0 12321 0 12321 0 12321...
11110/90009 = 0.1234321 0 1234321 0 1234321 0 1234321...
111110/900009 = 0.123454321 0 123454321 0 123454321 ...
1111110/9000009 = 0.12345654321 0 12345654321 0 12345654321...
11111110/90000009 = 0.1234567654321 0 1234567654321 0 123467654321...
111111110/900000009 = 0.123456787654321 0 123456787654321 0 123456787654...
1111111110/9000000009 = 0.12345678987654321 0 12345678987654321 0 123...

99/10 = 9.9
909/110 = 8.263636363636363636363636363...
9009/1110 = 8.116216216216216216216162....
90009/11110 = 8.10162016201620162016201620162...
900009/111110 = 8.100162001620016200162001620016....
9000009/1111110 = 8.1000162000162000162000162...
90000009/11111110 = 8.10000162000016200001620000...
900000009/111111110 = 8.1000001620000016200000001620...
9000000009/1111111110 = 8.10000000162000000016200000000162 ...

18/111 = 0.162162162162162162162.....
180/1111 = 0.16201620162016201620162016201620....
1800/11111 = 0.162001620016200162001620016200162....
18000/111111 = 0.16200016200016200016200016200...
180000/1111111 = 0.1620000162000016200001620000162...
1800000/11111111 = 0.1620000016200000162000001620000...
18000000/111111111 = 0.162000000162000000162000000162...

12/99 = 0.12 12 12 12 12 12 12 12 12 12 12 ...
123/999 = 0.123 123 123 123 123 123 123 123 ...
1234/9999 = 0.1234 1234 1234 1234 1234 1234 ...
\- -
123456789/999999999 = 0.123456789 123456789 123456789 123457...

12/999 = 0.012 012 012 012 012 012 012 012 012 ....
123/9999 = 0.0123 0123 0123 0123 0123 0123 0123 ...
1234/99999 = 0.01234 01234 01234 01234 01234 01234...
\- -
123456789/9999999999 = 0.0123456789 0123456789 0123456789 0123...
1/81 = 0.0123456789 0123456789 0123456789 0123...

	VOL	SURFACE	$\frac{S^3}{V^2}$ SHAPE FACTOR	NUMBER
X SPH	$\frac{4}{3}\pi\sqrt{8}R^3$	$8\pi R^2$	36π	TRANS
XCUBE	$8R^3$	$24R^2$	$6^3 = 216$	INTEGER
CYL	$2\pi R^3$	$6\pi R^2$	$54\pi =$	TRANS
2CYL	$\frac{16}{3}R^3$	$4\pi R^2$ ✓	$\frac{9\pi^3}{4}$ / $\cancel{9\pi^3/8\sqrt{2}}$	RATIONAL
3CYL	$8(2-\sqrt{2})R^3$	$\cancel{2\pi R^2}$? $3\pi R^2$? $3\sqrt{2}\pi R^2$?	$\cancel{\pi^3/8(2-\sqrt{2})^2}$	IRRATIONAL
INSPH	$\frac{4}{3}\pi R^3$	$4\pi R^3$	36π	TRANS
INCUBE	$\sqrt{8}R^3$	$12R^2$	216	IRRATIONAL

	$\times R^3$	$\times R^2$	
XSPH	11.847688	4σ 25.132741	113.09734
XCUBE	8	24	216
CYL	$\sigma =$ 6.283185	$3\sigma =$ 18.849556 $= 6\pi$	169.646
2CYL	$5.\bar{3}$	$2\sigma =$ ~~8.885766?~~ 12.566371	69.764123
3CYL	4.686292	$\sigma =$ 6.283185 $= \frac{2cyl}{2}$?	11.294864
INSPH	4.188790	$2\sigma =$ 12.566371	113.09734
INCUBE	2.828427 $\cong\sqrt{8}$	12	216

$\frac{27\pi^3}{64(2-\sqrt{2})^2}$

$\frac{2cyl}{IN\ Sph} = \frac{4}{\pi}$ $V_{cyl} = \sigma$ $\sigma = 2\pi$

$\boxed{\text{Survace 2Cyl} \equiv \text{Surface insphere}}$

F $\frac{Sph}{2cyl} = 1.621 \doteq \varphi$

Volumes

$$\frac{XCUBE}{2CYL} = \frac{CYL}{INSPH} = \frac{3}{2}$$

L's

Volumes 3CYL = 2(XCUBE) − 4(INCUBE)

Surfaces 3CYL = hemisphere

$$\frac{Vol\ X\,Sph}{Vol\ in\,Sph} = vol\ incube = \sqrt{vol\ Xcube}$$

CONE

Surface
- X Sph $8\pi R^2$
- CYL $6\pi R^2$
- 2CYL $4\pi R^2$ = INSPH
- 3CYL $2\pi R^2$

MATRIX w YANGHVI

	V	Δ^0	Δ^1	Δ^2	Δ^3	Δ^4
CUBE	$8R^3$	$8.\bar{0}$	1.716815			
CYL	$2\pi R^3$	6.283185	0.949852	0.766967	0.464156	
2CYL	$\frac{16}{3} R^3$	$5.\bar{3}$	0.647041	0.302811	0.153272	0.310884
3CYL	$16(1-\frac{1}{\sqrt{2}})R^3$	4.686292	0.497502	0.149539		
SPHERE	$\frac{4}{3}\pi R^3$	4.188790				
In Cube	$\sqrt{8}R^3$	2.828427				

MATRIX $\Delta^0 \rightarrow$ $\downarrow$	8.0	6.283185	$5.\bar{3}$	4.686292	4.188790	$\sqrt{8}$
8.0	0	—	—	—	—	
6.283185	1.716815	0	—	—	—	
5.3	2.666667	0.949852	0	—	—	
4.686292	3.313708	1.596893	0.647041	0	—	
4.188790	3.811210	2.094395	1.144543	0.497502 $\leftarrow \Delta^1$	0	

INNER CUBE $\sqrt{8}R^3$

$3\,cyl = 16\beta R^3$

A MATRIX and A YANGHVI OVERLAP
BUT EACH CONTIANS ELEMENTS
NOT IN THE OTHER

$\exists$ 6 elements in the matrix $\neq$ 6 elements in the Yanghvi

4 are the same
and the top or side is the same as the Δ^0

$$\boxed{\frac{CUBE}{2CYL} = \frac{3 \cdot 8}{16} = \frac{3}{2} \qquad \frac{CYL}{SPHERE} = \frac{6\pi}{4\pi} = \frac{3}{2}}$$

$\beta = \left(1 - \frac{1}{\sqrt{2}}\right) = 0.2928932$

SPHERE x CUBE = CYL x 2CYL

$\frac{2\,cyl}{3cyl} = \frac{1/3}{\beta} = \frac{1}{3\beta} = 1.1380712$

$\frac{3cyl}{\beta} = 16$

Every repeating decimal can be expressed by the quotient of two integers.

10/99 = 0.10 10 10 10 10 10 10 10 10 10 10 ...
110/909 = 0.121 0 121 0 121 0 121 0 121 0 121 ...
1110/9009 = 0.12321 0 12321 0 12321 0 12321 0 12321...
11110/90009 = 0.1234321 0 1234321 0 1234321 0 1234321...
111110/900009 = 0.123454321 0 123454321 0 123454321 ...
1111110/9000009 = 0.12345654321 0 12345654321 0 12345654321...
11111110/90000009 = 0.1234567654321 0 1234567654321 0 123467654321...
111111110/900000009 = 0.123456787654321 0 123456787654321 0 123456787654...
1111111110/9000000009 = 0.12345678987654321 0 12345678987654321 0 123...

99/10 = 9.9
909/110 = 8.2636363636363636363636363...
9009/1110 = 8.1162162162162162162162....
90009/11110 = 8.1016201620162016201620162...
900009/111110 = 8.1001620016200162001620016....
9000009/1111110 = 8.100016200016200016200162...
90000009/11111110 = 8.1000016200001620000162000...
900000009/111111110 = 8.1000001620000001620000001620...
9000000009/1111111110 = 8.1000000162000000162000000162 ...

18/111 = 0.162162162162162162162162.....
180/1111 = 0.162016201620162016201620....
1800/11111 = 0.16200162001620016200162....
18000/111111 = 0.162000162000162000162000...
180000/1111111 = 0.1620000162000016200001620000162...
1800000/11111111 = 0.162000001620000016200000162000000...
18000000/111111111 = 0.162000000162000000162000000162...

12/99 = 0.12 12 12 12 12 12 12 12 12 12 12 ...
123/999 = 0.123 123 123 123 123 123 123 123 ...
1234/9999 = 0.1234 1234 1234 1234 1234 1234 ...
\- -
123456789/999999999 = 0.123456789 123456789 123456789 123457...

12/999 = 0.012 012 012 012 012 012 012 012 012 ....
123/9999 = 0.0123 0123 0123 0123 0123 0123 0123 ...
1234/99999 = 0.01234 01234 01234 01234 01234 01234...
\- -
123456789/9999999999 = 0.0123456789 0123456789 0123456789 0123...
1/81 = 0.0123456789 0123456789 0123456789 0123...

+ YANGHUI

Σ

$\bar{C}$	8					
CYL	6.283185	14.283185	25.899703			
2c	5.333333	11.616518	21.636147	47.535850	88.066708	
3c	4.686292	10.019629	18.894711	40.530858	75.317868	163.384576
S	4.188790	8.875082	15.892299	34.787010		
$\underline{C}$	2.828427	7.017217				
	31.320027					

$\pi^3 = 31.006277$

$R = 1$ all $\times R^3$

Δ

$\bar{C}$	8	1.717815
CYL	6.283185	0.949852
2cyl	5.333333	0.647041
3cyl	4.686292	0.497502
Sph	4.188790	0.360363
$\underline{C}$	2.828427	
	31.320027	4.192573

$\bar{C}$	8
cyl	2π
2cyl	$\frac{16}{3}$
3cyl	$16 - 4\sqrt{8}$
sph	$\frac{4}{3}\pi$
$\underline{c}$	$\sqrt{8}$
cone	$\frac{2\pi}{3}$ k

Π ratios

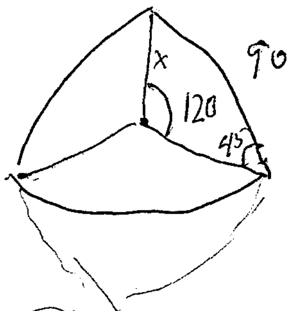
$4/\pi$ $\quad \frac{4}{\pi} \cdot d = \frac{3}{2}$ ~~1.0430328~~

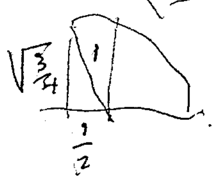
$\bar{C}$	8	1.2732396			
CYL	6.283185	d 1.1780972	a 1.0807594	1.0440404	1.0259689
2CYL	5.333333	e 1.1380711	b 1.0351701	1.0176141	
3CYL	4.686292	c 1.1187699	1.0172522		
Sph	4.188790	1.480961			
$\underline{C}$	2.828427	1.350475			
$\underline{k}$	2.094395				

$a \times b = c$

$c \times e = \frac{4}{\pi}$

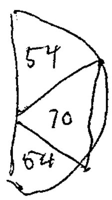
$\sqrt{b} \approx 1.0174331$





$$\frac{\sin x}{\sin 45} = \frac{\sin 90}{\sin 120}$$

$$\sin x = \frac{1}{\sqrt{2}} \cdot \sqrt{\frac{4}{3}} = \sqrt{\frac{2}{3}}$$



$x = 54^\circ.73561 \sim \frac{3}{10}\pi$

$70.52878 \sim \frac{4}{10}\pi \quad 0.3918266$

$$30^\circ = \frac{\pi}{6}$$

$$\frac{30}{180} = \frac{\pi/3}{2\pi}$$

R = 1

	V		÷ 1			
$\bar{C}$	8	8				
Cyl	2π	6.283185	1.2732396 (a) $= \frac{4}{\pi}$			
2cyl	$\frac{16}{3}$	5.333333	1.1780972 (b)	1.0807594 (e)	1.0440404	1.0259
3cyl	$16-4\sqrt{8}$	4.686292	1.1380711 (c)	1.0351701 (f)	1.017614	
Sph	$\frac{4}{3}\pi$	4.188790	1.1187699 (d)	1.0172522 (g)		
$\underline{C}$	$\sqrt{8}$	2.828427	1.480961			
kone	$\frac{2\pi}{3}$	2.094395	1.3504745	1.0885621		

$e \times f = 1.1187698 = d$

$c \times d = \frac{4}{\pi} = a$

$\sqrt{f} = 1.0174331$

$\frac{4}{\pi} \times b = a \times b = \frac{3}{2}$

$\sqrt{1.025969} = 1.0129031$

1.0258062×2

$= x$

$\left(\frac{x-1}{2}+1\right)^2 = x$

$(x-1+2)^2 = 4x$

$x^2+2x+1 = 4x$

$x^2-2x+1 = 0$

$x = \frac{2 \pm \sqrt{4-4}}{2} = 1$

$a = \frac{cube}{cyl}$

$b = \frac{cyl}{2cyl}$

$a \times b = \frac{cube}{2cyl} = \frac{3}{2}$

$\frac{2cyl}{3cyl} \times \frac{3cyl}{sph} = \frac{2cyl}{sph} = \frac{4}{\pi} = a$ ✓

c d

$\boxed{\frac{2cl}{sph} = \frac{cube}{cyl}}$ ✓

$\frac{16}{3} \frac{3}{4\pi} = \frac{4}{\pi}$

$e \times f = d$

$\frac{a}{b} \times \frac{b}{c} = d$

$\frac{a}{c} = d$

$\frac{\frac{cube}{cyl}}{\frac{2cyl}{3cyl}} = \frac{cube}{cyl} \cdot \frac{3cyl}{2cyl} = \frac{3cyl}{sph}$ ✓

NOTE36.WPD

November 19, 2004

COGNITIVE LEVELS

Roughly speaking, there are several "levels" to cognitive processes.

On the language level there is label thinking, syllogistic thinking,

On the image level there is identity thinking, wrapped in flag, belonging, idolatry

On the societal level there is group thinking, committee think, consensus

On the value level there is value thinking, morality, ethics, etiquette

SHAPINDX.WPD November 16, 1998

SHAPE INDICES

In flat space shape and size are independent permitting the creation of dimensionless indices that reference shape only. Two examples are given here. In two dimensions scale attributes of figures can be eliminated by taking the ratio P^2/A where P represents the perimeter of the figure and A its area. For three dimensional figures the dimensionless ratio S^3/V^2 removes scale factors, where S represents the surface area, and V the volume of the figure.

TWO DIMENSIONAL CASE

POLYGONS

Number of sides	Perimeter	Area	P^2/A	Value
∞	$2\pi r$	πr^2	4π	12.566371
6	6 e	$e^2 3\sqrt{(3)}/2$	$24/\sqrt{(3)}$	13.856407
5	5 e	e^2 1.720477		14.530854
4	4 e	e^2	16	16
3	3 e	$e^2\sqrt{(3)}/4$	$36/\sqrt{(3)}$	20.784610

3/2

The polygon shape parameters, all independent of size, have the value of 20.433 for an equilateral triangle and decrease toward $4\pi = 12.566371$ as the number of sides increases.

THREE DIMENSIONAL CASE

In the table E stands for the length of an edge; for pyramids a is an apothem and β is the base-face dihedral angle. Φ is the golden ratio 1.6180339...; $\varphi = 1/\Phi = 0.6180339$...

POLYHEDRA

FIGURE	SURFACE	VOLUME	S^3/V^2	VALUE	Value/.36
SPHERE	$4\pi R^2$	$4\pi/3\ R^3$	$36 \cdot \pi$	113.09734	3.14159
ICOSAHEDRON	$5\sqrt{(3)}\ E^2$	$5\ \Phi^2/6\ E^3$	$36 \cdot 5 \cdot 3^{3/2}/\Phi^4$	136.458	3.79125
DODECAHEDRON	$3\sqrt{[5(5+2\sqrt{5})]}\ E^2$	$(15+7\sqrt{5})/4\ E^3$		149.858	4.16514
OCTAHEDRON	$2\sqrt{(3)}\ E^2$	$\sqrt{(2)}/3\ E^3$	$36 \cdot 3^{3/2}$	187.061	5.19615
CUBE	$6\ E^2$	E^3	$36 \cdot 6$	216.000	6
TETRAHEDRON	$\sqrt{(3)}\ E^2$	$\sqrt{(2)}/12\ E^3$	$36 \cdot 2 \cdot 3^{3/2}$	374.123	10.39231

Note the ratio of triangle to circle = 1.65398 is one half the ratio of tetrahedron to sphere.

square to circle 2/3 cube to sphere

Hex to circle 2 Octahedron to sphere

Hx to circle = Tet to sphere. $6\sqrt{3}/\pi$

... circle and spheres as unit

ratios proportions = hyperratios hyper proportions purification

SHAPE INDICES OF SELECTED PYRAMIDS

b = ? = apothem-base angle

$K = (S^3/V^2)/36$, $\Phi = (1+\sqrt{5})/2 = 1.618034...$, the golden section.

113.09734 in spherical "units"

DEFINITION	b	S^3/V^2	K	S^3/V^2
$b = \arccos(\sqrt{3}/2)$	30^{o}		30.0111	1080.3998
$b = \sin \varphi$	38.1727		18.9768	683.1665
Dahshur Bent upper	43.3667		15.0262	540.9424
$\arccos(1/\sqrt{2})$ ①	45.0	$36(1+\sqrt{2})^3$	14.0711	506.5596
$b = \arcsin(\pi/4)$ ②	51.7575		11.1140	400.1031
"400" ②	51.7654		11.1111 $\frac{100}{9}$	400 $\approx \frac{100}{9}$
$b = \arccos(\varphi)$ ②	51.8273	$36\,\Phi^5$	11.0902	399.2472
$b = \arctan(4/\pi)$ ②	51.8540		11.0811	398.9193
Dahshur Bent lower	54.4622		10.2725	369.8089
$b = \arccos(1/\sqrt{3})$ ③	54.7356	$18(1+\sqrt{3})^3$	10.1962	367.0632
b = 1 radian	57.2958		9.5522	343.8787
$b = \arccos(1/2)$	60.0		9	324
$b = \arccos(1/\sqrt{5})$	63.4349		8.4721	304.9956
$b = \arccos(1/3)$ ④	70.5288		8	288
Inverse $\arccos(1/\sqrt{5})$	76.3453		8.4721	304.9956
$b = \arccos(1/5)$	78.4630		9	324
Inverse $\arccos(1/\sqrt{3})$	81.1006		10.1962	367.0632
Inverse $\arccos(\varphi)$	82.3090		11.0902	399.2472
Inverse $\arccos(1/\sqrt{2})$	84.6157		14.0711	506.5596

$\frac{400}{288} = \frac{25}{18}$

$2.546479 = x$

$\frac{x^2}{\sqrt{5}} = 2.9$ to 5 places

① This pyramid results from dividing a cube into six congruent pyramids.
② These pyramids have been considered the best approximations to the Great Pyramid of Cheops.
③ This pyramid is half of an octahedron.
④ This is the minimum value of S^3/V^2 acquired by any square based pyramid.

Does S include the base? yes

SHAPE INDEX RATIOS

S^3/V^2

Sphere 36π

CIRCLE P^2/A 4π $\qquad \frac{\text{SPHERE}}{\text{CIRCLE}} = 9$

OCTAHEDRON $S^3/V^2 = 36 \cdot 3^{3/2}$ $\qquad \frac{\text{Octahedron}}{\text{triangle}} = 9$

TRIANGLE $P^2/A = 36/3^{1/2}$

TETRAHEDRON $S^3/V^2 = 36 \cdot 2 \cdot 3^{3/2}$ $\qquad \frac{\text{TETRAHEDRON}}{\text{TRIANGLE}} = 18$

TRIANGLE $P^2/A = 36/3^{1/2}$

CUBE $S^3/V^2 = 36 \cdot 6$

SQUARE $P^2/A = 16$ $\qquad \frac{\text{CUBE}}{\text{SQUARE}} = 13.5 = \frac{27}{2}$

ICOSAHEDRON $S^3/V^2 = 36 \cdot 5 \cdot 3^{3/2}/\Phi^4$

TRIANGLE $P^2/A = 36/3^{1/2}$ $\qquad \frac{\text{ICOSAHEDRON}}{\text{SQUARE}} = \frac{45}{\Phi^4}$ $\qquad \Phi = 1.618\ldots$

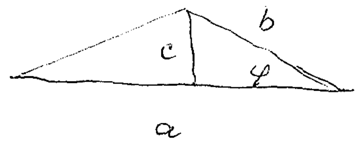
OCTAHEDRON $36 \cdot 3^{3/2}$

HEXAGON $P^2/A = 24/\sqrt{3}$ $\qquad \frac{\text{OCTAHEDRON}}{\text{HEXAGON}} = \frac{27}{2}$

TETRAHEDRON $36 \cdot 2 \cdot 3^{3/2}$

HEXAGON $24/\sqrt{3}$ $\qquad \frac{\text{TETRAHEDRON}}{\text{HEXAGON}}$ 27

Shape function



Area $= \frac{ac}{2} = b^2 \cos\varphi \sin\varphi$

Perimeter $= a + 2b = 2b\cos\varphi + 2b$

$$\frac{P}{A} = \frac{2b}{b^2}\frac{(\cos\varphi + 1)}{\cos\varphi \sin\varphi} = f(\varphi)$$

Max value?

$$f'(\varphi) = 0, \quad \frac{df}{d\varphi} = \frac{\cos\varphi\sin\varphi(-\sin\varphi) - (\cos\varphi + 1)[\cos^2\varphi - \sin^2\varphi]}{\cos\varphi^2 \sin\varphi^2} = 0$$

$$-\frac{1}{\cos\varphi\sin\varphi} - \frac{\cos^3\varphi + \cos^2\varphi}{\cos^2\varphi\sin^2\varphi} + \frac{\cos\varphi\sin^2\varphi + \sin^2\varphi}{\cos^2\varphi\sin^2\varphi} = 0$$

$$\frac{1}{\cos^2\varphi\sin\varphi} + \frac{\cos\varphi + 1}{\sin^2\varphi} = \frac{\cos\varphi + 1}{\cos^2\varphi}$$

$$\sin\varphi + \cos^3\varphi + \cos^2\varphi = \sin^2\varphi\cos\varphi + \sin^2\varphi$$

$$-\frac{1}{\cos\varphi} - \frac{\cos^3\varphi + \cos^2\varphi}{\cos^2\varphi\sin^2\varphi} + \frac{\sin^2\varphi(\cos\varphi + 1)}{\cos^2\varphi\sin^2\varphi} = 0$$

$$\frac{1}{\cos\varphi} + \frac{\cos\varphi + 1}{\sin^2\varphi} = \frac{\cos\varphi + 1}{\cos^2\varphi}$$

$$\frac{1}{\cos\varphi} + \cancel{\cos\varphi + 1} = \cos\varphi + 1\left[\frac{1}{\cos^2} - \frac{1}{\sin^2}\right]$$

$$-\frac{1}{\cos\varphi} = \frac{(\cos\varphi + 1)[2\cos^2\varphi - 1]}{\cos^2\varphi(1 - \cos^2\varphi)}$$

$$-\cos\varphi(1 - \cos^2\varphi) = 2\cos^3\varphi + 2\cos^2\varphi - \cos\varphi - 1$$

$$\cos^3\varphi - \cos\varphi = 2\cos^3\varphi + 2\cos^2\varphi - \cos\varphi - 1$$

$$\cos^3\varphi + 2\cos^2\varphi - 1 = 0$$

$$X^3 + 2X - 1 = 0$$

$X = 0{,}453398$

$X = -0{,}227 \pm i\,1{,}468$

$\varphi = 63{,}^\circ 0381$ for max area for given perimeter

$$P+T=\begin{bmatrix} -24.619576 & -24.619576 & -24.619572 & -24.619574 & -24.619571 & -24.619574 & -24.61957 & -24.619572 & -24.619569 \\ -29.281775 & -29.281771 & -29.281773 & -29.28177 & -29.281772 & -29.281769 & -29.281771 & -29.281768 & -29.28177 \\ -33.943971 & -33.94397 & -33.94397 & -33.94397 & -33.943969 & -33.943968 & -33.943968 & -33.943967 & -33.943967 \\ -38.606172 & -38.606169 & -38.60617 & -38.606168 & -38.60617 & -38.606167 & -38.606168 & -38.606166 & -38.606167 \\ -43.268369 & -43.268369 & -43.268368 & -43.268368 & -43.268367 & -43.268366 & -43.268366 & -43.268366 & -43.268365 \\ -47.930568 & -47.930568 & -47.930568 & -47.930566 & -47.930566 & -47.930565 & -47.930566 & -47.930565 & -47.930564 \\ -52.592767 & -52.592767 & -52.592766 & -52.592766 & -52.592765 & -52.592765 & -52.592764 & -52.592763 & -52.592763 \\ -57.254966 & -57.254965 & -57.254965 & -57.254964 & -57.254964 & -57.254964 & -57.254963 & -57.254963 & -57.254961 \\ -61.917165 & -61.917164 & -61.917164 & 76.059913 & -61.917154 & -61.917163 & -61.917162 & -61.917161 & -61.917161 \end{bmatrix}$$

GEOMES (GEOMETRIC MEANS)

INITIAL CONDITIONS GEOMES

$ML \quad L \quad \frac{L}{M} \quad \frac{L}{M^2}$

$ML \quad M \quad \frac{M}{L} \quad \frac{M}{L^2}$

$L \quad \sqrt{ML} \quad M \quad \frac{M^{3/2}}{L^{1/2}}$

$\frac{M}{L} \quad M \quad ML \quad ML^2 \quad ML^3$

$\frac{M}{L} \quad L \quad \frac{L^3}{M^2}$

$\frac{L}{M} \quad M \quad \frac{M^3}{L}$

$\frac{L}{M} \quad L \quad ML \quad M^2L$

---

let $q = \left(\frac{S}{\alpha\mu}\right)^{1/2}$, $p = \frac{m_o}{m_p}$ $\cancel{m_o p = m_o q}$

$q = \frac{39.355471}{1.127074} = 19.114198$ $\quad p = q = 19.114198$

35.228397

$m_o = -4.662404$

$m_p = -23.776602$

19.114198

$$\frac{S}{\alpha\mu} = \frac{m_o^2}{m_p^2}$$

B	$q^{-1} m_o$	$p^{-1} m_o$
P	$q^0 m_o$	$p^0 m_o$
D	$q m_o$	$p m_o$
★	$q^2 m_o$	$p^2 m_o$
U	$q^3 m_o$	$p^3 m_o$

$$S = \frac{m_o}{l_o}\frac{r_e}{m_p}$$

$$\alpha\mu = \frac{m_p r_e}{m_o l_o}$$

$u = (\alpha\mu S)^{1/2}$ $\quad v = \frac{r_e}{l_o}$ $\quad u = v = 20.241273$

$u = 39.355471$
1.127074
40.482545
$u = 20.241273$

-32.791341
-12.550068
$v \; 20.241273$

$$\alpha\mu S = \frac{r_e^2}{l_o^2}$$

B	$u^{-1} l_o$	$v^{-1} l_o$
P	$u^0 l_o$	$v^0 l_o$
D	$u \, l_o$	$v \, l_o$
★	$u^2 l_o$	$v^2 l_o$
U	$u^3 l_o$	$v^3 l_o$

DARK MATTER

B $q^{-1} m_o \; v l_o$ $\qquad \bar{B} \; q^{-1} m_o \; v^{-1} l_o$

D $q \, m_o \; v l_o$ $\qquad \bar{D} \; q \, m_o \; v^{-1} l_o$

$v^{-1} l_o = -53.032613$

$\sin(x)x + \sin(2x)x^2 + \sin(3x)x^3 + \cdots$ is not a power series.

10.120 636 308

~~8~~0.723 817 845
-32.791 340 828
27.932 477 017
10.120 636 308
38.053 113 325
~~10~~ 48.173 749 633

$(\alpha \mu s)^3 l_0$

27.932477
52.680193
80.612670
40.306335

80.965 090 460
-32.791 340 828
48.173 749 632 ✓

$$\sqrt{\frac{m_o^4}{m_p^3} \cdot \frac{r_e^3}{l_0^3}}$$

$$\left(\frac{S}{\alpha \mu}\right)^3 \quad 114\ 685\ 191\ 000$$

$$\left(\frac{S}{\alpha \mu}\right)^{3/2} m_0 \quad (\alpha \mu S)^{3/2} l_0$$

$$\sqrt{S^3 m_0 l_0}$$

$$\frac{l_0 m_0^2}{m_p}$$

$$m_0 l_0 = \frac{\hbar}{c}$$

43.123 093 452
9.557 099 250
33.565 994 202
19.114 198 500
14.451 795 702
9.557 099 250
24 008 894 932

7.691 204
33.565 994
41.357 198
20.628 599
40.306 335
19.677 741

S^3

-37.453 745
118.066913
80.612668
40.306334

-4.662 403 798
9.557 099 250
14.219 503 049
4.894 695 452

20.628599
19.677 741
0.950 853
-18.726 888
19.677 74.1
-38.404 629

39.355
37.454
1.901
0.950

18.726 588
37.443 776

52.680 192 702
9.557 099 250
62.237 291 952
202

-32.791
-4.662
-37.453
18.726

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	A	$\sqrt{A \cdot B}$	B	LENGTH
$\frac{r_e}{\lambda_c}$	−12,550 068 214		−32,791 340 828	
$\sqrt{\frac{A^3}{B}}$	−2.429 431 904	−22.670704521	$\sqrt{\frac{B^3}{A}}$	−42.911 977 135
$\frac{A^2}{B}$	+ 7.691 204 400	−22.670 704521	$\frac{B^2}{A}$	−53.032 613 442
$\sqrt{\frac{A^5}{B^3}}$	17.811 840 707		$\sqrt{\frac{B^5}{A^3}}$	−63.153 250 250
$\frac{A^3}{B^2}$	27.932 477 014		$\frac{B^3}{A^2}$	−73.273 886 056
$\sqrt{\frac{A^7}{B^5}}$	38.053 116 312		$\sqrt{\frac{B^7}{A^5}}$	−83.394 522 363
$\frac{A^4}{B^3}$	= 48.173 749 628		$\frac{B^5}{A^3}$	−93.515 158 670

$\Delta = \frac{A}{B} = 20.241\ 272\ 614$

$\Delta = 10.120\ 636\ 307$

$\frac{A^2}{B} = +7.691\ 204\ 400 = K$

$\frac{K}{\sqrt{A \cdot B}} = 30.361\ 908\ 921$

$K \cdot \sqrt{A \cdot B} = -14.979\ 000\ 121$

G - 13-10

	(L) $A = m_0$	MASS $\sqrt{A \cdot B}$	(R) $B = l_0$	$\frac{R}{L}$	
$\frac{m_0}{m_p^0}$	$-4.662404 = m_0$	-14.219503	$-23.776602 = m_p$		$\sqrt{\frac{\alpha/M}{S}}$
$\sqrt{\frac{A^3}{B}}$	$+4.894695$	-14.219503	-33.333701	$\sqrt{\frac{B^3}{A}}$	$\frac{\alpha/M}{S}$
$\frac{A^2}{B}$	$+14.451794$	-14.219503	-42.890800	$\frac{B^2}{A}$	$\left(\frac{\alpha M}{S}\right)^{3/2}$
$\sqrt{\frac{A^5}{B^3}}$	$+24.008893$	-14.21950	-52.447894	$\sqrt{\frac{B^5}{A^3}}$	$\left(\frac{\alpha M}{S}\right)^2$
$\frac{A^3}{B^2}$	$+33.565992$	-14.219504	-62.005000	$\frac{B^3}{A^2}$	$\left(\frac{\alpha M}{S}\right)^{5/2}$
$\sqrt{\frac{A^7}{B^5}}$	$+43.123091$	-14.219504	-71.562099	$\sqrt{\frac{B^7}{A^5}}$	$\left(\frac{\alpha M}{S}\right)^3$
$\frac{A^4}{B^3}$	$+52.680190$	-14.219504	-81.119198	$\frac{B^4}{A^3}$	$\left(\frac{\alpha M}{S}\right)^{7/2}$
$\sqrt{\frac{A^9}{B^7}}$	$+62.237289$	$\sqrt{A \cdot B}$			
$\frac{A^5}{B^4}$	$+71.794388$				

L and R
$\Delta = 9.557099 = \left(\frac{S}{\alpha M}\right)^{1/4}$

$B \cdot \sqrt{\frac{A^5}{B^3}} = 0.232291$

$\sqrt{\frac{B^3}{A}} \frac{A^3}{B^2} = 0.232291$

$\frac{B^2}{A} \sqrt{\frac{A^7}{B^5}} = 0.232291$

$\sqrt{\frac{B^5}{A^3}} \frac{A^4}{B^3} = 0.232296$

$+0.232296 = \sqrt{\frac{A^5}{B}}$

$\sqrt{\frac{A^9}{B^7}}$ 0.232289

$\frac{A^5}{B^4}$ 0.232,289

-14.219504
-0.232291
-14.451795
$= \frac{B}{A^2}$

$\sqrt{\frac{B}{A^5}} = \sqrt{\frac{B^3}{A^9}} = \left(\frac{B}{A^3}\right)^{3/2} =$

$\frac{A^5}{B} = 0.464552$

19.114 198 506
5w
9.557 099 250

$\sqrt{A \cdot B} \sqrt{\frac{B}{A^5}} = \frac{B}{A^3}$ ✓

-14.219504 -0.232296 -14.451794

$\frac{A^2}{B} = K$

$\frac{K}{\sqrt{AB}}$

$K\sqrt{AB} = $ "m_0"

IF ∃ balance $\sqrt{A \cdot B} = \frac{B}{A^3}$

$A^5 = B$

$\frac{A}{B} - 19.114~~198~~ 506 = \alpha^{-12} \mu^{-2}$

"A" $= -4.7553204$
W -4.662404
$.092916$

$\Rightarrow G$??

A $-4.662\ 403\ 798$
B $-23.776\ 602\ 304$

Δ

MUSIC

MUTUALITY

MYSTERY

ONTIC EPISTEMIC

ORTHOGONAL

PARADIGMS

PATTERNS

PLENITUDE

POLYTOPES

POWER of

PRODSUM NUMBERS

PROTO PLANETS

PURPOSE

QUESTIONS

RANDOM

RECURSION

REGRESSION

REPETITION

REPORT TO GALAXY

RITUAL

RULES META RULES

SEARCH

SEMIOTICS

SETS

SOCIETAL POLITICAL

SPACES

SPLN — SURVIVAL

SYNCHRONIC QUESTS

SYMMETRIES

SYNTHESIS

SYSTEMATICS GST

TECHNOLOGY

TEMPLATES

THEOLOGY

TIME

TOPOLOGIES

TYPOLOGIES

UNITS

UNITY | DIVERSITY U|D

UNIVERSALS

UNLEARNING

WIDTH OF HERE

WIDTH OF NOW

WIDTH OF IDENTITY

WIDTH OF VALIDITY

ZOOM

6-13-10 GEOMES

A -4.662404
B -23.776602
-28.439006
$\sqrt{AB}$ -14.229503

BOTH $\Delta\delta = 9.557099$ $\left(\frac{S}{\alpha M}\right)^{1/4}$
$V2 = 19.114198 = \left(\frac{S}{\alpha M}\right)^{1/2}$

A B

$\frac{R}{L} = \left(\frac{S}{\alpha M}\right)^{1/2}$

$\sqrt{\frac{A^3}{B}}$	$\sqrt{\frac{B^3}{A}}$
-4.662404	-23.776602
3	3
-13.987212	-71.329806
-23.776602	-4.662404
$+9.789390$	-66.667402
$\boxed{4.894695}$	$\boxed{-33.333701}$

$\frac{R}{L} = \left(\frac{S}{\alpha M}\right)^{1}$

$\frac{A^3}{B}$	$\frac{B^3}{A}$
-4.662404	-23.776602
2	2
-9.324808	-47.553204
-23.776602	-4.662404
$\boxed{+14.451794}$	$\boxed{-42.890800}$

$\frac{R}{L} = \left(\frac{S}{\alpha M}\right)^{3/2}$

$\sqrt{\frac{A^5}{B^3}}$	$\sqrt{\frac{B^5}{A^3}}$
~~-47.553204~~	$+48.017786$
~~$+48.017786$~~	~~-104.895798~~
$\boxed{+24.008893}$	$\boxed{-52.447894}$

$\frac{R}{L} = \left(\frac{S}{\alpha M}\right)^{2} = 76.4151$

diagonal matches
.3 -33.33 all $\Delta = 0.2323$
$+33.565$
i.e. skip 2 levels

$\frac{A^3}{B^2}$	$\frac{B^3}{A^2}$
$\boxed{+33.565992}$	$\boxed{-62.005000}$

$\frac{R}{L} = \left(\frac{S}{\alpha M}\right)^{5/2}$

L	R
43.123091	-71.562099
52.680190	-81.119198

$\frac{R}{L} = 114.685 = \left(\frac{S}{\alpha M}\right)^{3}$

$\frac{R}{L} = 133.799 \left(\frac{S}{\alpha M}\right)^{7/2}$

opposing diagonal
$-81 \times +24$ 57
-71 $+14$ 57

$\left(\frac{S}{\alpha M}\right)^{3/2} = 57.342595$
Δ again 0.232

$L \cdot R = -28.439000$ for all
$= AB$

$\frac{R}{L} =$

$\Delta = (\alpha M)^2$

Inner 33.565992
24.008893
57.574885
342

.232 agn

$+28.782942$
-28.739

AMERICA
NATIVES

CLIPS3.WPD **January 16, 2008** **March 7, 2008** **May 19, 2008** **August 13, 2008** **January 23, 2009**

AMERICAN NATIVE
AIR–LOCKS
ALTERNATIVES
ARCHIMEDES' TUB
ARCHITECTURE
ARKS
ANALEMMA
ARRANGEMENTS
ATHROISMATICS
BOTTOM UP | TOP DOWN
CERTAINTY. CERTITUDE
CHANGE
COGITANS
COINTS
COMMUNICATION
CONFEDERATION
CONSCIOUSNESS–IDENTITY
CRESTS
CURRENT CULTURE
DARK MATTER
DATA
DE'S AND RE'S
DIACHRONIC | SYNCHRONIC

DIACHRONIC THINK TANK
MONASTIC THINK TANK
DIALECTICS: MIDDLE WAY
DIMENSIONING
DISCRIMINATIONS
ECONOMICS –CAPITALISM
EDUCATION
ENCOUNTERS
EPIONTOLOGY
EVOLUTION
FORCES
FOUR THOUGHT
FREQUENCIES
FUZZINESS
GENERALIZ--ABSTRACTION
GLIMPSES
GLOSSARY
HUMOR
IN MEMORIAM
INFORMATION

INTRODUCTIONS
ITERATION & 3 R's
JOURNEY OF THE YEAR
JUXTAPOSITIONS
LAST PISCEAN
LAWS OF CHANGE
LAWYER THINK
LEVELS
LIFE LEVELS
LIFE
LIMITS
LOGICS AND LXM
MEANING
MYTH MATH METAPHOR
MONUN
MULTIPLEXING
MUSIC
MUTUALITY
MYSTERY
~~NATIVE AMERICANS~~

ONTIC EPISTEMIC
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REGRESSIONS OF BUBBLES
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RULES, META RULES
RITUAL
SEARCH
SEMIOTICS
SETS
SIGNIFICATION
SOCIETAL POLITICAL
SPACES
STORIES
SYNCHRONIC QUESTS
SYNTHESIS

Check $T\ \tau^2 = t^3$

cf Deutsch's Theorem

$B = -23.776$

$D = 14.451$

$\sqrt{B \cdot D} = -4.662 = m_o$

$\frac{D}{B} = \frac{S}{\alpha\mu} = 38.228$

$\sqrt{B \cdot D}\,\frac{D}{B} = \sqrt{\frac{D^3}{B}} = 33.565 = \frac{S}{\alpha\mu} m_o$

$= \left(\frac{S}{\alpha\mu}\right)^{3/2} m_o$

$\frac{D^2}{B} = 52.678$ 680

28.902
-23.776

$\sqrt{\frac{D^5}{B^3}} = 71.792$

72.255
-71.328

Δ 19.114

$= \sqrt{\frac{S}{\alpha\mu}}$

$D^5 \cdot B^3 = 0.927$

INNER

$\sqrt{52.680 \cdot 33565} =$

$\sqrt{52.680 \cdot 43.122}$

43.122	9.80
47.901	14 ⊙
50.040	16.7 ⊙
52.680	19.58 ⊙

cf Δ's with α

$\frac{\alpha}{\mu}$

μ

Start with B and P

$\overset{\circ}{\circ}$

$\circ E$

M^2_0

$^\circ\rho^{-1}$

$\overset{\circ}{\omega}$

GEOMEGRIDS

Did Mass

Also do Length, Force

Force $\sqrt{\frac{GM^3}{L^2} \cdot \frac{\hbar c}{L^2}}$ $\frac{M}{L^2}\sqrt{G\hbar c}$

$\frac{m_0^2}{m_p}$ $\left(\frac{m_0^3}{m_p}\right)^{1/2}$ m_0 $\sqrt{m_0 m_p}$ m_p

D

$\left(\frac{m_0^5}{m_p}\right)^{1/4} = a$ — [M]

$\left(\frac{m_0^5}{m_p}\right)^{1/4} = 0.232291 = a$ close to zero

a mass

$\frac{a}{2^5} = 0.007259$ am $= \alpha$

$\left(\frac{m_0^3}{m_p} \cancel{m_0 m_p}\right)^{1/2} =$ $\quad m_0\left(\frac{m_0^3}{m_p}\right)^{1/2} = \left(\frac{m_0^5}{m_p}\right)^{1/2}$

log = −2.139118

log α = −2.136835

Δ 0.002

$\frac{m_0^2}{m_0}$ $\sqrt{m_0 m_p}$ $2\left(\frac{m_0^5}{m_p}\right)^{1/2}$

$\frac{2^5}{a} = 137.758243$

137.0359997

$\Delta = 0.722$ 241

$\log_{10}\left[\frac{1}{2^5}\left(\frac{m_0^5}{m_p}\right)^{1/4}\right] = \log \alpha$

m_0^2 are $\log$

anti log 0.232291 = 1.707225936

$$\boxed{\begin{array}{l} M \rightarrow 0.232 \\ L \rightarrow \alpha \end{array}}$$

23 × 0.232291 = 5.34269

$\alpha^{23} =$

$\log_2 M \rightarrow \alpha$

$\sqrt{\frac{L^4}{L^2 F^{1/2}}}$ L^3 $\sqrt{\frac{ML^5}{T^2}}$ $\frac{ML^2}{T^2}$: $\frac{M^2L^4}{T^4L^3} = \frac{M^2L}{T^4}$

$\frac{L^2}{F^{1/4}}$ $C\sqrt{ML^3}$

A B X

$\sqrt{AX} = B$

$X = \frac{B^3}{A}$

$\frac{M^2}{T^4}\frac{F^2}{F^{3/2}}$ $\frac{M^2L^4}{T^4}\sqrt{\frac{T^3}{ML^5}} = \sqrt{\frac{T^2}{T^8}\frac{M^4}{M}\frac{L^8}{L^5}} = \sqrt{\frac{M^3L^3}{T^6}} = \left(\frac{ML}{T^2}\right)^{3/2} = F^{3/2}$

$\cdot F^{1/2}$

L^3 $\sqrt{\frac{ML^5}{T^2}}$ E $F^{3/2}$ $\frac{M}{T^2}F$

$\frac{L^4}{F^{1/2}}$ | L^3 | $L^2F^{1/2}$ | LF | $F^{3/2}$ | $\frac{M}{T^2}F$ | $\frac{M^2}{T^4}F^{1/2}$ |

$\frac{F^3}{L}$ $\frac{F^{5/2}}{L^2}$

E^{-1} $E^{-1/2}$ 1 $E^{1/2}$ E $E^{3/2}$ E^3

L^2 ML M^2

l_o^2 m_ol_o m_o^2 $\frac{m_o^3}{l_o}$ $\frac{m_o^4}{l_o^2}$

r_e^2 r_em_p m_p^2

$\sqrt{\frac{m_o^5}{m_p}}$ 0.232291

DO m_o l_o

m_p r_e

r_e^2 r_em_o m_o^2

l_o^2 l_om_p m_p^2

$\frac{m_o^2}{m_p}m_o^{1/2}m_p^{1/2}$

$= \frac{m_o^{5/2}}{m_p^{1/2}}$

$\frac{m_o^2}{m_o\sqrt{m_om_p}}$ $\left(\frac{m_o}{m_p}\right)^{3/2}$

$\left(\frac{m_o^5}{m_p}\right)^{1/2}$

-4.662404

-23.776002

28.439008

141.219503

5

$\sqrt{m_p m_o} =$ $= \frac{m_o^2}{m_p}$

$D = 14451796$

$\frac{1}{L^2}$ $\frac{M}{L}$ M^2

$\frac{m_o^4}{m_p^2}$ $\frac{m_o^3}{m_p}$ m_o^2 m_om_p m_p^2 $\frac{m_p^3}{m_o}$ $\frac{m_p^4}{m_o^2}$

$\left(\frac{m_o^3}{m_p}\right)^{1/2}$ m_o $\sqrt{m_om_p}$ m_p

B

$\left(\frac{m_o}{m_p}\right)^{3/2}$ $\frac{m_o^3}{m_p^2}$ $\left(\frac{m_o^5}{m_p^3}\right)^{1/2}$ $\frac{m_o^2}{m_p}$ E Z

A D

re-do !!

Q

$ML = \frac{M}{L}$

log $M + L = M - L$

$2L = 0$

$L = N \cdot (\alpha \mu S)^{1/4} + l_0 = 0$

$N = \frac{-l_0}{(\alpha\mu S)^{1/4}} = \underline{3.240\,047\,348}$

$(\alpha\mu S)^{1/4} = 10.120636$

$L_Q = 0$

$M_Q = 26.303050$

$M_{U/2} = 26.340\,095\,848$ $\quad \delta = 0.037045$

Q

$M = \sqrt{M_U}$

log $M = \frac{M_U}{2}$

$NV + m_0 = \frac{6V + m_0}{2}$

$V = \left(\frac{S}{\alpha M}\right)^{1/4} = 9.557\,099$

$N = \frac{6V - m_0}{2V} = 3 - \frac{m_0}{2V}$

$= \frac{4.662404}{19.114199} = 0.243924$

$+3 = \underline{3.243924}$

$L_K = -27.844\,017$

$M_K = 0$ $\quad L_U = +27.932\,477\,013$

$\delta = 0.088\,464$

Symmetry Summary:

$M \quad \sqrt{M_N \cdot M_{-N}} = m_0 \qquad \frac{M_N}{M_{-N}} = \left(\frac{S}{\alpha\mu}\right)^{N/2}$

$L \quad \sqrt{L_N \cdot L_{-N}} = l_0 \qquad L_N / L_{-N} = (\alpha\mu S)^{N/2}$

$ML \quad \sqrt{(ML)_n \cdot (ML)_{-N}} = \frac{\hbar}{c} \qquad \frac{(ML)_n}{(ML)_{-n}} = S^n$

$\frac{M}{L} \quad \sqrt{\left(\frac{M}{L}\right)_N \cdot \left(\frac{M}{L}\right)_{-N}} = \frac{c^2}{G} \qquad \left(\frac{M}{L}\right)_N / \left(\frac{M}{L}\right)_{-N} = (\alpha\mu)^N$

$\rho \quad \sqrt{\rho_m \cdot \rho_{-m}} = \rho_R$

Find N for $\quad L_U = -L_N$

The Great Switch over:

Above $N = 3.240 \quad M_N \longleftrightarrow L_N$ same sign

Below $N = 3.240 \quad M_N \longleftrightarrow L_{-N}, \; M_{-N} \longleftrightarrow L_N$

opposite sign

AT $N = 3.240 = Q \quad M_Q \doteq \sqrt{M_U}, \; L_Q = 1$

AT $N = 0.487 = K \quad L_K \doteq -L_U \qquad M_K = 1$

PYTHCOS

Four Critical Values

- $N=0$ P, The Planck Particle $\log M \overset{cgs}{=} -4.662\,404 = m_0$, $\log L = -32.791\,341 = l_0$
  $ML = \frac{h}{c}$ -37.453 $M/L = \frac{c^2}{G} = 28.129$

- $N \overset{K}{=} 0.487\,847$ $\log M_K = 0$, $M=1$ $\log L_K = -27.854\,017$ ML $-27.854 \overset{neg}{=}$ M/L $+27.854$
  $L_N \doteq L_U^{-1}$

- $N=Q= 3.240\,047$ $\log M_Q = 26.303\,050$ $\log L_Q = 0$, $L=1$ ML $26.303 =$ M/L 26.303
  $M_Q \doteq M_U^{1/2}$

- $N=6$ U, The Universe $\log M_U = 52.680\,192$ $\log L_U = +27.932\,477$ ML M/L
  $\sqrt{\ } = 26.340\,096$ 80.61 24.75

  $80.$ $24.$

$M_U^{1/2} = 26.340\,096$
$M_Q = 26.303\,050$
$0.037\,046$

$L_U = +27.932\,477$
$L_K = -27.854\,017$
$0.078\,460$

$\log M_K = 0$

$\log L_Q = 0$

$M_Q \doteq M_U^{1/2}$

$L_K \doteq -L_U$

Q is where $M \cdot L = \frac{M}{L}$ i.e. $\log M + \log L = \log M - \log L$ $L^2 = 1$

$N < Q$ $ML < \frac{M}{L}$ Related to the L–M $\overset{inter}{exchange}$ between Baryon Matter and Dark Matter
$N = -2$ $N = 12$

$N > Q$ $ML > \frac{M}{L}$ N > Above Q, Gravity and the Planck Force dominate, $N < Q$ other forces count

---

Note: $\log M_Q \doteq \sqrt{M_U} = 26.340\,096$, $\delta = 0.037\,046$

$\frac{M_U}{5} = 10.563\,038$ vs $(\alpha \mu S)^{1/4} = 10.120\,636$, $\delta = 0.441\,402$

$\frac{M_U}{M_Q} = 26.377\,142$ # $\log M_U - m_0 = \left(\frac{S}{\alpha\mu}\right)^{3/2}$

Note: Many of the solar system planets have masses close to 10^{26}

$\oplus = 27.776$, Mercury 26.518, Venus 27.687, Mars 26.807, Moon 25.866
Outer planets 29 or 30

Note: $\log L_U$ vs $\log L_K$
$+27.932\,477$ $-27.854\,017$
$\log L_U - l_0 = (\alpha \mu S)^{3/2}$

$M_Q \doteq \frac{M_U}{2} = 26.340\,095$	$L_K \doteq -L_U$
$\delta = 0.037$	$\delta = 0.078$
$L_Q = 0$	$M_K = 0$
From $ML = \frac{M}{L}$	From $ML = -\frac{M}{L}$

GEOMETRIC MEANS

Mass		Pure #	
m_p	$-23.776\,602\,304$	S	$39.355\,471\,115$
m_o	$-4.662\,403\,789$	$\alpha\mu$	$1.127\,074\,115$
$\Delta = \frac{m_o}{m_p} =$	$19.114\,198\,515$	Δ	$38.228\,397\,000$
		$\frac{\Delta}{2}$	$19.114\,198\,500 = \sqrt{\frac{S}{\alpha\mu}}$

$m_p = \sqrt{\frac{\alpha\mu}{S}}\, m_o$

A $\sqrt{AB}$ B

$\Delta = \sqrt{\frac{S}{\alpha\mu}}$

-23.776 602
-4.662 404
+14.451 794
+33.565 992
+52.680 190

$\frac{A}{B}$ or $\sqrt{\frac{A}{B}} = \frac{S}{\alpha\mu}$

A $\sqrt{AB}$ B

115.812 265
77.583 868
39.355 471
Fulcrum 1.127 074
-37.101 323
-75.329 720
-113.558 117

all $(\alpha\mu)$

all $\Delta = \frac{S}{\alpha\mu}$

$\frac{A}{B}$ $\sqrt{\frac{A}{B}} = \frac{S}{\alpha\mu}$

or $\sqrt[4]{\frac{A}{B}}$

$m_p = \left(\frac{S}{\alpha\mu}\right)^{-1/2} m_o$

$m_o = \left(\frac{S}{\alpha\mu}\right)^{0} m_o$

$M_p = \left(\frac{S}{\alpha\mu}\right)^{1/2} m_o$

$M_* = \frac{S}{\alpha\mu}\, m_o$

$M_u = \left(\frac{S}{\alpha\mu}\right)^{3/2} m_o$

-23.776
-4
14.451
+33
52.68

39.355
1.127
-37.101

all ratio $\frac{\text{Left}}{\text{right}}$

$= 13.324\,720 = A$

($\times 3 - S = 0.618689$)

$4A - M_u = 3A - S = 0.618690$

$\sim \phi$

$M_x = \left(\frac{S}{\alpha\mu}\right)^{3/4} m_o = 24.009$

$\left(\frac{S}{\alpha\mu}\right)^{5/4} m_o = 43.123$ G $\quad 45.512$ G $10^{10}\odot$ $\quad 10^{2}\cdot\odot$

47.902 G cluster

Value of G: Test and m_o

$G m_o^2 = -16.500\,103\,197$

$\hbar c = -16.500\,103\,227$

14.451794 24.008893

33.565992

28.787443 Uranus

29.982080 Saturn

31.176717 30.579

30.281 ♃

26.398

27.592 ⊕

305

32.371

32.968

33.267 ☉

GEOME $\sqrt{AB}$

METRIC $\sqrt{\Delta M^2 + \Delta L^2 + \Delta T^2}$

$\hbar = -26.976924$ $\quad$ $C=0$ FORCES

$\hbar^2 = -53.953848$

-7.175296

$\frac{\hbar^2}{\sigma} = -46.778552$

B
v=1 7.472959 > 37.101323 $= \frac{S}{(\alpha\mu)^2}$ ✓
v=0 −29.628364 > 37.101322
v=−1 −66.729686 > 37.10~~13~~22
v=−2 −103.831008 > 37.101322

11.981256 $\quad$ 40.482548 = ($\alpha\mu$S)

P
v=1 49.082578
v=0 49.082578 $\quad \frac{C^4}{G}$ ✓
v=−1 49.082578
v=−2 49.082578 28.501294

Check

D
v=1 −30.755 440 > 77.583872 → 77.583872
v=0 +46.828 432 > 77.583872 ~~error~~
v=−1 +124.412 304 > 77.583872 ✓
v=−2 +201.996176

77.583

★
v=1 −100.583458 155.167742 ✓
v=0 +44.574284 ~~error~~ ✓ ✓
v=−1 +199.747028 > 155.167742 ✓
v=−2 +354.909768 155.167740

77.583870 $= \frac{S^2}{\alpha\mu}$

U
v=1 −190.431476 232.751612 ✓
v=0 +412.320136 > 232.751613 ✓
v=−1 +275.071748 > 232.711612 ~~error~~
v=−2 + ~~507.883360~~ 507.823360

Fulcrum?

$\frac{S}{(\alpha\mu)^2}$ $\quad \frac{C^4}{G}$ $\quad \frac{S^2}{\alpha\mu}$

37.101 $\quad$ 77.583

A $\quad$ B

$\frac{B}{A} = \alpha\mu S$

$A \cdot B = \left(\frac{S}{\alpha\mu}\right)^3$

D $\overset{all}{\Delta} = 77.583872$

and

D, R, U } $\Delta i = D\Delta b$

Fractal

HUM

Ratios to Gravity

v=−2 U $\frac{507}{412} = 465$

R $\frac{354}{44} = 310$

D $\frac{201}{776} = 155$

P 1

B $\frac{-103}{-24} = -74$

The C=0 FORCES

$\text{factor} \rightarrow \frac{GM^2}{L^2}$ ~~cf to grav~~ $\frac{GM^2}{L^2}$

$$\left(\frac{GM^3L}{\hbar^2}\right)^V \sim [0] = K^V$$

$[M, L]$

$-\frac{7}{2}, +\frac{1}{2}$ $\quad \frac{M^8G^3}{\hbar^4} \cdot \frac{\hbar^4}{G^2M^6L^2}$ $\quad V=-2$

$-2, +1$ $\quad \frac{M^5}{L}\frac{G^2}{\hbar^2} \cdot \frac{\hbar^2}{GM^3L}$ $\quad V=-1$

$-\frac{1}{2} + \frac{3}{2}$ $\quad \frac{GM^2}{L^2}$ $\quad V=0$

$+1, +2$ $\quad \frac{\hbar^2}{ML^3} \cdot \frac{GM^3L}{\hbar^2}$ $\quad V=+1$

$\frac{G}{\hbar^2} = +46.778552241 = \frac{1}{m_o^3 l_o}$

$\hbar^2 = -53.953848$ ✓

$\frac{e^2}{\hbar^2} = +39.603256$

$\frac{G^3}{\hbar^4} = +86.381808$

$G = -7.175296$

$\hbar^4 = -107.907696$

$\frac{\hbar^4}{G}$ -100.732400

(*)

Ratio of C=0 Force to Gravity

$V=-2$ Force $\quad \frac{G^2}{\hbar^4}M^6L^2 = \left(\frac{M^3L}{m_o^3 l_o}\right)^2 \gg$ Gravity

$V=-1$ Force $\quad \frac{GM^3L}{\hbar^2} = \frac{M^3L}{m_o^3 l_o} >$ Gravity

$V=0$ Force $\quad 1 \approx 1 =$ Gravity

$V=1$ Force $\quad \frac{\hbar^2}{GM^3L} = \frac{m_o^3 l_o}{M^3L} <$ Gravity

ML $\quad U = \frac{h}{c}S^3 \quad 80.612672$

☆ $= \frac{h}{c}S^2 \quad 41.257200$

$D = \frac{h}{c}S \quad 1.901728$

$P = \frac{h}{c} \quad -37.453745$

$B = \frac{h}{c}(\alpha\mu) \quad -36.326670$

VALUES $\quad V=1, \hbar^2/ML^3 \quad V=0 \; \frac{GM^2}{L^2}$ Gravity $\quad V=-1 \; \frac{M^5G^2}{L\hbar^2} \quad V = \frac{M^8G^3}{\hbar^4} \; V=-2$

B $\quad +7.472959$ ~~115.380655~~ $\quad -29.628364 \quad$ — $\quad -66.229686$

Δ 41.609019 $\quad \Delta 2S^2$

P $\quad +49.082578 \quad 49.082578 = \frac{c^4}{G} \quad$ — $\quad 49.082577$

79.838018 = $\Delta = \alpha\mu S^2 \quad \Delta(\alpha\mu)^2$

D $\quad -30.755410 \quad 46.828432 \quad$ —

$\Delta = 69.838048 \quad \Delta(\alpha\mu)^2$

☆ $\quad -100.593458 \quad 44.574284 \quad$ —

$\Delta = 89.838018 \quad \Delta(\alpha\mu)^2$

U $\quad -190.431476 \quad 42.320136 \quad$ —

B $\quad \frac{V_1}{V_0} = 37.101323$

P $\quad \frac{V_1}{V_0} = 1$

D $\quad \frac{V_1}{V_0} \quad S^{-2}(\alpha\mu) = -77.583842$

☆ $\quad \frac{V_1}{V_0} \quad -145.167706$

U $\quad \frac{V_1}{V_0} \quad -232.751612$

37
77 40
10
67
20
87

M, L

(*) $\frac{5}{2}, \frac{5}{2} \quad \frac{\hbar^4}{GM^4L^4}$

$G = 0$

$n = 3M - L$ $\rightarrow \frac{\hbar c}{L^2}$

$F(M, L)$

$-1, 0$	$\frac{M^3 L c^4}{\hbar^2} \left(\frac{MLc}{\hbar}\right)^{-3}$ ✓		
$-\frac{3}{2}, -\frac{1}{2}$	$\frac{M^4 L^2 c^5}{\hbar^3} \left(\frac{MLc}{\hbar}\right)^{-4}$ ✓		
$-2, -1$	$\frac{M^5 L^3 c^6}{\hbar^4} \left(\frac{MLc}{\hbar}\right)^{-5}$ ✓		
$+\frac{3}{2}, +\frac{5}{2}$	$\frac{\hbar^3}{c M^2 L^4} \left(\frac{MLc}{\hbar}\right)^{2}$ ✓		
$+1, +2$	$\frac{\hbar^2}{M L^3} \left(\frac{MLc}{\hbar}\right)^{1}$ ✓		
$+\frac{1}{2}, +\frac{3}{2}$	$\frac{\hbar c}{L^2} \left(\frac{MLc}{\hbar}\right)^{0}$ ✓		
$0, 1$	$\frac{M}{L} c^2 \left(\frac{MLc}{\hbar}\right)^{-1}$ ✓		
$-\frac{1}{2}, +\frac{1}{2}$	$\frac{M^2 c^3}{\hbar} \left(\frac{MLc}{\hbar}\right)^{-2}$ ✓		

$\left(\frac{MLc}{\hbar}\right)$ [0] $3M - L$

or $\left(\frac{\hbar}{MLc}\right)$ [0] $L - 3M$

?

$\rightarrow \frac{c^4}{G}$ $p = M + L$

$\frac{M^3 L c^4}{\hbar^2} \left(\frac{c \hbar}{G M^2}\right) \left(\frac{MLc}{\hbar}\right)^{-1}$

$\frac{M^4 L^2 c^5}{\hbar^3} \left(\frac{c \hbar}{G M^2}\right) \left(\frac{MLc}{\hbar}\right)^{-2}$

$\frac{M^5 L^3 c^6}{\hbar^4} \left(\frac{c \hbar}{G M^2}\right) \left(\frac{MLc}{\hbar}\right)^{-3}$

$\frac{\hbar^3}{c M^2 L^4} \left(\frac{c \hbar}{G M^2}\right) \left(\frac{MLc}{\hbar}\right)^{+4}$

$\frac{\hbar}{M L^3} \left(\frac{c \hbar}{G M^2}\right) \left(\frac{MLc}{\hbar}\right)^{3}$

$\frac{\hbar c}{L^2} \left(\frac{c \hbar}{G M^2}\right) \left(\frac{MLc}{\hbar}\right)^{2}$

$\frac{M}{L} c^2 \left(\frac{c \hbar}{G M^2}\right) \left(\frac{MLc}{\hbar}\right)^{1}$

$\frac{M^2 c^3}{\hbar} \left(\frac{c \hbar}{G M^2}\right) \left(\frac{MLc}{\hbar}\right)^{0}$

Two dimensional identities

$\left(\frac{c \hbar}{G M^2}\right)$ [0], $\left(\frac{MLc}{\hbar}\right)^p$ [0]

$= \frac{m_0}{M^2}$

always first power

$p = M + L$

HEINZ PAGELS

THE COSMIC CODE
Heinz Pagels
1982
V-D-1

PERFECT SYMMETRY
Heinz Pagels
1985
V-C-1

THE DREAMS OF REASON
HEINZ PAGELS
1988
I-B-5

MAKE 2 COLOR FULL CHART

6-1-10

Col / row

h^2/G = -46.778552241

-83.879874

OTHER GAPS

	$m_p^3 r_e$ -83.879874	$m_o^3 l_o$ -46.778552	$M_D^3 r_e$ 30.805320	$M_*^3 L_*$ 108.389190	$M_U^3 L_U$ 185.973060
$m_p^3 r_e$	1	-37.101322 $(\alpha M)^2/S$	-114.685194 $(\alpha M)^3/S^3$	-192.269064 $(\alpha M)^4/S^5$	-269.852934 $(\alpha M)^5/S^7$
$m_o^3 l_o$		1	-77.583872 $\alpha M/S^2$	-155.167742 $(\alpha M)^2/S^4$	-232.751612 $(\alpha M)^3/S^6$
$M_D^3 r_e$			1	-77.583870 $\alpha M/S^2$	-155.167740 $(\alpha M)^2/S^4$
$M_*^3 L_*$				1	-77.583870 $\alpha M/S^2$

$\frac{(\alpha\mu)^2}{S^{5/2}}$ $\frac{\alpha\mu^3}{S^{9/2}}$ $\frac{\alpha\mu^4}{S^{13/2}}$

$\frac{(\alpha\mu)^{3/2}}{S^3}$ $\frac{\alpha\mu^{5/2}}{S^5}$

$\frac{\alpha\mu^{3/2}}{S^3}$

$\frac{\alpha\mu^3}{S^4}$

U 185.973060 $> \frac{S^3}{\alpha\mu}$

$*$ 108.389190 $> \frac{S^3}{\alpha\mu}$

D 30.805320 $> \frac{S^2}{\alpha\mu}$

P -46.778552 $> \frac{S}{(\alpha\mu)^2}$

B -83.879874

Galaxies in gaps?

e.g. $\frac{(\alpha\mu)^{7/2}}{S^4}$ $\frac{(\alpha\mu)^{9/2}}{S^6}$

$\frac{(\alpha\mu)^{5/2}}{S^2}$

$\left(\frac{S}{\alpha\mu}\right)^{5/2} = 45.570$

cluster → 185.973060 U

G → 147.181119

Dwarf Galaxy

$M = \left(\frac{S}{\alpha\mu}\right)^{5/4} m_o$ $\quad L = (\alpha\mu S)^{5/4} l_o$ $M^3 L$ =

$= 47.785496$

$\times m_o$

= 43.123092

33.3

9 8 ☉ star cluster?

10^{10} ☉

108.389190 $*$

$\frac{(\alpha\mu)^5}{S^7}$ -269.852934 $> \frac{S}{\sqrt{\alpha\mu}}$

$\frac{(\alpha\mu)^{9/2}}{S^6}$ -231.060993 $> \frac{S}{\sqrt{\alpha\mu}}$

$*$ $\frac{(\alpha\mu)^4}{S^5}$ -192.269064 $> \frac{S}{\sqrt{\alpha\mu}}$

$\frac{(\alpha\mu)^{7/2}}{S^4}$ -153.477125 $> \frac{S}{\sqrt{\alpha\mu}}$

D $\frac{(\alpha\mu)^3}{S^3}$ -114.685194 $> \frac{S}{\sqrt{\alpha\mu}}$

$\frac{(\alpha\mu)^{5/2}}{S^2}$ -75.893257 $> \frac{S}{\sqrt{\alpha\mu}}$

P $\frac{(\alpha\mu)^2}{S}$ -37.101322

19.114

use Δ = 9.552

33.565
9.552
43.117 to 43.123

50 **FIFTY MATHEMATICAL IDEAS YOU REALLY NEED TO KNOW**
TONY CRILLY
2007
V-F-2

$-2.331\ 201\ 902$

m_0 $-4.662\ 403\ 804$

m_p $-23.776\ 602\ 304$

$-11.888\ 301\ 152$

α

μ

S

l_0 $-32.791\ 340\ 829$ $-16.395\ 670\ 415$

r_e $-12.550\ 068\ 214$ $-6.275\ 034\ 107$

$\alpha^{-23}\mu^{-3} = S$

r_e^5 $-62\ 750\ 341\ 070$

l_0^2 $-65.582\ 681\ 658$

$3.832\ 340\ 588$

$2.026\ 523$

$1.805\ 817$

r_e^8 $-100.400\ 545\ 712$

l_0^3 $-98.374\ 022\ 487$

~~973 476 775~~

$-2.026\ 523\ 325$

Geome "Languages"

Mass

$$m_0\left(\frac{S}{\alpha\mu}\right)^{1/2};\ (\alpha^{-12}\mu^{-2})\,m_0;\ +14.463\ldots$$

cgs

Length For

$\frac{m_p'}{m_p}$ $\left(\frac{\alpha\mu}{S}\right)^{1/2}$ $\alpha^{12}\mu^{2}$ -19.774

-23

$\frac{m_0'}{m_p}$

$\frac{m_0}{m_p}$ $+14.451$

A B

EXPANSION
and
EXTENSION
when?

9
18
27
36
(10) 45
54
63
72
81
90

108
117
126
135
(9) 144
153
162
171
180

207
216
225
(8) 234
243
252
261
270

306
315
324
(7) 333
342
351
360

405
414
(6) 423
432
441
450

504
513
(5) 522
531
540

603
(4) 612
621
630

702
(3) 711
720

(2) 801
810

(1) 900

2 55

8
17
26
35
(9) 44
53
62
71
80

107
116
125
(8) 134
143
152
161
170

206
215
(7) 224
233
242
251
260

305
(6) 314
323
332
341
350

602
3 611
620
2 701
710
1 800

5
(6) 14
23
32
41
50

Number of numbers whose digits add to 1, 2, --- n

$\boxed{\text{Cf } \frac{\alpha}{M} = .2.700371}$

$$2N_n - N_{n-1} + 1 = N_{n+1}$$

$$2(n)+1 = (n+1)+(n-1)$$

add to	# <1000
13	105
12	~~91~~
11	78
10	66
9	55
8	45
7	36
6	28
5	21
4	15
3	10
2	6
1	3

27

55, ~~[illegible]~~

45

3 6 10 15 21 28 36 45 55
1 2 3 4 5 6 7 8 9

16

10
19
28
11 37
46
55
64
66 73
82
91

Fibonacci $N_3 = N_1 + N_2$ or $N_2 = N_3 - N_1$

Other $N_2 = \frac{N_1 + N_3}{2}$

$2N_2 + 1 = N_1 + N_3$

25

27	999	1
26	989	3
25		6
24		

988
979 6

$\left(\frac{\alpha}{\mu}\right)^{1/2}$ ~ 2,700

$\left(\frac{\alpha}{\mu}\right)$ ~ 5,400

$3/2$ ~ 8,100

$\left(\frac{\alpha}{\mu}\right)^2$ 10,801

3 dig

S	#		
27	1	1	3 ✓
26	3	2	6 ✓
25	6	3	10 ✓
24	10	4	15
23	15	5	21
22	21	6	28
21	28	7	36
20	36	8	45
19	45	9	55
18	55		
17	66	10	66
16	78	11	78
15	91	12	91
14	105	13	105

$\boxed{\left(\frac{\alpha}{\mu}\right)^{16} = 108.014}$

$\left(\frac{\alpha}{\mu}\right)^{18} = 54.007$

11	63
12	72
13	81
14	90
15	99
16	108

3
12
21
30
120
102
210
201
300

111

CELLULAR

AUTOMATA

6

WOLFRAM'S 4 CLASSES [$2^8 = 256$

[linear cellular automata]

Rule 250 • UNIFORM — STATIC

Rule 90 • FRACTAL — HIERARCHICAL

Rule 30 • RANDOM — ~~HIERARCHICAL~~

Rule 110 • EMBEDDEDS; COMPLEX, NON-REPETITIVES

CHOICE ZONE

SELF-ORGANIZING?

~ LIFE-SYSTEMS

BOOK 4

~~SHAPE INDICES~~
CURVES OF GROWTH
SOLIDS
~~CELLULAR AUTOMATA~~
MISC
~~ZIPF's Law~~

VENNS
Venns and orders of intersects
~ PASCAL TRIANGLE

SETS
In how many ways can we generalize?
Generalization ~~w~~ Abstraction
Correlations, parameterization

GEOMETRY
SHAPE INDICES
RELATED SOLIDS [intersecting cylinders etc.]
PYRAMIDS

FUNCTIONS
Curves of Growth

CELLULAR AUTOMATA
CONRADS LIFE
WOLFRAM

MISC
ZIPF's LAW

05-01-26

A wee bit o' math

$x + y = K$

For what values of x and y will $x \cdot y$ be maximum?

$y = K - x$

$f(x) = x(K-x) = Kx - x^2$

$f'(x) = K - 2x = 0$

$\therefore\ x = \frac{K}{2},\ y = \frac{K}{2}$

$x \cdot y = K$

For what values of x and y will $x + y$ be maximum?

$y = \frac{K}{x}$

$f(x) = x + \frac{K}{x}$

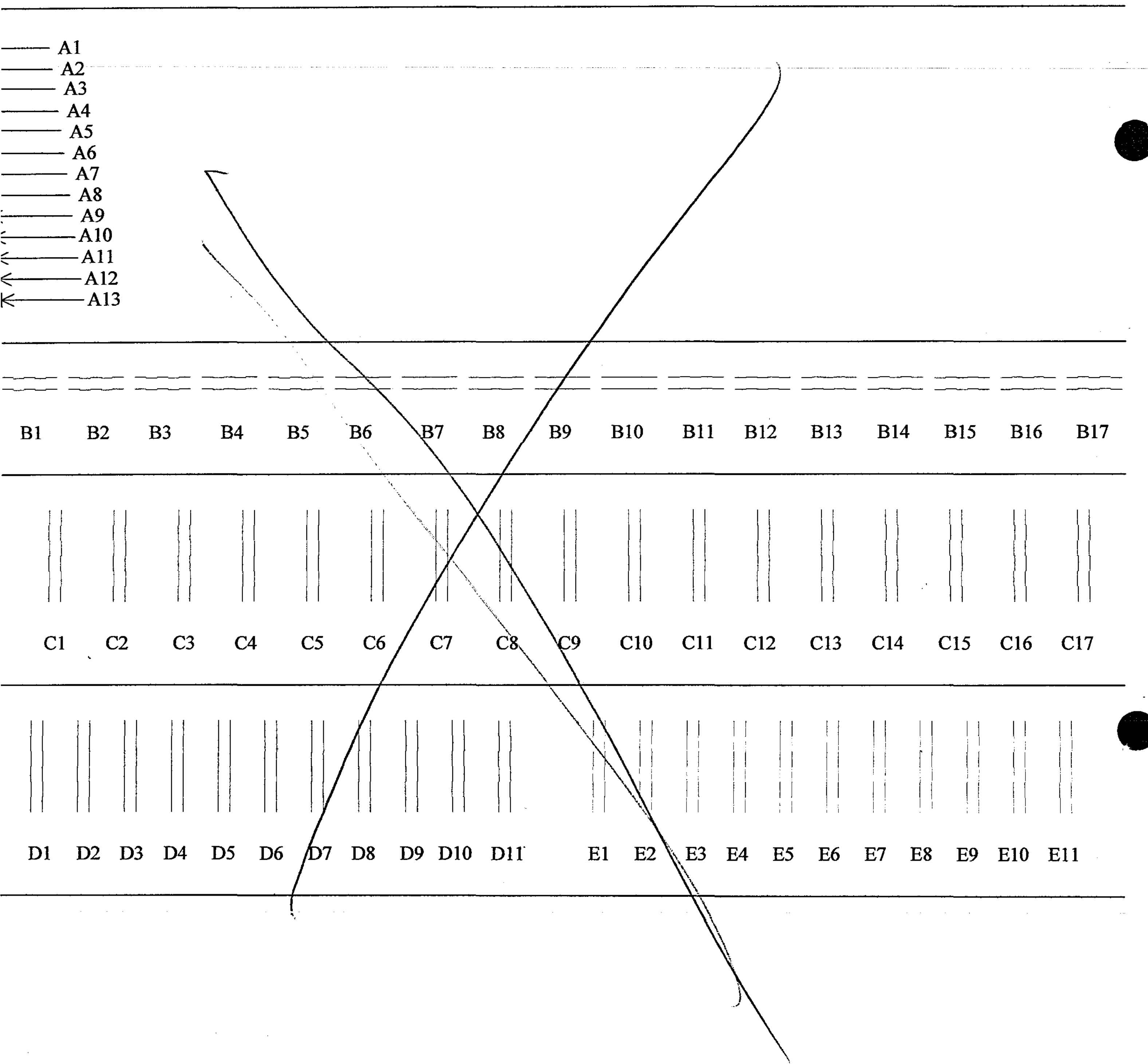
$f'(x) = 1 - Kx^{2} = 0$

$x = \sqrt{K},\ y = \sqrt{K}$

$xy = 4$	Example: $K = 4$	$x = 2,\ y = 2$	$K = 4$	$x = 2$	$y = 2$	$x+y = 4$
$xy = 20.25$	$K = 9$	$x = 4.5,\ y = 4.5$	$K = 9$,	$x = 3$,	$y = 3$	$x+y = 6$
$xy = 64$	$K = 16$	$x = 8,\ y = 8$	$K = 16$	$x = 4$,	$y = 4$	$x+y = 8$
$xy = 156.25$	$K = 25$	$x = 12.5,\ y = 12.5$	$K = 25$	$x = 5$,	$y = 5$	$x+y = 10$
324	$K = 36$	$x = 18,\ y = 18$	$K = 36$	$x = 6$,	$y = 6$	$x+y = 12$
$xy = 600.25$	$K = 49$	$x = 24.5,\ y = 24.5$	$K = 49$	$x = 7$,	$y = 7$	$x+y = 14$
$xy = 1024$	$K = 64$	$x = 32,\ y = 32$	$K = 64$	$x = 8$,	$y = 8$	$x+y = 16$
$xy = 1640.25$	$K = 81$	$x = 40.5,\ y = 40.5$	$K = 8.1$	$x = 9$,	$y = 9$	$x+y = 18$
$xy = 2500$	$K = 100$	$x = 50,\ y = 50$	$K = 100$	$x = 10$,	$y = 10$	$x+y = 20$

$x+y$	$(x+y)^2$	K	$\frac{xy}{x+y}$	$(xy)(x+y)$
4	$2^4 \cdot 1^2$	4	1	$16 = 4^2 = 2^4 \cdot 1^5$
6	$2^4 \cdot (1.5)^2$	9	2.53125	$121.5 = 11.0227^2 = 2^4 \cdot (1.5)^5$
8	$2^4 \cdot 2^2$	16	$8 = 2^3$	$512 = 22.627^2 = 8^3 = 2^9 = 2^4 \cdot 2^5$
10	$2^4 \cdot (2.5)^2$	25	15.625	$1562.5 = 39.528^2 = 2^4 \cdot (2.5)^5$
12	$2^4 \cdot 3^2$	36	$27 = 3^3$	$3888 = 62.354^2 = 2^4 \cdot 3^5$
14	$2^4 \cdot (3.5)^2$	49	42.875	$8403.5 = 91.671^2 = 2^4 \cdot (3.5)^5$
16	$2^8 = 2^4 \cdot 2^4 = 2^4 \cdot 4^2$	64	$64 = 2^6$	$16384 = 128^2 = 2^{14} = 2^4 \cdot 4^5$
18	$2^4 \cdot (4.5)^2$	81	91.125	$\cancel{30064.5}\ 29524.5 = 171.827^2 = 2^4 \cdot (4.5)^5$
20	$2^4 \cdot 5^2$	100	$125 = 5^3$	$50{,}000 = 223.607^2 = 2^4 \cdot 5^5$

Something happens whenever $A_{n+1} = A_n + A_{n-2}$


A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11
A12
A13
B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12 B13 B14 B15 B16 B17
C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16 C17
D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11
E1 E2 E3 E4 E5 E6 E7 E8 E9 E10 E11