

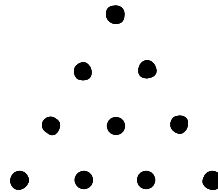
Guide to Lecture 16: Pythagorean Number Part 1

A) Introduction

a) Pythagorean Principles and Number

- i) Number is not just a quantitative tool, but is qualitative and experiential. It has applications to ethics and healing.
- ii) Basic concept of Number based on units and counting, but not restricted to that.

- b) **Tetraktys.** All-important diagram for the Pythagoreans; they used to swear oaths to Pythagoras (its alleged discoverer). It is a “figured” number, and shows important harmonic and geometrical relationships (to be discussed later).



B) Principles: the Limit and Unlimited

- a) Refer to lecture on Anaximander (Lecture 9, “The Milesians”). The Pythagoreans applied these principles thematically to many areas. Number itself, and things themselves, are combinations of limit or structure, and something indeterminate receiving structure. Example: the monochord. The string is the principle of the Unlimited, but when touched on a fret and touched, the harmony is a function of Limit imposed on the Unlimited.
- b) Table of opposites derived from the Limit and Unlimited:

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Limit	Unlimited
Odd	Even
One	Plurality
Right	Left
At rest	Moving
Straight	Crooked
Light	Darkness
Good	Bad
Square	Oblong
Male	Female

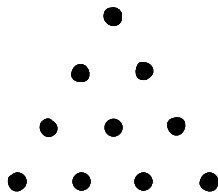
- c) Limit side has to do with sameness, identity, stability; Unlimited side with change, motion, swerving or crossing (or lacking) limits. In English we still speak of good people as being “straight” or on the “straight path,” and immoral people as “crooked.”
- d) A caution about the ambiguity of the Limit and Unlimited: are they the same as the Monad (One) and the Dyad (Two), or prior to them?

C) Kinds of Number

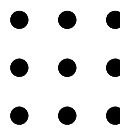
- a) **Figured numbers.** These are numbers which can be put into shapes.
- i) Triangular numbers: 3, 6, 10, 15, 21, 28, etc.
 - ii) Square numbers: 4, 9, 16, 25, 36, 49, etc.
 - iii) Oblong numbers: 6, 12, 20, 30, 42, 56, etc.
 - iv) Pentagonal numbers: 5, 12, 22, 35, 51, 70, etc.
 - v) Hexagonal numbers: 6, 15, 28, 45, 66, 91, etc.
 - vi) Heptagonal numbers: 7, 18, 34, 55, etc.

Examples of figured numbers:

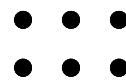
Triangular Number 10



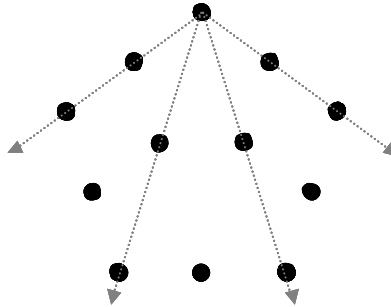
Square Number 9



Oblong Number 6



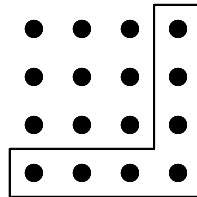
Pentagonal Number 12



1			11	
2			12	Oblong, Pentagonal
3	Triangular		13	Octagonal
4	Square		14	
5	Pentagonal		15	Triangular, Hexagonal
6	Triangular, oblong, Hexagonal		16	Square
7	Heptagonal		17	
8	Octagonal		18	Heptagonal
9	Square, Nonagonal		19	
10	Triangular		20	Oblong

- b) **Gnomonic numbers.** Numbers used as molds or patterns to generate larger figured numbers. Example:

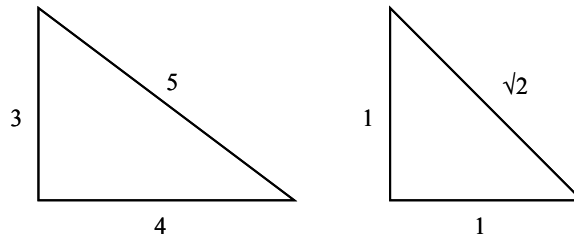
Gnomonic Number 7



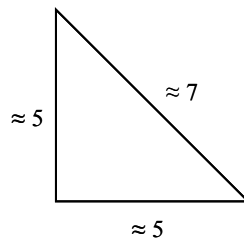
- c) **Perfect numbers.** Numbers whose value is equal to the sum of their factors (excluding themselves): 6, 28, 496, 8128, etc. Example: $6 = 1+2+3$.
- d) **Friendly (or “amicable”) numbers.** A pair of numbers (such as 220 and 284) whereby the sum of the factors of each (excluding itself) equals the value of its friend. The factors of 220, excluding itself ($1 + 2 + 4 + 5 + 10 + 11 + 20 + 22 + 44 + 55 + 110$), equal 284; those of 284, excluding itself, ($1 + 2 + 4 + 71 + 142$), equal 220.
- e) **Side and Diagonal numbers.** Pairs of numbers in which one represents the length of the side of a square, the other its (ideal) diagonal, so that pairs of larger and larger numbers approach a square with 90° angles, and their ratios approach $\sqrt{2}$ (1.414213). No pair of natural numbers or set of whole units as side/diagonal numbers will make a perfect square. Side and diagonal numbers fulfil the following equation: $2x^2 - y^2 = \pm 1$.

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Pythagorean Theorem: $a^2 + b^2 = c^2$



Side	Diameter	Ratio
1	1	1
2	3	1.5
5	7	1.4
12	17	1.41666
29	41	1.41379
70	99	1.41428



- f) **Irrational numbers.** Numbers that cannot be expressed as a ratio of natural numbers (whether being reduced like $7/1$ to 7 , or other irreducible fractions like $7/3$, etc.). These include $\sqrt{2}$, π , and others. Their essential relation to geometry and in structuring features of the world means there is a deep “irrationality” at the heart of the universe (at least, if you think that something

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like countable units are essential for rationality). A possible Egyptian source for irrational numbers?

D) Particular numbers (primarily only epithets listed in guide).

- i) Monad (One). Non-spatial source of number; potentiality; creative principle; mother and father; androgynous and hermaphroditic; sameness, equality, stability, identity; linguistically, the singular form and “this”; shares itself with everything; form; preserves and maintains; makes things cohere and combine; source and resolution of contrariety and contradiction; light; everlastingness and permanence; (connection to the Qabalistic Shekinah).
(1) Divine titles: God, Providence, Prometheus, Atropos, Proteus, Zeus.
- ii) Dyad (Two). Change, length, movement, flowing/flux, generation; courage, daring, impulse; anguish, endurance, hardship; without form or shape; opposition and contrariety; source of multiplicity in number; divisible; linguistically, the dual form and “either”; separation, matter, substrate; opinion, relativity; vices; unequal, excess, deficiency; infinite.
(1) Divine titles: Erato, Justice, Isis, Nature, Rhea.