

STUDY QUESTIONS ON ‘THE GREEK CONCEPTION OF NUMBER’

1] Consider the following definitions of number/*arithmos* and answer these questions:

a] Which best defines a number? Defend your answer (you do not have to confine yourself to

definitions where that term, rather than *arithmos*, is used)

b] Which best defines *arithmos*? Defend your answer. (you do not have to confine yourself to

definitions where that term, rather than ‘number’, is used)

c] Based on your answer to [a] and [b], what is the *essential* difference between ‘number’ and

‘arithmos’?

1] Thales: *arithmos* is a collection of units [Iamblichus *Introductio Arithmetica* p. 10]

2] Pythagoreans - Amade number out of one@ 985a20.

3] Chryssipus Amultitude one=

4] Moderatus [neo-Pythagorean, 60 a.d.] *arithmos* Aa progression of multitude beginning from a unit and a regression ending in it.@ Stobaeus; Eclogae i. Proem. 8

5] Nicomachus Aa flow of quantity made up of units@

6]: ANumber is that by which the quantity of each thing is revealed.@ Simon Stevin

7] An *arithmos* is a finite multitude... Eudoxus

8] >limited multitude=. Aristotle, *Metaphysics* 1020a30

9] A a set/system of units μοναδων συστημα Dominus 413

10] “*arithmos* is always a multitude of indivisibles πληθος αδιαιρετων. Aristotle; *Metaphysics* 1085b22

11] an aggregate in the realm of quantity composed of monads, Nicomachus. 13, 8

12] Aristotle “an *arithmos* signifies a measured plurality or a plurality of measures” [*Metaphysics* 1088a6]

13] Aristotle gives a few implied definitions of *arithmos*, but here are some passages from his writings that employ *arithmos* in a way that gives a deeper sense of what he means by the term:

Metaphysics Delta 13, 1020a8-14:

Quantity [*poson*, literally "how much" or "how many"] is said to be that which is divisible into constituents, each of which is by nature one [or "a one"] and a "this" [*tode ti*, a specific indicable thing]. A plurality [*plethos*] is a kind of quantity if it [the quantity] is numerable [countable; *arithmeton*]; a magnitude is a kind of quantity if it [the quantity] is measurable. A plurality is said to be that which is divisible potentially into parts which are not continuous; a magnitude, on the other hand, is that which is potentially divisible into parts which are continuous....Of these, a limited [*peperasmemon*] plurality is said to be a *arithmos*, a limited length a line, a limited width a surface, and a limited depth, a body.

Metaphysics Iota (I)6, 1057a2-6:

Plurality is as if it were [or "such as"; *hoion*] a genus of *arithmos*; for *arithmos* is a plurality measurable by the one. And in some sense [or "in a way"] the one and *arithmos* [or "a *arithmos*"] are opposed, not as contraries, but...as some relative things are; for the one in so far as it is a measure is opposed to *arithmos* in so far as *arithmos* is measurable.

Metaphysics Nu (N)1, 1087b33-1088a15:

The one signifies a measure, evidently. And in each case there is some different underlying subject [*hupokeimenon*, thing laid down], such as in the musical scale a quarter-tone; in magnitude a finger or a foot or some other such thing; and in rhythm a beat or a syllable....And this is also according to formula [or "definition" or "account": *logos*]; for the one signifies a measure of some plurality and the *arithmos* signifies a measured plurality [a plurality that has been measured] and a plurality of measures. Therefore it is also with good reason that the one is not a *arithmos*; for neither is a measure measures, but a measure is a principle [or "source", *arche*], and so is the one.

2] Based on Nicomachus' treatment of *arithmetike*, speculate on why the Greeks did not consider [a] fractions, [b] negative numbers, or [c] irrational numbers to be *arithmoi*, or group all these with *arithmoi* under as one category, similar to our concept of 'number'.

3] Do the terms 'arithmos' and 'number' connote the same 'category of understanding', and is the argument between ancients and moderns then an argument over the proper definition and extent of that category?

4] Consider the following definitions of numerical unit. Why do you think that, from the Greeks through at least the middle ages, 'one' was held to not be a number?

- 1] Pythagoreans: one is not a number since a measure is not the thing measured 1088a7
- 2] Thymarides: [Pythagorean 4th b.c.e.] unit as a >limiting quantity= Iamblichus 11-12
- 3] . “an unities is no number but the beginning and original of number.” Baker 1568
- 4] A..Ramus, and such that have written since his time, affirme not only that an unities or one, is a number, but also that every fraction or parte of an unities, is a number...@ Hylles 1592
- 5] “...unities alone out of all number, when it multiplies itself, produces nothing greater than itself...Unity, therefore, is non-dimensional and elementary.” Nicomachus 238
- 6] [a] if from a number there is subtracted no number, the given number remains [b] if from 3 we take 1, 3 does not remain [c] therefore one is not >no number.= Simon Stevin
- 7] Rabbi Ben Ezra *Sefer ha-Echad* (Book on Unity) (1140) first to entertain idea that one is a number
- 8] “Multiplicity is the genus of *arithmos*. Because of this *arithmos* and one are opposites.” Iamblichus [see also Aristotle *Metaphysics* 1056b 19ff]
- 9] “The one is the source of number” *Metaphysics* 1052b22ff.
- 10] “...unities is not an *arithmos* for neither is a measure measures, but a measure is a principle, and so is unities.” Aristotle, *Metaphysics* 1088a7

5] Is there any notable disagreement among the above definitions of unity?

6] Think back to Aristotle’s claim that a definition should aim at the ‘*ti esti*’ of something – the essence, or literally, the ‘what is it’. What would you, or any modern, say the ‘*ti esti*’ is of 3125? What would Nicomachus say?

7] For Nicomachus what does it mean to ‘know’ a number?

8] One reason why 1 and 2 are not considered numbers by the Pythagoreans derives from their conception of a number as the sum of other numbers. In this conception, 1 and 2 can only be generators of number, not numbers themselves. The Pythagorean shape numbers in Nicomachus are a particular version of this conception of numbers as sums – in this case a number is a summation series. Why do you think the Pythagoreans might have thought that this quality of being a sum was definitive to the concept ‘number’?