COMPOUND NUMBERS & NUMERALS IN GREEK

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Abstract: An examination of the word order in which Greek literary texts, up to circa 325 BCE, record compound numbers (e.g., “twenty-four”) illuminates two problems: the transmission of numbers in those texts, and the expansion of “commercial” numeracy in Greek society. Compound numbers occur both in descending (“twenty-four”) and ascending (“four and twenty”) order. The prevalence of ascending-ordered numbers in these literary texts argues for their having been transmitted as words, not numerals. The proportion of numbers written in descending order differs among authors, and is correlated with a stronger presence of “commercial” numeracy. The evidence of inscriptions and papyri concurs.

The Egyptian and Mesopotamian cultures (among many others) each deployed its own numeral system to record and manipulate numbers. Unlike Greek (and Latin), neither Egyptian nor Mesopotamian languages deployed a separate system for writing number-words: their number-symbols were their way to spell their number-words. Moreover, their numeral systems always recorded numbers in descending order. Greek and Latin therefore present two anomalies: (1) each has both a “verbal” and a “symbolic” (i.e., numeral) system for recording numbers; and (2) their literary texts, especially the earlier ones and those in verse, record most numbers in words, and in ascending order. We tend to overlook the first anomaly, precisely because it also exists in many modern (and all European) languages, where both words (e.g., “twenty-four”) and numerals (e.g., “24”) are deployed.

Greek poets are presumed to have used words to express numbers, but it appears to be an open question whether and when writers of

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1 Chrisomalis, especially for the Egyptian system, 34–67, the Mesopotamian systems, 228–258, and the two Greek systems: 98–105 (the set of “acrophonic” systems), and 134–147 (the alphabetic system). For a thorough survey of the complexity of the Mesopotamian systems, see Nissen, Damerow, and Englund.
Greek prose used numerals. The numerals in question might have been either (1) the “acrophonic” numeral system, or else (2) the “alphabetic” numeral system. In the “acrophonic” system, a stroke (tally-mark) represented one, the letters ΔΗΧΜ represented respectively the decades 10, 100, 1000, 10000, and Π represented 5—but the half-decades 50, 500, 5000, 50000 were represented by Π written around, i.e., enclosing, the letters ΔΗΧΜ, respectively. Thus “twenty-four” would have been written ΔΔΙΙΙΙ in this system. In the “alphabetic” numeral system, a Greek alphabet of 27 letters including digamma, qoppa, and “san-pi” represented 1…9, 10…90, and 100…900, with decimal multiples of those being indicated by various diacritics. Thus “twenty-four” would have been written ΚΔ in this system. In each system, the number was written in descending order (either ΔΔΙΙΙΙ or else ΚΔ), as inscriptions attest. The spatial and temporal range within which each system was used, as attested by inscriptions, indicates that most of the prose authors studied here (historians, orators, and philosophers) could have used the “acrophonic” system, but none of the authors studied here, poetic or prosaic, would have been likely to have been familiar with the alphabetic system.

There is thus an a priori case that a number in some literary text that is written in ascending order, like “four and twenty,” did not pass through a stage of transmission (on papyrus or vellum) when it was written in numerals. Numbers when written out in words were nearly always

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2 Rubincam n. 12 (pp. 360–361); Keyser (1986): 230–231; Lapini 39.

3 Tod (1911/12) for the acrophonic system, and (1950) for the alphabetic; both reprinted in his (1979), and the two systems compactly explained in Threatte 110–119. On the name of the symbol for “900,” see Jeffery 38–39 and Allen 60–61: from (Byzantine) Greek ὡς ἂν πὶ, “like a pi.”

4 Besides the extensive evidence provided by Tod (1979), see also Meritt, Wade-Gery, and McGregor. Tod (1950): 129, and Threatte 113–117, note only a handful of exceptions, all for alphabetic-numeral ordinals in the teens specifying calendar dates within the month, and all from the Hellenistic period. In Attica, the only examples of ascending-ordered alphabetic numerals are for teens, from the Roman period (Threatte 114).

5 The alphabetic system, although invented by the 6th century BCE, appears to have been unused during ca. 475 – ca. 325 BCE. See Menninger 268–274; Threatte 113–117; Ifrah 225–230, 260–274; and Chrisomalis 98–105, 134–147.
written in ascending order in the archaic period, with a few being written in descending order in the early and middle fourth century, and many in descending order after ca. 325 BCE. The evidence of inscriptions, from across Greece (all early instances of descending-ordered number-words are from inventories), 6 and from Attica, 7 confirms this. Papyri will be cited if available, and in all but one or two cases they show that the numbers were written out in words, and that scribes did not change their order. That calls into question the scholarly wisdom that numbers in Greek texts were written in numerals, which were transmitted unreliably—but that piece of conventional wisdom appears to be based on one piece of Latin evidence and the practice of two Greco-Roman pharmacists. 8

I have consulted a few MSs that are available in digitized form, in order to check the work of editors in recording variants, especially for certain authors where such variants might affect the results. However, as will be seen, only for one somewhat isolated MS of Xenophon, and one family of Herodotos MSs, were any such variants found.

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6 Schwyzer (1923) cites only four inscriptions from before ca. 325 BCE with number-words written in descending order, all of them inventories: #320 (p. 161) = SGDI 2.1683, lines 8–9 (πεντέκοντα καὶ ἐξ, ca. 430 BCE (Schwyzer), or 5th c. BCE (SGDI)), Delphi: http://epigraphy.packhum.org/text/241189); #324 (p. 165) = FD 3.1, #294, lines 2–3 (τετρακάτια|ς πεντήκοντα τετόρε|σσι, ca. 380 BCE, Delphi: http://epigraphy.packhum.org/text/238931); #467 (p. 237) = IG 7.2418, line 10 (διάδεκα|ντα πέτταρας, ca. 350 BCE, Thebes: http://epigraphy.packhum.org/text/145909); and #688 (pp. 338–339) = Chios #76 (many numbers, 5th c. BCE, Khios: http://epigraphy.packhum.org/text/246461). Add to those: CID 2.34 = SIG #244 (many numbers, in an inventory, ca. 344 BCE, Delphi: http://epigraphy.packhum.org/text/238364), plus several others from Delphi in the following decade; and Erythrai #54 = SEG 37 (1987) #918 (many numbers, in an inventory, ca. 400 BCE, http://epigraphy.packhum.org/text/251611).


8 See Shipley for the Latin evidence, based on a filiated pair of Livy MSs; see Keyser (2008b) and Vogt for the Greco-Roman writers.
So this study of the patterns of usage of “compound” numbers will serve two purposes. In addition to exploring how numbers in Greek literary texts were initially recorded and later transmitted, this study also addresses numeracy. The focus of the study is on compound numbers—i.e., ones that were expressed in compound words, like “twenty-four” (in contrast to numbers expressed in single words, like “twenty”), and in particular, on the order of the parts: either in ascending order, like “four and twenty,” or else in descending order, like “twenty-four.”

To anticipate the results, descending-ordered numbers are rare in Greek texts from before ca. 325 BCE, and when found, they are mostly used in ways that suggest intent to convey either precision (often as the result of a calculation), or else the record of an accurate or even official value. That pattern of usage increases over time, consistent with a model of increasing numeracy. Hawke has presented a convincing model of the growth of Greek numeracy, based on extensive evidence, although his model covers only poetry up to ca. 550 BCE. The present study shows that, like many developmental processes, numeracy did not develop evenly, and even well after 550 BCE, there were significant variations in numeracy: it would actually be quite surprising if every Greek author of a given generation were equally numerate.

9 Some languages privilege one or the other order when expressing numbers in words, e.g., in German “vier und zwanzig” (ascending order) is correct, whereas in French “vingt quatre” (descending order) is correct (and in fact, “quatre-vingt” means a different number, namely “eighty”). An early study raised some of these issues without resolving any: Wackernagel, who confesses (44/247): “Statistisch genaue Sammlungen fehlen mir.”

10 Within, I use “precision” to refer to values specified to a fine degree (as “123” rather than “about 100”); and I use “accuracy” to refer to values that could be verified as correct or very close to correct. Note that an accurate value might nevertheless be imprecise, and that a precise value might be far from correct, and thus inaccurate. As will be seen, many of the authors studied valorize precision and accuracy. Plato, Philebos 59d, and Isokrates, #15, Antidosis §265, both assert that calculation and similar discourses ought to involve accuracy.

11 Hawke, see 7 for the focus.

12 That literacy varied within Greek culture (as it does within ours) is shown by various Greek texts, e.g., Aristophanes, Knights 188–193; and Plutarch, Aristeides 7.5–6. For a modern exploration of this, see Thomas. Numeracy would have followed the same pattern.
The core of this paper is a survey and analysis of the use of compound numbers, and the order in which they are written, ascending or descending, in Greek authors. The study focuses on (a) compound numbers, and (b) extant authors. Regarding (a) the focus on compound numbers, their importance in numeracy is that they track the deployment of what Hawke has labeled the fourth stage of developing numeracy, “complex numeracy.” With respect to (b) the focus on extant authors, let us note that excerptors of fragments may well have altered the way in which the numbers were written, so the survey is restricted to extant authors, plus fragmentary poets, where the meter should preserve the word order. In addition, the survey covers authors of ca. 325 BCE or earlier, since the patterns of usage of numbers in later texts will be quite different (as is suggested by the evidence of inscriptions, above). The results of the survey are then used to elucidate some observations about the use of numbers and numerals in a case-study on one Hellenistic writer who has not previously been brought into this debate, Kallixeinos of Rhodes, and who uses primarily descending-ordered compound numbers, and provides evidence that in his text they were written in (alphabetic) numerals.

Even within the somewhat restricted list of authors whose use of compound numbers is here surveyed, there are thousands of relevant passages, not all of which can be examined in detail. Moreover, because in these authors the ascending-ordered numbers are the normal case and very frequent, no complete list of such passages is provided here. It will prove more revealing to consider first compound numbers in the poets (§1); then the “subtractive” writing of numbers like twenty-eight (§2); and next how numbers in the teens are written (§3). After that, six corpora of the fifth to fourth centuries BCE are examined, which are distinguished primarily by genre. The first three of these are: the Hippocratic corpus (§4); the Attic orators (§5); and the classical philosophers (§6). The texts of Herodotos and Thucydides contain a large quantity of compound numbers, and each author’s practice seems complex. Therefore, we proceed in reverse chronological order, and consider next, Xenophon (§7), along with Aeneas Tacticus and the Hellenica Oxyrhynchia. Only then do we turn to Thucydides (§8) followed by Herodotos (§9). (Note that the Hippocratic corpus overlaps in time with the three historians and most of the orators, as well as Plato.) After the summary

13 Hawke 33–38, emphasizing that at this stage, different types of numerate culture might coexist within a given society in a given era.
of the survey, §10, the use of numbers and numerals by the Hellenistic historian Kallixeinos is briefly considered (§11).

1. COMPOUND NUMBERS IN GREEK POETRY.

Greek poets who wrote used words rather than numerals to express any numbers in their verse, and normally wrote the words of compound numbers in ascending order. Among Greek poets before ca. 325 BCE, there are few passages containing a compound number, and most of those are numbers in the teens, where the lexicon privileges ascending order (see §3). Including those teens, there are 101 ascending-ordered compound numbers in early poets (of which only seven are larger than twenty); see the *Iliad* 2.748 (δύω καὶ εἴκοσι, “two and twenty”) and 13.260 (ἐν καὶ εἴκοσι, “one and twenty”),¹⁴ the *Odyssey* (8.35, 8.48, and 16.247 all have δώ καὶ πεντήκοντα, “two and fifty”),¹⁵ Anakreon (fr. 16, πεντήκοντά τε κάκατόν, “fifty and a hundred”), Pindar *Nemean* 6.60 (πέμπτον ἐπὶ εἴκοσι, “twenty-fifth”),¹⁶ and Aristophanes.¹⁷

In contrast there are merely seven descending-ordered compound numbers in poets of the same era, namely: the *Iliad* 2.510 (ἐκατόν καὶ εἴκοσι, “one hundred and twenty”), 11.680 (ἐκατόν καὶ πεντήκοντα, “one hundred and fifty”), the *Odyssey* 14.20 (τριηκόσιοί τε καὶ ἑξήκοντα, “three hundred and sixty”), Pindar *Pythian* 9.113 (τεσσαράκοντα καὶ ὀκτὼ, “forty and eight”), Aeschylus *Persae* 342–343 (ἐκατόν δίς ἦσαν ἑπτά θ’, “twice a hundred they were, and seven”), and Aristophanes *Plutus* 1083 (μυρίων ἐτῶν γε καὶ τρισχιλίων, “in a myriad and three thousand years”) and *Wasps* 663 (ἐκατόν δήπου καὶ πεντήκοντα, “surely one hundred and

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¹⁴ Plus forty-two teens, for which see the lexica, and note the compound words at 15.678 (δυωκαιεικοσίπηχυ, “two-and-twenty-cubit”), 23.264 (δυωκαιεικοσίμετρον, “two-and-twenty-measure”).

¹⁵ Plus thirty-three teens, for which see the lexica. Note also 16.249, πίσυρες τε καὶ εἴκοσι φώτες, “four and twenty men.”

¹⁶ Plus *Olympian* 1.79 (τρεῖς τε καὶ δέκ’, “thirteen”), and *Pythian* 4.10 (ἐβδόμα καὶ σὸν δεκάτα, “seventeenth”): with thanks for all three to Joel B. Lidov.

¹⁷ Δώδεκα (“twelve”) is found ten times, for which see the lexica; in addition, see *Frogs* 49–50 (ἡ δώδεκ’ ἢ τρεῖς καὶ δέκα, “twelve or thirteen”), 551 (ἐκκαίδεκ’, “sixteen”), *Lysistrata* 282 (ἐπτακαίδεκ’, “seventeen”), *Peace* 990 (τρία καὶ δέκ’, “thirteen”), and *Plutus* 194–195 (τριακαίδεκα, / … ἐκκαίδεκα, “thirteen, / … sixteen”).
fifty”). Why did these poets write these numbers in the unusual descending order? In the epic texts and in Aristophanes, the smallest descending-ordered number is larger than any ascending-ordered number in the same text. We find as follows *Iliad*: “one hundred and twenty” versus “two and twenty;” *Odyssey*: “three hundred and sixty” versus “two and fifty;” Pindar: “forty and eight” versus “fifth-and-twentieth;” and Aristophanes: “hundred and fifty” versus “seventeen.” Notice, however, that the threshold for switching to descending-order would differ between authors: Pindar has “forty and eight,” but the *Odyssey* “two and fifty,” and Anakreon even “fifty and a hundred.” The Aeschylus passage is anomalous, in that the expression ἑκατὸν δὶς … ἐπτά θ’ is unparalleled. Perhaps the simplest explanation for Aeschylus’ expression is found a few lines prior, in lines 323 (πεντήκοντα πεντάκις, “five times fifty”) and 339 (ὁ πᾶς ἀριθμὸς ἐς τριακάδας δέκα, “the whole number was ten thirtiads”),\(^{18}\) of other detachments of ships. I suggest that Aeschylus sought unusual expressions for some number-values, probably the larger values.

In any event, it seems clear that it was the choice of these poets to express these compound numbers in descending-ordered words, and they were not likely constrained by meter.\(^{19}\) It seems possible that compound numbers were written with descending-ordered words when the number was “large enough,” but if so, that threshold varied from poet to poet.

2. SUBTRACTIONAL NUMBERS IN EARLY GREEK.

Extant Greek prose, before ca. 325 BCE,\(^{20}\) contains about three dozen compound numbers written subtractively, i.e., like “two short of twenty”

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\(^{19}\) Edwards 90, of one of the formulae (but surely applicable to all, and to numbers generally): “the number of ships varies, but can easily be adapted to fit at the end of the verse;” and Joel B. Lidov (*per litteras*, 2013 Jan 22), “the uniformly descending order is not metrically driven, and a decent poet could probably have found a way to state the numbers in ascending order.”

for “eighteen.” Such numbers belong primarily to the same conceptual space as numbers written in ascending order, and could not have been written subtractively in numerals, since neither the acrophonic nor alphabetic system had any such notation. This subtractive expression is found a few times each in the Hippocratic corpus, the orators Andocides (Mysteries §34: δυοῖν δέοντας εἴκοσιν, “two short of twenty”), Lysias (#32, Diogeiton §24 and §27: δυοῖν δεούσας πεντήκοντα, “two short of fifty”), and Demosthenes, as well as in Xenophon (Hellenica 1.1.6, δυοῖν δεούσας εἴκοσι, “two short of twenty”), Plato (Laws 5, 738a4–9, μιᾶς δεουσῶν ἑξήκοντα, “one short of sixty”), and Aristotle.

However, well over half the instances (21/37) are found in the two historians Herodotos and Thucydides. Nine of the ten instances in Herodotos follow the pattern seen in the other authors: the amount subtracted is one or two, and the number is otherwise simple. In one case, Herodotos writes an ascending-ordered compound number subtractively, but with the subtractive portion postponed (1.130.1): ἐτεα τριήκοντα καὶ ἑκατὸν δυῶν δέοντα, “thirty and one-hundred, lacking two.” It should also be noted that in 4.1.2–3, Herodotos first expresses “28” years as δυοῖν δέοντα τριήκοντα (“two short of thirty”), and in the next sentence expresses “28” years as ὀκτὼ καὶ εἴκοσι (“eight and...”)

21 In contrast to the Etrusco-Latin system, see Lejeune.

22 See: Places in Man §6 (Littré 6.286), δυοῖν δεόντοιν εἴκοσίν, “two short of twenty;” Regimen 3.68.14 (CMG 1.2.4, p. 88), δυοῖν δεούσαν πεντήκοντα, “two short of fifty;” and Diseases 2.44 (Littré 7.62), ἕνὸς δέοντας εἴκοσι, “one short of twenty;” 3.15.5 (Littré 7.138 = CMG 1.2.3, p. 84.14), εἴκοσι δυοῖν δεούσας, “twenty lacking two” (note the inverted order). A fifth passage is discussed below.

23 See: orations #27, Aphobos I.37 (δυοῖν δεούσας εἴκοσι), and #36, For Phormio §19 (δυοῖν δέοντ’ εἴκοσιν), both meaning “two short of twenty;” #9, Philippics III.23 (τρίακονθ’ ἕνὸς δέοντα, “thirty lacking one,” with inverted word order); and #20, Leptines §77 (πεντήκοντα μιᾶς δεούσας, “fifty lacking one,” with inverted word order).


25 Those nine are: 1.14.4, 1.16.1, 1.94.4, 1.214.3, 2.157, 4.1.2, 4.90.1, 5.52.2, and 6.57.5.
twenty”). This difference is hardly compatible with a hypothesis that these numbers were originally numerals; i.e., a hypothesis that at some stage in the creation and transmission of the text, it offered the numeral ΔΔΠΙΙΙ in both places, and that a later scribe transcribed one ΔΔΠΙΙΙ into ascending-ordered words, and a few lines later the scribe transcribed the other ΔΔΠΙΠΙ as subtractive words.

In Thucydides, eight of the eleven instances also follow the basic pattern of subtracting one or two from a simple number: Thucydides twice subtracts larger values, and once writes an ascending-ordered compound number subtractively. In 4.38.5, a passage where two other compound numbers appear, written in ascending order (εἴκοσι μὲν ὡπλῖται διέβη-σαν καὶ τετρακόσιοι, “twenty hoplites crossed over and four-hundred;” and εἴκοσι καὶ ἕκατόν, “twenty and one-hundred”), Thucydides writes ὀκτὼ ἀποδέοντες τριακόσιοι (“eight short of three-hundred”). In 2.13.3, the text reads τριακοσίων ἀποδέοντα μύρια (“three-hundred short of a myriad”) for the number of talents. Although a scholion to Aristophanes (Plutus 1193) gives a different text in which there is no subtraction, commentators on Thucydides have accepted the subtractive number here, and 4.38.5 provides a parallel in which a number larger than two is the subtractive portion. Finally, Thucydides, in what is agreed to be a (possibly erroneous) calculation, writes (5.68.3): τετρακόσιοι καὶ δυοῖν δέοντες πενήκοντα (“four-hundred, and two short of fifty”), i.e., a number not only in descending order, but also written subtractively.

The Hippocratic corpus, Eight-Month Child §1 (Littré 7.436 = CMG 1.2.1, p. 88), records what is evidently a calculation about the lengths in days of the seasons. The compound numbers found there are written in descending order (on which see below, §4), and there is also a number written subtractively, ἑξήκοντα μίῆς δεούσῃσιν (“sixty lacking one”). Since normally the smaller, subtracted, number precedes, this could be

26 An insight I owe to Catherine Rubincam, per litteras, 2014 March 31.

27 Those eight are: 2.2.1, 4.102.3, 5.16.3, 7.31.4, 7.53.3, 8.6.5, 8.7.1, and 8.25.1. The greater frequency of these in books 7 and 8 may be significant (see below §8).

28 POxy 1 (1898) #16, col. II, line 49, confirms the reading “twenty and one-hundred.”

29 See Gomme (1953), followed by Hornblower v. 1 253–254.

regarded (like Diseases 3.15.5, Littré 7.138 = CMG 1.2.3, p. 84.14, and Thucydides 5.68.3) as a descending-ordered subtractively written number. On the other hand, Herodotos 1.130.1 (above) presented “thirty and one-hundred, lacking two,” which itself might be intended as his calculation of the total length of reign of the Medes. Finally, the Hippocratic corpus, Fleshes §19 (Littré 8.612–614), presents a calculation, based on seven-day periods, of the number of days at which a *krisis* can occur, in which the most acute diseases have their *krisis* in the smallest number of such periods. Diseases are categorized by how acute they are, and:

\[\tau\rho\iota\tau\alpha\iota\iota\alpha\ \varepsilon\nu\nu\delta\varepsilon\kappa\alpha \iota \eta\mu\epsilon\rho\varepsilon\eta\varsigma, \varepsilon\nu \mu\iota\alpha \varepsilon\beta\delta\omicron\omicron\alpha\delta\iota \kai \iota \mu\iota\omicron\sigma \varepsilon\beta\delta\omicron\alpha\delta\omicron\delta\varsigma \ldots \kai \alpha\iota \pi\epsilon\mu\iota\tau\alpha\iota \iota \varepsilon\nu \delta\omicron\upsilon\sigma\varepsilon\iota\varsigma \varepsilon\iota\kappa\omicron\sigma\iota \eta\mu\epsilon\rho\varepsilon\eta\varsigma, \delta\nu\iota\omicron \varepsilon \varepsilon\beta\delta\omicron\alpha\delta\omicron\delta\iota \varepsilon\nu \iota \iota \varepsilon\beta\delta\omicron\alpha\delta\omicron\delta\iota \kai \iota \mu\iota\sigma\varepsilon\beta\delta\omicron\alpha\delta\omicron\delta\varsigma.\]

the third (most acute) in eleven days, i.e., in one hebdomad and half of one; … and the fifth (most acute) in two less than twenty days, i.e., two hebdomads and half a hebdomad.

Here, the result of a calculation is presented with a number written subtractively and in ascending (normal) order. Note also that the calculations involving halves are given approximately: 2 ½ times 7 would be 17 ½ exactly, not 18.

Subtractive numbers are a relatively rare, but normal, means of writing numbers in words (not numerals), usually involve a small subtraction (of one or two), and are implicitly numbers written in ascending order, with the subtracted quantity preceding. Two, or possibly three, cases of subtractive numbers written in descending order in Herodotos and Thucydides are associated with calculations. As we will see, that is to be expected.

### 3. COMPOUND NUMBERS IN THE TEENS.

Greek numbers in the teens (11 through 19) are nearly always written in ascending order (just as in English, “thirteen,” or in German,

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31 Although if so, there was some error, since the numbers given in 1.102–106 and 1.130 add up not to 128, but to 122: Deioces 53 + Phraortes 22 + Cyaxares 40 less 28 + Astyages 35. (Many hypotheses could explain this discrepancy, but none are very simple, or convincing.)

“dreizehn”). The poets studied in §1 (Homer, Anakreon, Pindar, Aeschylus, and Aristophanes), and the twenty prose authors studied in §2, were searched in the online TLG for the various forms of these numeral-words. Those counts are in row “A” of the table below. The second row, “B,” contains the counts for ordinals. The results of a search for the numeral-words written in tmesis are given in row “C,” followed by row “D,” ordinals in tmesis. Given the large quantity of these number-words, the precise counts do not matter greatly (nor can each passage be considered), but in order to demonstrate that focusing on the specified set of authors does not skew the results, some additional poets (Hesiod, Simonides, Sophocles, and Euripides) were also searched for these number-words, and those additional counts are in row “E” (including both cardinals and ordinals; no instances in tmesis were found in this set of authors).

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**Table 1: Ascending-Ordered Teens**  
A: Cardinals; B: Ordinals;  
C: Cardinals in Tmesis; D: Ordinals in Tmesis;  
E: Additional Poets

Of the 140 ordinals (row “B”) larger than “twelfth,” a total of 128 are found in the Hippocratic corpus, and even for “eleventh” the proportion

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33 Menninger 83–86; Berger 31–35; Schmitt; Threatte 419–422: in inscriptions, the descending order was normal in Hellenistic times, but before ca. 325 BCE, Threatte offers only one example each for “13” (δεκατρεῖς in *IG* 1.1 (1981) 476.274, inventory of 408/7 BCE, [http://epigraphy.packhum.org/text/490](http://epigraphy.packhum.org/text/490)), for “14” (δεκατέταρες in graffito, ca. 450–425 BCE), and for “18” (δεκαοκτώ in *IG* II.2–3 1668.47, inventory of 347/6 BCE, [http://epigraphy.packhum.org/text/3893](http://epigraphy.packhum.org/text/3893)); and Blažek 332. Add the inscription cited above, *SGDI* 2.1683 (ca. 430 BCE, Delphi: [http://epigraphy.packhum.org/text/241189](http://epigraphy.packhum.org/text/241189)), which has δεκατέτορες on line 6.

34 Variant forms were included: (a) δυώ- and δώδεκα; (b) τρισ-, τρεισ-, and τριακαίδεκα; (c) τεσσαρεσ-, τεσσαρασ-, τεσσαρα-, and τετταρεσκαίδεκα.
is 40/69 in the Hippocratic corpus: but for “twelfth” it is only 11/45 in the Hippocratic corpus. Most of the 56 instances in tmesis (row “C”) are no more than editorial decisions to print, e.g., τριακαίδεκα as τρία καὶ δέκα, although instances like τριά καὶ δέκα or τεσσάρων καὶ δέκα (of which there are thirteen) seem normally to be written in tmesis.\textsuperscript{35} There are three instances in the \textit{Odyssey} and four in prose that have an intervening particle,\textsuperscript{36} and such cases could only have been written out in words. Two instances in Xenophon seem to show that the numbers there were being conceived as written in words: \textit{Cyropedia} 1.4.16 (τὰ πέντε ἡ ἐκκαίδεκα ἐτη, “fifteen or sixteen years”) and \textit{Hellenica} 4.5.17 (ὡς ἕξ ἡ ἐπτά καὶ δέκα στάδια, “about sixteen or seventeen years”). Note how each approximate value is expressed as “five- or sixteen” or as “six- or seventeen,” which could be done if writing in words, but not if writing in numerals. No more could we say “6 or 17” to mean “16 or 17.” The ordinals written in tmesis, such as ἕκτην καὶ δεκάτην (“sixteenth”), appear mainly in the Hippocratic corpus (days of illness),\textsuperscript{37} Herodotos (Persian provinces),\textsuperscript{38} Thucydides (years of war or rule),\textsuperscript{39} Xenophon, \textit{Hellenica}\textsuperscript{35} Hipp., \textit{Head Wounds}§19 (Littré 3.254 = Hanson 88.15), \textit{Epidemics} 7.9 (Littré 5.380), \textit{Coan Prenotions} §570 (Littré 5.716); Thucydides 2.21.1, 2.97.3, 8.108.1; Xenophon, \textit{Hellenica} 1.1.2; Demosthenes, \textit{Phil.} 3.25, \textit{Against Phormio} §26, \textit{Aphobos} 1.4, 59 bis, II.8.

\textsuperscript{36} See: \textit{Odyssey} 5.278 = 7.267 = 24.63 (ἐπτὰ δὲ καὶ δέκα, “seven and ten”); Thucydides 2.2.1 (τέσσαρα μὲν γὰρ καὶ δέκα ἐτη, “four and ten years”), 3.79.2 (τρεῖς δὲ καὶ δέκα, “three and ten”); Isocrates, \textit{Callimachus} §54 (τεττάρων δὲ καὶ δέκα, “four and ten”); and Demosthenes, \textit{Nausimachus} §6 (τεττάρων μὲν καὶ δέκ’ ἐτῶν, “for four and ten years”).

\textsuperscript{37} Eight (or seven) instances: \textit{Epid.} 1.3.13(10) (Littré 2.706), 6.7.1 (Littré 5.330), \textit{Afections} §7 (Littré 6.216), \textit{Diseases} 2.47 (Littré 7.70), 3.15.5 (Littré 7.138 = \textit{CMG} 1.2.3, p. 84.13) πέμπτη καὶ ἐκτη ἐπὶ δέκα (“fifteenth and sixteenth”), 3.16.9 (Littré 7.146 = \textit{CMG} 1.2.3, p. 90.3), and \textit{Internal Afections} §2 (Littré 7.172) ἡμέρη δὲ τετάρτη καὶ δεκάτη, “on the four-and-tenth day,” where Potter (1988) reads ἡμέρη δὲ καὶ ἡμέρη, “day after day,” with MS Θ.


\textsuperscript{39} Nine instances: 1.87.6, 2.2.1, and 8.58.1 (years of rule), plus: 5.56.4 (13\textsuperscript{th} year of
1.2.7 (days after an event), 2.3.9 (years after an event), and Plato, *Laws* 8 (850c5, years of residence). Once again, Xenophon writes in a manner that seems to show that he conceived the numbers as written in words: *Hellenica* 4.6.6, ἡμέρα πέμπτη ἢ ἕκτη καὶ δέκατη (“on the fifteenth or sixteenth day”); and compare 3.15 (Littré 7.138) τῇ πέμπτῃ καὶ ἕκτῃ ἐπὶ δέκα (“on the fifteenth and sixteenth (day)”). The approximate value is expressed as “five- or six-and-tenth,” which could be done if writing in words, but not if writing in numerals.

In contrast, descending-ordered teens are quite rare, and are found only in two works of the Hippocratic corpus and in two works of Aristotle. In *Epidemics* 4.1.25 (Littré 5.168), the day of the *krisis* is the δεκάτῃ καὶ ἑβδόμῃ (“seventeenth”), whereas other crisis days in that book are given in words like ἐκκαιδεκάτῃ (4.1.26, Littré 5.170, “sixteenth”). Seven times in the *Internal Affections*, the manuscripts present descending-ordered teens, but in five of those the most recent editor adopts the *lectio facilior*, ascending-order, without citing any MS evidence. Those five are, with the readings of the most recent editor:

1. §4 (Littré 7.178), αἱ δεκατέσσαρες ἡμέραι (“the fourteen days”), where the most recent editor reads: … τεσσαρεσκαίδεκα …;
2. §18 (Littré 7.212), δέκα καὶ τρεῖς (“thirteen”), where the most recent editor reads: τρεῖς καὶ δέκα;
3. §35 (Littré 7.254), αἱ δεκατέσσαρες ἡμέραι (“the fourteen days”), where the most recent editor reads: … τεσσαρεσκαίδεκα …;
4. §39 (Littré 7.262), ἐν ἑπτὰ ἡμέραισιν ἢ δεκατέσσαροι (“in seven or fourteen days”), where the most recent editor reads: … τεσσαρεσκαίδεκα;
5. §40 (Littré 7.264), exactly as in §39 (Littré 7.262).

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40 Dem., *Crown* §104, refers to the “1/16th part” of the subvention of a ship.

41 Although in *Epidemics* 4.1.20 (Littré 5.158), for ἐπτακαιδεκάτη Smith reads the numeral ΙΙΖ, without citing MS evidence; he agrees with Littré in reading ἐννεακαιδεκάτη (rather than a numeral) a few lines below.

42 Potter (1988).
In *Internal Affections* §13 (Littré 7.200), δεκαπέντε (“fifteen”), the reading is undisputed. We will consider the import of these descending-ordered teens, along with other compound numbers in this work, in §4.

Aristotle’s *History of Animals* provides accounts of the lives of various species. In some of those, the gestation period is given very precisely, and in descending-ordered numbers. First, *History of Animals* 6.4 (562b29–a1), the pigeon (περιστερά):

"Εγκυα δὲ γίνεται δέκα καὶ τέτταρας ἡμέρας, καὶ ἐπῳάζει ἄλλας τοσάτας· ἐν ἑτέραις δὲ δέκα καὶ τέτταρσι πτεροῦνται οὕτως ὥστε μὴ ραδίως καταλαμβάνεσθαι.

She carries her eggs for fourteen days, and hatches for as many more; in another fourteen, the chicks are sufficiently fledged as to be not easily caught.

Then also dogs, and note the calculation of the fifth part of the year (on which more below, §6): *History of Animals* 6.20 (574a25–28):

"Ενιαὶ δὲ κύουσι τῶν κυνῶν τὸ πέμπτον μέρος τοῦ ἐνιαυτοῦ (τούτῳ δὲ ἐστὶν ἡμέραι ἐβδομήκοντα καὶ δύο) τυφλὰ δὲ γίνεται τὰ σκυλάκια τούτων τῶν κυνῶν ἡμέρας δεκατέτταρας.

Some bitches carry their pups for the fifth part of the year, i.e., seventy-two days, and their pups are blind for fourteen days.

Likewise, Aristotle’s account of elephants, derived it would seem from a source using Macedonian measures, precisely records a large amount of water known to have been consumed by an elephant: *History of Animals* 7(8).9 (596a7–9):

"Ηδὴ δὲ τις ἔπιεν ἐλέφας μετρητὰς Μακεδονικοὺς εἰσάπαξ δέκα καὶ τέτταρας, καὶ πάλιν τῆς δείλης ἄλλους ὀκτὼ.

One elephant drank all at once fourteen Macedonian measures of water, and another eight on the same afternoon.\(^{43}\)

\(^{43}\) Aristotle apparently only used the word μετρητής (“measure”) here and in *Oikonomikos* 2.2.23d (1350b10), usually thought spurious—Valente 16–31, esp. 29, and commentary 220–221,—which strengthens the case that the account about the elephant is copied from some source.
Finally, his account of the changes in birds (plumage, etc.), includes this datum on the nightingale: *History of Animals* 8(9).49B (632b20–22):

"Ἡ δ’ ἄηδὼν ᾄδει μὲν συνεχῶς ἡμέρας καὶ νύκτας δεκαπέντε, ὅταν τὸ ὄρος ἢδη δασύνηται.

The nightingale sings for fifteen days and nights in a row, when the mountains are already clothed."  

In addition to those passages, Aristotle uses a descending-ordered teen in one other place, *Metaphysics* 14(N).6 (1093a29–30), in rejecting Homeric numerology: "αἵ τε μέσαι ἡ μὲν ἐννέα ἡ δὲ ὀκτώ, καὶ τὸ ἔπος δεκαεπτά, ἰσάριθμον τούτοις ("the middle notes are nine and eight, and the epic verse seventeen, equal to the sum of these").

The rarity of descending-ordered teens precludes any certain conclusion, but it may be that authors used them when aiming at precision of report, or when recording the results of a calculation. Although they are rare, there does not seem to be a strong case in the manuscripts for emending them into ascending-ordered numbers.

4. **COMPOUND NUMBERS IN THE HIPPOCRATIC CORPUS.**

There are a little more than seventy compound numbers among the works of the Hippocratic corpus, in twenty of those works, especially *Internal Affections* (15), *Seed* (9), *Epidemics* 7 and *Diseases of Women* (7 each). A relatively large proportion, just over half (38 / 73), is descending-ordered; of those, 21 are found in just two works, *Internal Affections* (10), and *Seed* (9, plus 2 from a parallel passage). Those 21, plus nine or ten others, can be understood as giving the result of some calculation.

The Hippocratic *Nature of the Child* offers a model of fetal development in §16–20, including some numerical speculation in §18. In that chapter, the author propounds the theory that female embryos form in 42 days, and male embryos in 30. The two numbers are evidently related by some calculation, as indeed the author states: "δεῖ δὴ τὴν κά-θαρσιν ἀποδοθῆναι ἐν τοῖσι λοχίσιοι, καὶ ἐξεῖναι ἔξω κατὰ λόγον τῶν ἡμερέων, "the purgation must correspond to the lochia, and flow out in proportion to the days" (§18, Littré 7.500.18–19). He is grounding

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44 The text of Balme (2002) is followed.
his theory on an alleged observation (duration of post-partum bleeding), and claiming that the same ratio of durations in that phenomenon must hold in the phenomenon of formation. The number “42” in this passage is always (8 times) written in descending order, e.g.: καὶ ἐπὶ τῇ κούρῃ κατὰ λόγον τῶν τεσσαράκοντα καὶ δύο ἡμερέων (“and for a girl-child in proportion to the forty-two days”). In addition, the author here writes “25” in descending order: ἀκίνδυνος δ’ ἂν εἴη καὶ ἐν εἴκοσι καὶ πέντε ἡμέρησιν (“and she would be safe if it occurs in twenty-five days,” Littré 7.500.6–7). The ratio 42/30 for the period of formation is probably best explained as 6 times a “fundamental” ratio 7/5 for male/female. Moreover, the descending-ordered pair of numbers “42” and “25” in the parallel passage in Diseases of Women §72 (Littré 8.152) is likely copied from this text.

In the Internal Affections, the author is categorizing, describing, and treating diseases, and often specifies the expected day of the krisis; many of those are fourteen days (a preferred period in the Hippocratic Prognosis). Littré prints the five instances of “fourteen” in Internal Affections as number-words written in descending order (compare above, §3, “Teens”):

1. §4 αἱ δεκατέσσαρες ἡμέραι (“the fourteen days,” Littré 7.178);
2. §35, ditto (Littre 7.254);
3. §39 ἡ νοῦσος αὕτη κρίνεται ἐν ἑπτὰ ἡμέρῃσιν ἢ δεκατέσσαρσι· πολλοὶ δὲ διατρέχουσι καὶ ἐς τὰς εἰκοσιτέσσαρας (“this disease has its *krisis* in seven days or fourteen; many last even up to twenty-four days,” Littre 7.262);
4. §40 ἐν ἑπτὰ ἡμέρῃσιν ἢ ἐν δεκατέσσαρσι· πολλοὶ δὲ διαφέρουσι καὶ ἐς τὰς εἰκοσιτεσσάρων ἡμερέων (“in seven days or fourteen; many last for twenty four days,” Littre 7.264);
5. §48 κρίνεται δὲ ἐν δεκατέσσαρσιν ἡμέρῃσι τὸ μακρότατον (“it has its *krisis* in fourteen days at the longest,” Littre 7.286–288).

However, the most recent editor, Potter, regularizes the first four of those to ascending order, and in the fifth, §48, Potter follows MS Θ, reading τεσσαράκοντα, “forty,” instead of the δεκατέσσαρσιν, “fourteen,” of MS M, which Littré followed.¹⁴⁹ There are also two instances of a descending-ordered “twenty-four” in the immediate context of *Internal Affections* §§39–40 (above): the first of these Potter regularizes, but not the second. In addition to these seven descending-ordered numbers, there are three more, all in prescriptions:

1. §12 (Littre 7.198), cause patient to walk every day ἐκατὸν πεντήκοντα σταδίους, “one hundred fifty stades,” twenty after dinner and forty before breakfast;⁵⁰
2. §13 (Littre 7.200), perform cautery δεκαπέντε (line 22), “fifteen,” times, after the πέντε καὶ τεσσαράκοντα (line 18), “five and forty,” days of fattening diet;⁵¹
3. §18 (Littre 7.212.18), induce nosebleed for ἡμέρας τὸ ἐλάχιστον δέκα καὶ τρεῖς, “at least thirteen days.”⁵²

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¹⁴⁹ Potter (1988) 88, 188, 200, 204, and 236. The change from τεσσαράκοντα to δεκατέσσαρσιν, or vice versa, cannot be explained by recourse to acrophonic or alphabetic numerals.

⁵⁰ The numbers are sufficiently regular as to suggest a calculation, in which “150” was the remainder after some subtractions (to perform the total prescribed walk, whether 150 stades/day or 210 stades/day, might take an entire day).

⁵¹ Perhaps “15” from “five and forty” divided by three?

⁵² Potter (1988) 132 regularizes this number; but it seems more likely (with the τὸ ἐλάχιστον) to be another “14,” as if: “do this up until the 14th day, then stop.”
There is no need to prefer the lectio facilior, especially in the absence of MS evidence—only for the reading in §48 (Littré 7.286–288) does the most recent editor cite any—and all ten of these descending-ordered numbers may be seen as the result of some calculation.

In addition to the ten descending-ordered numbers of Internal Affections, and the eleven in and from Nature of the Child, there are three other Hippocratic works in which a passage with descending-ordered numbers records a calculation: Regimen book 3 (three numbers), Eight-Month Child (two numbers), and Bones (four numbers).

First, in Regimen 3.68.7–8 (Littré 6.598), the total length of the winter season is split into three segments of 44, 15, and 32 days, and the two longer segments are written in descending order: ἀπὸ πλημάδων δύσιος μέχρι ἡλίου τροπέων ἡμέρας τεσσαράκοντα τέσσαρας… μέχρι ισημερίης ἡμέρας τριήκοντα δύο (“from the setting of the Pleiades until the solstice, for forty-four days … until the equinox, for thirty-two days”).

Second, in Eight-Month Child §1 (Littré 7.436), the author calculates the length of gestation of a seven-month's child:

53 See Joly and Byl, CMG 1.2.4 pp. 198.2–7.

54 Mendell 313; earlier astronomers may have also specified this length, itself calculable by dividing a 365-day year into almost-equal quarters (with one day extra): cf. on the lengths of the seasons according to Euctemon, Dicks 88.

55 See Joly and Byl, CMG 1.2.4 pp. 200.12–13. Further confirmation that these periods were calculated is found in 3.68.9 (Littré 6.600 = CMG 1.2.4, p. 198.15–16), διελεῖν τὸν χρόνον ἐς μέρας ἕξιν κατὰ ὀκτὼ ἡμέρας, “divide the time into six parts each of eight days,” i.e., “6 times 8,” and the total calculated from that multiplication, 3.68.14 (Littré 6.604 = CMG 1.2.4, p. 200.22): ἐν ἡμέραις δυοίνοι δευτεράδιας πεντήκοντα μέχρι πλειάδων δύσιος ἀπὸ ισημερίης, “in fifty less two days until the setting of the Pleiades after the equinox,” i.e., “48.”

Seven-month fetuses occur after one hundred and eighty and two days and a remainder. So: if you reckon for the first month fifteen days, and for the five months, one hundred and forty and seven, and half a day (since in sixty days less one very nearly two months are completed); thus, given that, there remain in the half-year more than twenty days for the seventh month, since the fraction of a day is added to the other fraction.

That is, he computes, starting from 2 (lunar) months = 59 days, that 5 (lunar) months equal 2 ½ times 59 days, which equals 147 ½ days, plus the 15 days for the first month (i.e., because the conception was at mid-month), which gives 162 ½ days, which when subtracted from the 182 days and a fraction that constitute half a year, leaves “more than 20” into the seventh month. Not only are the two larger numbers, each the result of a calculation, written in descending order, but so also is the subtractively written “59.”

Third, in Bones §1 (Littré 9.168), the author adds up the number of bones in the human body:

Bones of the hand, twenty-seven; of the foot, twenty-four; of the neck up to the big one, seven; of the loins, five; of the spine, twenty; of the skull with the facial bones, eight: altogether ninety-one, and with the nails one hundred eleven.

The author adds 27 (hand) plus 24 (foot) plus 7 (neck) plus 5 (loins) plus 20 (spine) plus 8 (skull) for a total of 91, and then with the “nails”
All four compound numbers are written in descending order. Note, however, that Littré records that most MSs write the two sums “91” and “111” using alphabetic numerals, i.e., “ϜΑ” and “ΡΙΑ.”

However, although these thirty compound numbers in the Hippocratic corpus written in descending order can all be seen as indicating a calculation, there are seven passages containing nine more compound numbers in the Hippocratic corpus that are written in descending order, for which that explanation is not established.

1. *Epidemics* 4.1.25 (Littré 5.168), the day of the krisis, δεκάτη καὶ ἑβδόμη (“seventeenth”), the oddity of which has been noted above, §3 (“Teens”);

2. *Epidemics* 7.1 (Littré 5.364), lists the days on which the krisis was observed as ὀλίγοισιν ἐν ἑπτὰ καὶ ἑννέα ἐπαύοντο, ἄλλοις ἑνδέκεα, καὶ τεσσαρεσκαίδεκα, καὶ ἐπτακαίδεκα, καὶ εἰκοσιδύω (“In a few cases they ceased at seven and nine days, in others at eleven, and fourteen, <and seventeen, and twenty-two>”), but there is no convincing reason to restore a value of “22” that is in descending order;

3. *Coan Prenotions* §156 (Littré 5.618), advises to expect hemorrhages in μάλιστα μὲν νεωτέροισι τῶν τριήκοντα πέντε (“especially in those younger than thirty-five”);

4. *Diseases* 3.15 contains two descending-ordered values “twenty-one”: 3.15.3 (Littré 7.136.22–23 = CMG 1.2.3, p. 84.4–5)

Modern medicine counts about twice this many, and the author either gives an extra bone to one hand, or fails to notice that he should count “hand” and “foot” twice each. The word ὀπωπίοις (hapax) is explained by Littré and by LSJ as “bones of the eyes” (i.e., eye-sockets), but “bones of the face” seems anatomically more likely. (*Head Wounds* §1 (Littré 3.182–184) attributes multiple bones to the skull, but gives no explicit number.)

The emended portion reads καὶ εἰκοσιδύω, καὶ ἐς ἑπτακαίδεα (“and twenty-two and (up to) seventeen”) in MS J; and καὶ (εἰς) KB, καὶ (εἰς) ἐπτακαίδεα (“and (up to) 22 and (up to) seventeen”) in MSs DFHK (with “IZ” in G); and καὶ εἰς δευτέρην καὶ εἰς ἑπτὰ καὶ εἰς δέκα (“and up to the twenty-second and up to the seventh and on the tenth”) in MS C. The emendation, already in Littré, is based on *Epidemics* 7.2 (Littré 5.368, a krisis on the twenty-second day) and 5.73 (Littré 5.246, list of krisis days ending with seventeenth and twentieth). For εἰς with numbers, see LSJ, s.v., III.2, expressing “up to” and approximation.
Despite the anomalies (several of which may be scribal not authorial), the bulk of the descending-ordered numbers (30 out of 38, or almost 80 %) in the Hippocratic corpus are associated with calculations. There are, however, two instances of calculations in which the numbers are written in ascending order (in addition to the mixed case above, in Fleshes §19):
1. *Eight-Month Child* §13 (Littré 7.460.5–7 = CMG 1.2.1, p. 88.12–14): ὥστε πολλάκις ἐπιλαμβάνειν τοῦ ἑνδεκάτου μηνὸς τὰς ὀγδοήκοντα καὶ διακοσίας ἡμέρας· τοῦτο γάρ ἐστιν ἑπτά τεσσαρακοντάδες (“so that often they reach the eighty and two-hundred days only in the eleventh month: since that period equals seven times forty”),

2. *Fleshes* §19 (Littré 8.614.13–15): καὶ ἐν ἑπτὰ ἔτεσίν ἐστι δὲ λόγῳ καὶ ἀριθμῷ ἀτρεκέως δεκάδες ἑβδομάδων <ἕξ καὶ τριήκοντα> καὶ ἡμίσυ δεκάδος, ἑβδομάδες πέντε καὶ ἑξήκοντα καὶ τριηκόσιαι (“in seven years there are by measure and number exactly <thirty-six> decads of sevens <and a half decad: (i.e.,) five and> sixty and three hundred (hebdomads)”), the preserved numbers (ἑξήκοντα καὶ τριηκόσιαι) show that the result must have been written in ascending order.

So despite the strong regularity that explains most of the descending-ordered numbers as the results of calculations, at least in some texts (or authors) of the corpus, that pattern is not completely followed. Two of the works that present calculations, with numbers written in descending order, *Fleshes* in its §19, and *Nature of the Child* in its §18, also explicitly express a rhetoric of accuracy. The author of *Fleshes* performs two calculations (§19, as above), and attributes exactitude (ἀτρεκέα, Littré 8.612.3, and ἀτρεκέως, Littré 8.614.14) to both. The author of *Nature of the Child* raises the issue of precision and accuracy (the ἀτρεκές) several times, §28 (Littré 7.528.27–28), §39.3 (Littré 7.558.15–18), §45.2 (Littré 7.568.21–22), and §49.1 (Littré 7.578.9), in reference to being able to know or say exactly what is the case. That expressed preference coheres with a reading of the descending-ordered numbers in those two texts as indicating accuracy.

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62 Potter (1995) 164–165; the supplement is by Littré, and accepted by Potter.

63 The word ἀτρεκέως familiar from the oft-repeated Homeric: ἀλλ’ ἄγε μοι τόδε εἴπῃ καὶ ἀτρεκέως κατάλεξον.

64 See Lonie 43–51 on the unity and authorship of the three treatises: *Generation*, and *Nature of the Child*, and *Diseases IV*. 
5. COMPOUND NUMBERS IN THE ORATORS.

Among the orators of Athens, the manner of writing compound numbers varies, in several rather telling ways. First, Lysias uses only ascending-ordered compound numbers, even for relatively large numbers, as do the three minor orators Dinarchus, Hypereides, and Lycurgus. The text of Andocides offers two numbers (χιλίους τε καὶ διακοσίους, “thousand and two-hundred,” cavalry, and ὀγδοήκοντα καὶ πέντε, “eighty and five,” years) in descending order, and three numbers in ascending order. There is no basis for emending any of those five compound numbers. Likewise, Isocrates provides two descending-ordered numbers (his own age ἐνενήκοντα καὶ τέτταρσιν, “ninety and four,” years, and χιλίας καὶ διακοσίων, “thousand and two-hundred,” triremes)—and fifteen ascending-ordered numbers, of similar value, and found both in those and in other speeches. No simple explanation for these variations is apparent.

65 The text of Carey: #2, Epitaphios §27 (διακοσίαις μὲν καὶ χιλίαις, “two-hundred and a thousand”); #3, Simon §24; #10, Theomnestos I §4 and the parallel in #11, Theomnestos II §1; #10, Theomnestos I §27; #12, Against Eratosthenes §19; #29, Philokrates §12 (ἐξακόσιοι δὲ καὶ χίλιοι, “six-hundred and a thousand”); and #32, Diogeiton §21, 26, 27.

66 Dinarchus, Demosthenes §52 (πεντακοσίως καὶ δισχίλιος, “five-hundred and two-thousand”), §70, §107; Hypereides, Athenogenes §31 (col. 15, lines 17–18); and Lycurgus, Leocrates §24.

67 The text of Redondo i Sànchez: Andocides, Peace §7 (which occurs in an inventory-like context) and §38 respectively for the descending-ordered compound numbers, and for the ascending-ordered numbers, Mysteries §43 (δύο καὶ τετταράκοντα, “two and forty” conspirators), §134 (ἐξ καὶ τριάκοντα, “six and thirty” talents, possibly a “Steigerung” after the immediately preceding “six talents”), and Peace §9 (διακόσια καὶ χίλια, “two-hundred and thousand” talents).

68 The MS Burney 95 (“Crippsianus”) was checked for the text of Andocides, via the digitized version at http://www.bl.uk/manuscripts/FullDisplay.aspx?ref=Burney_MS_95, and no variants or numerals were found: Mysteries §43, f. 7r, line 20, δύο καὶ τετταράκοντα; §134, f. 14v, lines 15–16, ἔξ καὶ τριάκοντα / ταλάντων; Peace §7, f. 19r, line 24, χίλιους τε καὶ διακοσίους ἵππες; §9, f. 19v, line 34, διακόσια καὶ χίλια τάλαντα; and §38, f. 22v, lines 12–13, ὀγδο/ήκοντα καὶ πέντε … ἔτεσιν. For an evaluation of the “Crippsianus,” see Wilson 202.

69 Text of Mandilaras; for descending-ordered, see respectively: Isocrates, Panath. §3 and Paneg. §97; and for ascending-ordered, see: Antid. §§9, 111, 113 bis, 145; Euag.
The three orators Aeschines, Apollodōros, and Isaios display patterns that suggest careful deliberation in their handling of compound numbers. The simplest of these three is Isaios, who treats compound numbers as the poets did, writing those larger than six-hundred in descending order (Hagnias §42 ἑπτακόσιαι καὶ εἴκοσι, “seven hundred and twenty,” and §43 τετρακισχιλίας ἐνακοσίας, “four-thousand, nine-hundred”), and those smaller than six-hundred in ascending order (the largest of these is in Philoktemon §33, πεντήκοντα καὶ πεντακοσίων, “fifty and five-hundred”). There is no basis for emending the order or value of any of these descending-ordered compound numbers.

The orator Apollodōros, whose six or seven extant speeches are preserved within the corpus of Demosthenes, rarely writes compound numbers in an ascending order. The transitional value, about six hundred, may be significant, as the number “six-hundred” (at least in Latin) functioned as a stand-in for “many”: Woelfflin.

§60 (πεντακισχίλια καὶ μύρια, “five-thousand and a myriad”); Loch. §11; Areop. §67; Panath. §§49, 56; Paneg. §§87, 93, 118 (three instances of διακόσια καὶ χίλια, “two-hundred and a thousand”); and Peace §86 bis. Note that POxy 5 (1908) #844, col. XXXIII, lines 527–532, confirms Mandilaras’ text of Paneg. §87.


72 The MS Burney 95 (“Crippsianus”) was checked for the text of Isaios, via the digitized version at http://www.bl.uk/manuscripts/FullDisplay.aspx?ref=Burney_MS_95, and no variants or numerals were found: Menekles §15, f. 32r, line 17, τρία καὶ εἴκοσιν ἔτη; §45, f. 34r, lines 22–23, τρία καὶ εἴκοσιν ἔτη / ἐπιβιόντα ἔτη; Philoktemon, §14, f. 50v, line 11, δύο καὶ πεντήκοντα ἔτη; §18, f. 50v, lines 34–35, ἔτη ἐξ / καὶ ἑνενήκοντα; §33, f. 52r, lines 13–18, πέντε καὶ ἑβδομήκοντα μνῶν … / … τεττάρων καὶ τεταράκοντα μνῶν … / … τριών καὶ δέκα / μνῶν … τὸ δὲ πεντήκοντα / καὶ πεννακοσίων δραχμῶν; Kiron, §8, f. 59v, line 26, πέντε καὶ εἴκοσι μνᾶς / Hagnias, §42, f. 75v, lines 3–6, αἱ πεντεκαὶ / δέκα μναί … / [5] / ἐπιτακόσια καὶ εἴκοσι δραχμαί; §43, f. 75v, lines 7 + 9, δύο καὶ εἴκοσι μναῖ … ἐνεπόλησαν τετρακισχιλίας ἐνακοσίας; §44, f. 75v, line 22, δέκα καὶ ἑκατόν μναίς.

73 Trevett 50–76: the six speeches #46: Against Stephanos II; #49: Against Timotheos; #50: Against Polyceles; #52: Against Callippos; #53: Against Nicostratos; and #59: Against Neaira, plus possibly #47: Against Eupiros & Mnesiboulos.
numbers in ascending order, and only those less than two hundred,\textsuperscript{73} whereas all twelve of his descending-ordered compound numbers are larger than two hundred—but each of them may also be seen as a precise and legal record of an amount of money (balance, fine, or loan), i.e., an inventory.\textsuperscript{74} That is, he either follows the pattern of the poets in writing large compound numbers in descending order, or else he writes in descending order those compound numbers intended as precise. As discussed below, neither pattern can be established for Demosthenes, among whose corpus all the speeches of Apollodōros were preserved, so that the distinctive pattern of Apollodōros cannot be credited to a scribal tradition.\textsuperscript{75}

Aeschines writes all eleven of his compound numbers in descending order, from smallest (\textgreek{ἐξήκοντα καὶ πέντε}, “sixty-five”) to largest (\textgreek{χιλίους καὶ πεντακοσίους}, “thousand and five-hundred”).\textsuperscript{76} Two of these are clearly intended as precise (his father’s age),\textsuperscript{77} but two others have

\textsuperscript{73} The text of Dilts v. 4 (2009); the ascending-ordered numbers are: \textit{Euerg}. §43 (\textgreek{πέντε καὶ εἴκοσι}, “five and twenty,” in the MSs at §9, transposed by Sauppe, and bracketed by Dilts), \textit{Neaira} §5 (\textgreek{πέντε καὶ εἴκοσιν}, “five and twenty”), \textit{Nicostratos} §7 (\textgreek{ἐξ καὶ εἴκοσιν}, “six and twenty”), and \textit{Polycle}§19 (\textgreek{πέντε καὶ τετταράκοντα}, “five and forty”); plus \textit{Euerg}. §64, if the restoration \textgreek{ὀγδοήκοντα δὲ καὶ ἑκατὸν} (“eighty and one hundred”) is accepted.

\textsuperscript{74} See: \textit{Euergos} §64 (\textgreek{χιλίας μὲν καὶ ἑκατόν}, “thousand and one hundred,” and \textgreek{τριακοσίας δέκα τρεῖς}, “thousand three-hundred and thirteen”), §77 and §82 (\textgreek{χιλίας τριακοσίας δέκα τρεῖς}, “thousand three-hundred and thirteen,” twice); \textit{Callippos} §6 (\textgreek{χιλίας ἕκακοσίας τετταράκοντα}, “thousand six-hundred and forty”); \textit{Nicostratos} §14 (\textgreek{ἔκακοσίας καὶ δέκα}, “six-hundred and ten,” and restored in §15 by Platner); and \textit{Timotheos} §6 (\textgreek{χιλίας τριακοσίας πεντήκοντα μίαν}, “thousand three-hundred and fifty-one”), §8 (\textgreek{χιλίας τριακοσίας δραχμὰς καὶ πεντήκοντα καὶ μίαν}, “thousand three-hundred drachmas and fifty and one”), §29 (\textgreek{χιλίας ἑπτακοσίας πεντήκοντα}, “thousand seven-hundred and fifty”), §32 (\textgreek{διακοσίας τρίακοντα ἑπτά}, “two-hundred thirty-seven”), and §44 (\textgreek{χιλίας καὶ τριακοσίας καὶ πεντήκοντα καὶ μίαν}, “thousand and three-hundred and fifty-one”).

\textsuperscript{75} Kapparis 108–109, points out that the distinctive Apollodorean style was preserved within the Demosthenic corpus—i.e., there is little evidence of scribal interference with the text.

\textsuperscript{76} They are found in two of his three speeches, i.e., none in \textit{Against Timarchus}.

\textsuperscript{77} See \textit{False Embassy} §147 (\textgreek{ἐνενήκοντα καὶ τέτταρα}, “ninety-four”) and the next year \textit{Ktesiphon} §191 (\textgreek{ἐνενήκοντα καὶ πέντε}, “ninety-five”). Using the text of Dilts (1997).
been argued to be round figures, and another two or three are “well-known” values. Nothing special marks the other four, and there is no basis for arguing that the text-tradition of Aeschines somehow inverted the order of every number in his text, from the normal ascending order into the lectio difficilior of descending order. Moreover the presence of intervening particles within four of the eleven numbers seems to exclude the possibility that those were written in numerals. The conclusion would seem to be that Aeschines himself preferred to write compound numbers in descending order.

78 False Embassy §70 (ἑβδομήκοντα μὲν καὶ πέντε, “seventy-five”) and Ktesiphon §194 (ἑβδομήκοντα καὶ πέντε, “seventy-five”); Oost 238–240, followed by Whitehead 313–314, argues that “seventy-five” is a round figure. (I am indebted to Ian Worthington for the latter reference, per litteras 2014 Jan 22.)

79 See: (a) Ktesiphon §222, the number of ships in a famous ancient battle; and (b) False Embassy §77 and Ktesiphon §235: the ordinary estimate of 1500 for the number of citizens illegally executed by the Thirty, cf. Isocrates Lochites §11 and Areopageticus §67, and Aristotle, Athen. Polit. 35.4.

80 See: False Embassy §71 (ἐκατὸν δὲ καὶ πεντήκοντα, “hundred and fifty” ships, and χίλια δὲ καὶ πεντακόσια, “thousand and five-hundred” talents) and §174–175 (χιλίους δὲ καὶ διακόσιος, “thousand and two-hundred” cavalry, and χίλια καὶ διακόσια, “thousand and two-hundred” talents).

81 On the text-tradition of Aeschines, see Diller; the papyri are no aid here, e.g., P. Hamb. 2 (1954) #165 begins just after the number in Ktesiphon §194: see Snell.

82 False Embassy §70, §71 (two numbers), and §174.

83 The MS Laur. Plut. 57.45 was checked for the text of Aeschines, via the digitized version at http://teca.bmlonline.it/ImageViewer/servlet/ImageViewer?idr=TECA0000867622&keyworks=Plut.57.45#page/1/mode/1up, and no variants or numerals were found. In False Embassy, §70, f. 203v, line 25, ἑβδομήκοντα μὲν καὶ πέντε πόλεις, and §71, lines 30–31 + 33, ἐκατὸν δὲ καὶ πεντήκοντα τριήρεις ... χίλια δὲ καὶ πεντακόσια τάλαντα; §77, f. 204v, lines 21–22, χίλιους καὶ πεντακόσιος / ἀκρίτους τῶν πολιτῶν (note the inversion of the order of τῶν πολιτῶν and ἀκρίτους—but not of the numbers); §147, f. 212r, line 25, ἐνενήκοντα καὶ τέτταρα; §174, f. 215r, line 25, χίλιους δὲ καὶ διακόσιος ἱππέας; §175, f. 215v, line 1, πλέον ἢ χίλια καὶ διακόσια τάλαντα. Then, in Ktesiphon, §191, f. 238r, line 28, ἐπὶ βιούς ἐνενήκοντα καὶ πέντε; §194, f. 238v, line 20, ἑβδομήκοντα καὶ πέντε; §222, f. 241v, line 12, ἐξήκοντα καὶ πέντε νεὼν; §235, f. 243r, lines 4–5, πλείους ἢ χίλιους καὶ πεν/τακόσιους.
Demosthenes bulks large among the orators, with a total of 76 compound numbers (compared to 77 compound numbers found in all other orators combined); but the corpus of Demosthenes, even with the seven speeches of Apollodōros removed, is sufficiently large that those 76 represent a lower ratio of compound numbers to text than is found in Apollodōros, who has about twice as many per length as does Demosthenes.\textsuperscript{84} That also distinguishes Apollodōros’ practice with compound numbers from that of Demosthenes, and provides evidence that the numbers as we have them are not simply the result of scribal practice in the text-tradition of the Demosthenic corpus.\textsuperscript{85}

Exactly half (38/76) of the compound numbers in Demosthenes are written in descending order (\textit{cf.} the 29/77 in all other orators). The distinction is not based on size: the ascending-ordered numbers range from “two and twenty” (or even the teens, \textit{cf.} above §3) up to “four-hundred and two-thousand” (that value intended as precise);\textsuperscript{86} whereas the descending-ordered numbers range from “twenty and two” up to “myriad and five-thousand” (the largest number in any orator, and not intended as precise).\textsuperscript{87} Indeed, of the thirteen numbers larger than 1000 (outside the speech Against Phormio, to which we shall return), half are

\textsuperscript{84} Using the word counts provided by the online TLG, which presents the old Oxford edition (1903–1921): 30,188 words for the seven speeches of Apollodōros and 245,087 words for the remainder of the Demosthenic corpus, without the spurious letters, the Eroticlus, or the Syntaxis. However, I checked all readings in the text of the new Oxford edition, by Dilts (2002–2009).

\textsuperscript{85} Hernández-Muñoz 145–146, the papyri show that the pre-Byzantine text was fluid, i.e., not systematically altered; Tempesta 166 and 178, restating the consensus established by Pasquali and Canfora, that there were three late-antique editions of Demosthenes that influenced the Byzantine tradition.

\textsuperscript{86} See respectively #19, False Embassy §123 (\textit{δύο καὶ εἴκοσίν, “two and twenty”}) and #27, Aphobos I.11 (\textit{τετρακοσίας δὲ καὶ δισχιλίας, “four-hundred and two-thousand”}, where the value must be intended as precise since it records the amount deposited at Pasion’s bank.

\textsuperscript{87} See respectively #38, Nausimachus §6 (\textit{εἴκοσι δὲ καὶ δυοῖν, “twenty and two”}) and #18, On the Crown §237 (\textit{μύριοι μὲν καὶ πεντακισχίλιοι, “myriad and five-thousand”), the latter being Demosthenes’ boast about the number of mercenaries he acquired for the city. Intervening particles preclude these descending-ordered compound numbers from being transcriptions of numerals.
in descending order. Each one of the eight speeches that contains at least three compound numbers also contains at least one in each order.

In three passages containing four instances, the number written in descending order is the result of a calculation (and in two of those an intervening word, μὲν or μναῖ, militates against a hypothesis that numerals were used):

1. #14, *Summories* §27, if 1% is sixty talents, then 2% is ἐκατὸν καὶ ἐκοσίον (“hundred and twenty”);

2. #27, *Aphobos* I.35–36, the total capital was five talents plus fifteen mnai (i.e., 315 mnai), on which the interest would be ἐβδομήκοντα μναῖ καὶ ἐπτά (“seventy mnai and seven” twice);

3. #37, *Pantainetos* §4–5, the five and a hundred mnai paid, less the one talent (i.e., 60 mnai) of Euergos, leaves τεττάρακοντα μὲν καὶ πέντε (“forty and five” mnai, i.e., 105 – 60 = 45).

In one speech of the corpus, the *Against Phormio*, all sixteen compound numbers, stating monetary amounts, and ranging from “twenty and eight” up to “five-thousand and five-hundred,” are written in descending order, and it would seem that each of those numbers was intended as a precise and legal record, as in Apollodōros (above). The

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89 Those speeches are numbers 3, 14, 18, 19, 27, 34, 35, and 37.

papyrus *P. Grenf.* II.10, containing *Against Phormio* §7, confirms the descending order of those numbers:\(^91\) col. II, lines 5–6: ΕΚΑΤΟ[ν δέκα πέντε] / TE, and col. II, lines 11–16:

\[
\begin{align*}
\text{ΑΛΛ Η [πεντακισχί}
\text{ΔΙΩΝ [καὶ πεντακο}
\text{ΣΙΩΝ Δ[ραχμών, σύν}
\text{ΤΩΙ ΕΠ[ισιτισμώ].}
\text{ΟΦΕΙΛΕ[ι δὲ ἐβδομήκον}
\text{ΤΑ ΜΝΑΣ [καὶ πέντε}
\end{align*}
\]

However, in seven other speeches of Demosthenes in which precise and legal records of money are stated, eleven compound numbers, ranging from “five and twenty” up to “eight-hundred and one-thousand,” are in ascending order.\(^92\) Another eight numbers written in descending order are found in the documents inserted into the speeches;\(^93\) but many such documents are later insertions by commentators.\(^94\) In addition to the twenty-eight instances of descending-ordered numbers so far analyzed from Demosthenes (four in calculations, sixteen in the *Against Phormio*, and eight in documents), there are ten others for which none of those

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\(^91\) Grenfell and Hunt (1897) 20–21.


explanations can be offered. Three of those ten texts either contain intervening words or are confirmed by papyri, rendering unlikely both an emendation to ascending-order as well as a transcription from numerals.

Thus, although the practice of the orators as a whole varies greatly, several authorial patterns that cannot be the result of scribal practice stand out clearly. First, Aeschines wrote all his numbers in descending order. Second, Isaios seems to have followed the practice of the poets, writing larger numbers in descending order. Third, Apollodōros either followed that practice, or wrote in descending order any number that derived from an official or legal account, or was from an inventory. Lastly, Demosthenes mostly varies, but follows the Hippocratic practice in three places, writing the results of calculations in descending order; in half the places where he writes large numbers, they are in descending order. In one speech in his corpus greatly concerned with monetary quantities, the author wrote all the numbers in descending order, as if from an inventory.

6. COMPOUND NUMBERS IN THE PHILOSOPHERS.

The four classical philosophers whose texts are extant and contain compound numbers are Plato, Aristoxenos, Aristotle, and Theophrastos. (The last-named extends beyond the end-date of this survey.) Two of them write all, or nearly all, their compound numbers in ascending order, but have very few such numbers: Aristoxenos (only one, in Elem.)

95 Two were cited above: #38, Nausimachus §6, and #18, On the Crown §237. See also: (c) #3, Olynth. III.28 (χίλια καὶ πεντακόσια, “thousand and five-hundred”); (d) #9, Phil. III.23 (ἐβδομήκοντα ἑπτά καὶ τρία, “seventy years and three,” of Attic hegemony); (e) #14, Summaries §16 (χίλια καὶ διακόσια, “thousand and two-hundred”); (f) #19, False Embassy §251 (διακόσια ἑτάκοσια ἑπτάκοσια καὶ τετταράκοσια, “two-hundred and forty”); (g) #27, Aphobos I.11 (χιλιάς καὶ ἕξακοσίας, “thousand and six-hundred”); (h) #37, Pantainetos §31 (δισχίλιοι καὶ ἑξακοσίοι, “two-thousand and six-hundred”), (i) 49 (ἐκατόν καὶ πέντε, “hundred and five”); and (j) #41, Spoudias §22 (χίλιαι καὶ ὀκτακόσιαι, “thousand and eight-hundred”).

96 Intervening words occur in (d) and (f), in prior note. Text (c) is confirmed in P. Berol. inv. 21280, col. II-R, lines 33–34, πλείω ΔΕ ΧΙΛΙΑ ΚΑΙ νυμ, see Maehler; and in P.Oxy 62 (1995) #4314, fr. 3, lines 1–2: πλείω ΔΗ ΧΙΛΙΑ ΚΑΙ ΠΕΝΤΑΚΟΣΙΑ ΤΑ ΦΑΣΙΝ ΤΟΝ ἐνω, see Manfredi #13, and p. 41 on the uncertain supplement in line 8.
Most of the compound numbers in Plato are in his *Laws* (26 of 34); all five of the descending-ordered numbers are among those. Some of the compound numbers written in normal ascending order are notable: the calculated value ἐννεακαιεικοσικαιεπτακοσιοπλασιάκις, “nine and twenty and seven-hundred times” (computed as nine cubed), in *Republic* 9 (587e); the computed ratio of ἕξ καὶ πεντήκοντα καὶ διακοσίων πρός τρία καὶ τετταράκοντα καὶ διακόσια, “six and fifty and two-hundred to three and forty and two-hundred” (calculated as the seventh power of two divided by the fifth power of three), in *Timaeus* 36b; and the council of ἕξήκοντα δὲ καὶ τριακόσιοι, “sixty and three-hundred” (computed both as thirty dozen and as four groups of ninety), in *Laws* 6 (756b7–c1). Oppositely, the smallest compound number written in descending order, τριάκοντα γεγονὼς καὶ πέντε, “being thirty and five,” as the age of marriage, in *Laws* 4 (721d), is not the result of a calculation, or an official record of anything, and the same quantity, the age of marriage, is elsewhere written in ascending order, πέντε καὶ τριάκοντα (“five and thirty”).

The magic number τετταράκοντα καὶ πεντακισχιλίων, “5040,” the optimal number of households in the ideal city of the *Laws*, is computed as what we would call “seven factorial” (seven times six times five etc. down to one), and is correctly stated to have μιᾶς δεουσῶν ἑξήκοντα (“one short of sixty”) distinct factors, in ascending-ordered compound numbers, *Laws* 5 (737e–738a, twice). Plato varies his representation, and writes the same value in descending-ordered numbers, πεντακισχίλιαι καὶ τετταράκοντα, *Laws* 5 (740d–e,

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97 Barker.

98 See *HP* 1.7.1 (τρεῖς καὶ τριάκοντα, “three and thirty”), 3.13.1 (τέτταρας καὶ εἴκοσι, “four and twenty”), 5.8.2 (πέντε καὶ εἴκοσι, “five and twenty”), 9.3.1 (ὁγδοήκοντα καὶ ἑκατόν, “eighty and one hundred”), descending order 9.7.2 (ἐκατόν πεντήκοντα, “hundred fifty,” not the largest number), and 9.17.3 (δύο καὶ εἴκοσι, “two and twenty”). The opening of the *Characters*, giving the author’s age as ἐνενήκοντα ἑννέα, “ninety-nine,” is widely regarded as spurious, since Theophrastos is reliably attested to have died much younger, see D.L. 5.40.

99 Just above in *Laws* 4 (721b), and in 6 (772e, 785b); Aristotle suggests the same in *Rhetorica* 2.14 (1390b10), where that age is when the (male) body is at its peak.
twice), then twice more in ascending-ordered numbers, Laws 5 (745c, 746d); when he returns to the “5040” in book 6 (771a, 771c), it is again written in descending order; and finally in Laws 9 (877d) and 11 (919d, 929a), it is written ascending-ordered. Plato writes no other numbers in descending order.

The texts of Aristotle present more descending-ordered numbers (27) than ascending-ordered (18), with over half (14 / 27) of the descending-ordered numbers being in the History of Animals, and nine more in the two political works, the Politics (4) and the Constitution of Athens (5). First, let us consider seven passages containing a total of eight descending-ordered numbers in calculations:

1. **On the Heaven** 1.11 (281a17): who cannot walk a thousand stades, necessarily cannot walk χίλια καὶ ἕν (“thousand and one”);
2. **History of Animals** 6.20 (574a25–28): the fifth part of a year is ἑβδομήκοντα καὶ δύο (“seventy and two”) days;
3. **Metaphysics** 12(Λ).8 (1074a7–14): the total number of heavenly spheres actually needed adds up to πεντήκοντα τε καὶ πέντε (“fifty and five”);
4. **Metaphysics** 14(Ν).6 (1093a30): the two halves of the epic verse have nine and eight syllables, which sums to δεκαεπτά (“seventeen,” a rare descending-ordered teen, cf. §3);
5. **Politics** 4.4 (1290a33–36): one thousand wealthy citizens plus three-hundred poor citizens add up to χίλιοι καὶ τριακόσιοι (“thousand and three-hundred”) total citizens;
6. **Politics** 5.12 (1315b24–38): the lengths of reigns of Athenian tyrants are summed to yield τριάκοντα καὶ πέντε (“thirty and five”) and Peisistratos ruled only seventeen years out of τρίακοντα καὶ τρισὶν (“thirty and three,” but the total length of the reigns of Corinthian tyrants is written τρία καὶ ἑβδομήκοντα, “three and seventy” years);
7. **Oikon**. 2.2 (1353a19): what Chabrias did when there were sixty ships and sixty extra crews, for a total of ἑκατὸν καὶ εἴκοσι (“hundred and twenty”) crews.

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100 This text confirmed by POxy 52 (1984) 3673, col. II, lines 11–12.

101 Note also the rare descending-ordered δεκατέτταρας (“fourteen”) in this passage (compare above §3). The same calculation is perhaps in Thucydides 4.39.1, see §8.
Next is a set of six descending-ordered numbers in five passages that may reflect an official or legal account, although we cannot be sure of that interpretation:

1. *Politics* 2.11 (1272b34): there are ἑκατὸν καὶ τεττάρων (“hundred and four”) magistrates in Carthage;
2. *Athen. Polit.* 4.3: there was a council of τετρακοσίους καὶ ἕνα (“four-hundred and one”) in the constitution of Drakon;
4. *Athen. Polit.* 24.3: among those supported by the tribute to Athens were six-hundred and a thousand archers, plus χίλιοι καὶ διακόσιοι (“thousand and two-hundred”) knights, and δισχίλιοι καὶ πεντακόσιοι (“two-thousand and five-hundred”) hoplites;
5. *Athen. Polit.* 35.4: the Thirty illegally executed χιλίους πεντακόσιοι (“thousand and five-hundred”) citizens.

There are a number of inconsistencies in the text of the *Constitution of Athens* that render any conclusions about these numbers uncertain. For item 3, the account about Peisistratos disagrees with that in Aristotle’s *Politics*; for item 4, the numbers of personnel supported include some in ascending order (archers), some in descending order (knights and hoplites), and one in alphabetic numerals (50 Acropolis guards); and for item 5, the well-known number of those executed by the Thirty (cf. above §5) may be standard but is not otherwise attested to be official and legal. Thirteen more descending-ordered compound numbers in the *History of Animals* (including those discussed in §3 above) seem to reflect an attempt to mark precision or accuracy of the account.¹⁰²

Some of the compound numbers in the philosophers Plato and Aristotle that are written in descending-order are associated with calculations (as was also the case in five Hippocratic works, and in three cases in Demosthenes). Some others, all in Aristotle, seem to express an

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¹⁰² See, where the * indicates I have followed the text of Balme: 5.14 (545b6–9), three in 5.14 (545b16–20)*, two in 6.4 (562b29–a1), 6.9 (564a25)*, 6.20 (574a25–28, the δεκατέτταρας), 6.22 (576a26–b2)*, 6.37 (580b13), 7(9).9 (596a7–9), 7(9).46 (630b23), and 8(9).49B (632b21).
intention to be precise or accurate, a practice seen also in one speech of Demosthenes, and probably in Apollodōros.

7. COMPOUND NUMBERS IN XENOPHON AND SOME OTHER HISTORIANS.

In turning to the historians, let us first notice that very few of the descending-ordered compound numbers we have considered so far are textually uncertain. In the Hippocratic corpus a few of them were written as numerals in some MSs, that is, still in descending order; some others, in one passage, were transformed by the most recent editor into ascending order, without any stated basis in the MSs. Two of the descending-ordered numbers in Aristotle, *History of Animals*, are written in ascending order in some MSs, but in each case Balme accepts the *lectio difficilior* of descending order. In contrast, emendations and textual variants will play a somewhat larger role in the next sections.

Aeneas Tacticus twice writes a compound number, in both cases “twenty-four,” the number of letters in his Greek alphabet; in the first passage, 31.17, it occurs in descending order, and a few lines later, 31.21, in ascending order. The first instance appears to be a calculation, where twenty-four = six times four: ἀστράγαλον εὐμεγέθη τρυπήσαι <τρυπήματα> ἐίκοσί καὶ τέτταρα, ἕξ εἰς ἑκάστην πλευρὰν τοῦ ἀστραγάλου (“bore good-sized holes in a knuckle-bone, six in each side of the knuckle-bone”).

The extant portions of the *Hellenica Oxyrhynchia* provide three instances of compound numbers: two are written in descending order and one in ascending order. In fr. B, col. 4, §3, line 12, there are εἴκοσι καὶ δύο (“twenty and two”) ships; in fr. D, col. 19, §3, line 8, there are διακόσια καὶ εἴκοσι<ν> (“two-hundred and twenty”) talents; but in fr. D, col. 21, §3, there are more than τριάκοντα καὶ εἴκατον (“thirty and one-hundred”) who died. It is possible to argue that the first two numbers represent an intention to be precise or accurate, whereas the number of dead is only an estimate.

There are 70 compound numbers in the texts of Xenophon, most of those being in his *Anabasis* (24, of which 14 are in descending order) and in his *Hellenica* (40, of which 6 are in descending order). The *De Vectigalibus* (“Poroi”) contains one compound number, in ascending

103 Aristotle indicates that, at least for biology, accuracy is desirable: *Parts of Animals* 3.5 (668b28–30), 4.13 (696b14–16), *Generation of Animals* 3.2 (753b14–17), etc.
order (4.23, διακόσια καὶ χίλια, “two-hundred and a thousand”), and the Cyropaedia contains four compound numbers in ascending order, and one in descending order (ἐίκοσι τέτταρες, “twenty four,” 6.3.21), but some scholars excise the passage.

There are relatively few descending-ordered compound numbers in Xenophon’s Hellenica (only 6/40), and four of those six are in book one—in fact, almost half of the compound numbers of the Hellenica (17/40) are in book one (moreover, none at all are in book seven). The ascending-ordered numbers in the Hellenica range from δυοῖν καὶ εἴκοσιν (“two and twenty,” 1.3.1) up to πεντακοσίους καὶ χιλίους (“five-hundred and a thousand,” 1.4.21 and 4.2.16). Since the descending-ordered compound numbers range from τετταράκοντα καὶ ἑπτά (“forty and seven,” 1.7.17) up to χιλίων καὶ πεντακοσίων (“thousand and five-hundred,” 6.2.5), it is clear that size is not the explanation for the descending-order of those six compound numbers. Three of the descending-ordered compound numbers in book one concern numbers of ships (1.6.16, ἐκατὸν καὶ ἐβδομήκοντα, “hundred and seventy;” 1.6.24 ἐκατὸν καὶ δέκα, “hundred and ten;” and 1.7.17, above), but other accounts of ships in book one are in ascending order (1.1.13, 1.2.12, 1.6.3, and 1.6.25–26), as they are in other books of the Hellenica, and in two other places (1.6.35 and 1.7.30) the detachment of forty and seven ships from 1.7.17 is counted as ἐπτὰ (μὲν) καὶ τετταράκοντα (“seven and forty”). The descending-ordered number in book two concerns talents (τετρακόσια καὶ ἐβδομήκοντα, “four-hundred and seventy,” 2.3.8): that is the only compound number of talents in the Hellenica, and may be intended as a precise or accurate account. Finally, the descending-ordered numbers in 5.4.14 (ἐκατὸν καὶ πεντήκοντα, “hundred and fifty”) and 6.2.5 (χιλίων καὶ πεντακοσίων, “thousand and five-hundred”) refer to numbers of soldiers, and are each explicitly marked as approximate (respectively, ὡς περὶ, “about,” and οὐκ ἐλάττους, “not less”).

See 1.2.13 πέντε καὶ εἴκοσιν (“five and twenty”) twice, 6.1.28 διακόσιοις καὶ χιλίοις (“two-hundred and a thousand”) cavalry, and 6.1.54 πέντε καὶ εἴκοσι τάλαντα (“five and twenty talents”).

Miller.

P. Princ. 3 (1942) #112, col. III-R, line 7, preserves the ΕΠΤΑ of the descending-ordered number in 1.7.30; see Johnson and Goodrich.
All that suggests a rather unsystematic approach to compound numbers by Xenophon in the *Hellenica*. There is a pattern of omissions that suggests the same: although Thucydides quite regularly gives the (ordinal) number of the year of the war, Xenophon—whose work commences during the 21st year, see 1.3.1 for the beginning of the 22nd year—omits to mark the 23rd year (cf. 1.4.1–2), does mark the 24th year (1.6.1) and the 25th year (2.1.7), and then again omits to mark years, the 26th and the 27th (expected at 2.2.24); finally the 28th is marked (2.3.9).

Xenophon’s treatment of compound numbers in the *Anabasis* displays some similarities and some differences. As with the *Hellenica*, more than half of the compound numbers in the *Anabasis* are found in book one (13/24), and most of the descending-ordered instances are also (10/14). The ten descending-ordered compound numbers in book one include four distance measures. The other six descending-ordered compound numbers concern military strengths. Also in book one, however, three compound numbers are written in ascending order: another distance measure (1.2.23 parasangs), and two other accounts of military forces (1.2.3 hoplites, and 1.4.2 πέντε καὶ εἴκοσιν, “five and twenty,” ships). The Vienna MS of Xenophon’s *Anabasis* was consulted, because scholars have noted that it represents a somewhat anomalous branch of the tradition; however, despite showing some evidence of scribal interference, the Vienna MS provides no basis for emending the order or value of any of the numbers in book I, or for assuming that they were transmitted via numerals.

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107 *Anabasis* 1.2.5 (εἴκοσι καὶ δύο, “twenty and two,” parasangs); 1.2.8 (εἴκοσι καὶ πέντε, “twenty and five,” feet wide the river); 1.2.20 (εἴκοσι καὶ πέντε, “twenty and five,” parasangs); and 1.5.1 (τριάκοντα καὶ πέντε, “thirty and five,” parasangs).


109 See Svensson for a precise evaluation of the MS, which can be consulted via the digital version available at [http://data.onb.ac.at/rec/AL00227175](http://data.onb.ac.at/rec/AL00227175). For descending-ordered compound numbers in book I, see: 1.2.5, f. 3r, line 4, παρασάγγας εἴκοσι καὶ δύο; 1.2.8, f. 3r, line 19, εἴκοσι καὶ πέντε ποδῶν; 1.2.9, f. 3v, lines 6–9, οἱ σύμπαντες ὁπλῖται, ἐκάτον ἑκατον καὶ εἴκοσι, πελτάσται δὲ ἄμφι τοὺς δισχίλιους; 1.2.20, f. 4v, line 14, παρασάγγας...
Although the large figures for Greek hoplites written in descending order seem to be round figures,\textsuperscript{110} when viewed in the context of the other military-strength figures all written in descending order, and given the central importance in Xenophon’s narrative of the troop-strength of the Greek army, it may be a better interpretation to view all of these as representing an accurate account or an inventory (similar to what we have seen for Aristotle, and in Demosthenes and perhaps Apollodōros). Similarly, the distances that are compound numbers written in descending order can be seen as an attempt to represent accurately the voyage. One reading of the \textit{Anabasis} interprets the narrative in just that sense: the journey along the royal road is accurate, but when the Greeks retreat off road across country, time and space become distorted and paradoxical.\textsuperscript{111}

There are only four descending-ordered compound numbers in the remaining six books of the \textit{Anabasis}, namely: 2.4.24 (τριάκοντα καὶ ἑπτὰ, “thirty and seven,” boats composing a bridge), 5.3.3 (ὀκτακισχίλιοι καὶ ἑξακόσιοι, “eight-thousand and six-hundred,” surviving hoplites), 5.5.5 (τετταράκοντα πέντε, “forty five,” days of rest for the Greeks), and 6.1.15 (χίλια καὶ πεντακόσια, “thousand and five-hundred,” jars of wine).\textsuperscript{112} Two of these can be read as giving a precise or accurate account:

\begin{itemize}
  \item εἴκοσι καὶ πέντε; 1.4.2, f. 8r, line 5, νῆες τριάκοντα καὶ πέντε; 1.5.1, f. 10r, line 16, παρασάγγας τριάκοντα καὶ πέντε; and 1.7.10–12, f. 14v, lines 14–16, 19 + f.15r, line 3, ἐν τῇ ἐξο/\[15\] ἀριθμὸς ἐγένετο … ἀσπίς μυρία καὶ τετρακόσιοι, πελτασταὶ δὲ δυσχίλιοι καὶ τετρακόσιοι … [19] ἔκατον καὶ εἴκοσι μυριάδες … [3] ἄρματα δρεπανηφόρα ἔκατον καὶ πεντήκοντα. Svensson 10 explains the second τετρακόσιοι at f. 14v, line 16, as a mistaken copy of the first one; in any event, the use of numerals could not explain such a mistake for the πεντακόσιοι in the bulk of the tradition. For ascending-ordered compound numbers in book I, see: 1.2.3, f. 2v, lines 15–16, εἰς πεντακόσιους καὶ χιλίους; 1.2.23, f. 5r, παρασάγγας πέντε καὶ εἴκοσιν; and 1.4.2, f. 8r, line 7, ναῦς ἑτέρας … πέντε καὶ εἴκοσιν. The MS contains what appears to be a scholarly \textit{marginalium} (with numbers) incorporated into the text of 1.2.9, see Svensson 5 (\textit{ad} Hude p. 6.16: for the citation, see Svensson 3).
  \item εἴκοσι καὶ πέντε; 1.4.2, f. 8r, line 5, νῆες τριάκοντα καὶ πέντε; 1.5.1, f. 10r, line 16, παρασάγγας τριάκοντα καὶ πέντε; and 1.7.10–12, f. 14v, lines 14–16, 19 + f.15r, line 3, ἐν τῇ ἐξο/\[15\] ἀριθμὸς ἐγένετο … ἀσπίς μυρία καὶ τετρακόσιοι, πελτασταὶ δὲ δυσχίλιοι καὶ τετρακόσιοι … [19] ἔκατον καὶ εἴκοσι μυριάδες … [3] ἄρματα δρεπανηφόρα ἔκατον καὶ πεντήκοντα. Svensson 10 explains the second τετρακόσιοι at f. 14v, line 16, as a mistaken copy of the first one; in any event, the use of numerals could not explain such a mistake for the πεντακόσιοι in the bulk of the tradition. For ascending-ordered compound numbers in book I, see: 1.2.3, f. 2v, lines 15–16, εἰς πεντακόσιους καὶ χιλίους; 1.2.23, f. 5r, παρασάγγας πέντε καὶ εἴκοσιν; and 1.4.2, f. 8r, line 7, ναῦς ἑτέρας … πέντε καὶ εἴκοσιν. The MS contains what appears to be a scholarly \textit{marginalium} (with numbers) incorporated into the text of 1.2.9, see Svensson 5 (\textit{ad} Hude p. 6.16: for the citation, see Svensson 3).
\end{itemize}

\textsuperscript{110} \textit{Cf.} Lendle 18, 57–58.

\textsuperscript{111} Purves 159–184; Rood (2010) 56, 59–60.

\textsuperscript{112} Here also the Vienna MS was consulted, see: 2.4.24, f. 32r, line 18, πλοίοις τριάκοντα καὶ ἑπτὰ, where Svensson 15, \textit{ad} Hude p. 66.14, notes that MS “D” (Bodleianus) has the ascending order, ἑπτὰ καὶ τριάκοντα; 5.3.3, f. 82v, lines 6–7,
the unusual and important boat-bridge, and the official muster record of
the surviving hoplites (note ἐξέτασις, “scrutiny”) that mirrors the initial
muster record in 1.7.10–12. The other two may represent calculations:
the Greeks rested for half a season, i.e., 90/2 days (cf. Apollodóros, Polycles
§19); and the jars of wine are exactly half the number of measures of
barley also sent as gifts to the Greeks.

There are in addition three passages that seem to offer calcula-
tions, two of which contain only descending-ordered numbers (2.2.6
ascending-ordered; 5.5.4; and 7.8.26): these are often seen as Byzantine
interpolations by a commentator, but have been defended.113 The first
summarizes the stages and parasangs and stades of the outward jour-
ney; the second likewise summarizes the return journey; and the third
summarizes the entire journey. Since Xenophon is less precise about the
return journey, and may well have been representing it as chaotic and
paradoxical, it seems somewhat unlikely that the summaries in books
five and seven are his. Nor is it clear what narrative purpose even the
summary in book two would serve.

Only in book one of the Anabasis can Xenophon’s practice in writ-
ing compound numbers in descending order be seen as systematic, and
there he appears to be representing his account of the outward journey
as accurate, as if an inventory of distances.114 In four other passages of
the Anabasis he offers descending-ordered compound numbers that may
be representing either accuracy (2.4.24 and 5.3.3), or else the results
of a calculation (5.5.5 and 6.1.15). One final note before turning to
Thucydides: of the compound numbers in the twenties in the texts of
Xenophon, most (13/18) have the value “25,” whether ascending or
descending ordered, which suggests a preference for that number as a
round figure.

ἐξέτασις σὺν τοῖς ὅπλοις / ἐγίγνετο καὶ ἀριθμός, καὶ ἐγένοντο ὀκτακισχίλιοι καὶ
ἐξακόσιοι; 5.5.5, f. 86v, lines 11–12, ἐνταῦθα ἐμείναν ἡμέρας τετταρά/κοντα καὶ
πέντε (the καὶ not found in most MSs); and 6.1.15, f. 98v, lines 7–8, ἀλφίτων
μεδίμνους τρισχιλίους, οἴνου / δὲ κεράμια χίλια καὶ πεντακόσια.

113 See Lendle 97–98, 333–334 (marginal note by Xenophon himself that was taken
into the text), and 486–487, respectively.

114 Note that neither the MSs (Jackson) nor the papyri (Dillery and Gagos 186–189)
show any variants in the writing or values of the numbers.
8. COMPOUND NUMBERS IN THUCYDIDES.

Thucydides uses many compound numbers in his text: 142 in about 153,000 words (0.93%), a rate higher than Demosthenes (76 in about 245,000 words, or 0.31%) or even Apollodōros (17 in about 30,000 words, or about 0.57%). The relative frequency of compound numbers rises in years 19, 20, and 21 of the war (i.e., in 7.19 to the end). However, the proportion of compound numbers that is written in descending order is relatively small (only 11/142, or less than 8%): contrast Xenophon (21/70, or 30%), Demosthenes (38/76, or 50%), or Aristotle (27/45, or 60%); the proportion in Thucydides is closer to, but even lower than, that in Plato (5/34, or 15%).

Of the eleven descending-ordered compound numbers in Thucydides, four may be calculations (1.116.1, 3.17.2, 4.39.1, and 5.68.3); two are official accounts (1.96.2 and 2.58.3); and the other five are uncertain (1.10.4, 1.29.1, 3.20.2, 4.11.2, and 7.34.3). Note that some passages based on official accounts provide rounded and ascending-ordered numbers: 2.13.3–8 and 6.43. Note also that most (9/11) of the descending-ordered numbers are in the first part of the war (i.e., up to 5.25), with only 5.68.3 and 7.34.3 in the second part of the war.

115 Without precise word-counts for the text covering each year, it is difficult to make careful comparisons, but the proportion in the first five books is 65 compound numbers in 380 OCT pages (or 0.17), whereas in years 19 through the end, the proportion is 58 compound numbers in 133.5 OCT pages (or 0.43), about 2.5 times as many.

116 The Vienna MS Cod. Hist. Gr. 33 (which breaks off at 6.14) was consulted via the digital version, http://data.onb.ac.at/rec/AL00116294. See: 1.10.4, f. 2v, line 18, χιλίων καὶ διακοσίων νεῶν; 1.29.1, f. 6v, line 6, ἐβδομήκοντα ναυσὶ καὶ πέντε, δισχιλίους τ’ ὅπλιταις ἔπλεον; 1.96.2, f. 18v, line 30, τετρακόσια τάλαντα καὶ ἕξηκοντα; 1.116.1, f. 22r, line 11, τεσσαράκοντα δὲ ναυσὶ καὶ τέσσαροι; 2.13.3, f. 31v, lines 25–26, τρι/ακοσίων ἀποδέοντα, μύρια ἐγένετο; 2.58.3, f. 40r, lines 12–13, ἀπὸ τετρακισχιλίων ὀπλιτῶν χιλίους καὶ πεντήκοντα; 3.17.2, f. 54r, lines 30–31, ὥστε αἱ πᾶσαι ἄμα ἐγίγνοντο ἐν ἑνὶ θέρει δια/κόσιαι καὶ πεντήκοντα; 3.20.2, f. 54v, line 28, ἐς δὲ ἄνδρας διακοσίους καὶ εἰκοσὶ μάλιστα; 4.11.2, f. 76r, line 19, τεσσαράκοντα καὶ τρισί; 4.39.1, f. 82r, lines 29–31 + f. 82v, line 1, χρόνος δὲ ὁ / [30] ξύμπας ἐγένετο ὅσον οἱ ἄνδρες οἱ ἐν τῇ νήσῳ ἐπολιορκήθησαν, ἀπὸ τῆς ναυμα/χίας μέχρι τῆς ἐν τῇ νήσῳ μάχης, ἐβδομήκοντα ἡμέραι / καὶ δύο; 5.68.3, f. 115v, lines 21–22, τετρακό/σιοι καὶ δυοίν δέοντες πεντήκοντα.
The calculation in 1.116.1 is relatively simple: sixty ships in the fleet sent to Samos, less sixteen detached for other duties, leaves τεσσαράκοντα δὲ ναυσὶ καὶ τέσσαρας (“forty ships and four”).\(^\text{117}\) The grand total of ships given in 3.17.2, ὥστε αἱ πᾶσαι ἅμα ἐγίγνοντο ἐν ἕνι θέρει διακόσιαι καὶ πεντήκοντα (“so that the whole (number) in one summer was two-hundred and fifty”), looks like it is being given as the calculated sum of the two prior hundreds, plus those at Potidaea and in other places.\(^\text{118}\) The lengthy period of the siege of Sphacteria is given as (4.39.1): χρόνος δὲ ὁ ξύμπας ἐγένετο … ἐβδομήκοντα ἡμέραι καὶ δύο (“the whole time was … seventy days and two”), which could be a calculation of days from a record that stated “the fifth part of a year,” as in Aristotle, *History of Animals* 6.20 (574a25–28), above §5. The fourth calculation, 5.68.3, is quite explicitly a calculation, the number of Spartans in the front rank, τετρακόσιοι καὶ δυνὸν δέοντες πεντήκοντα (“four-hundred, and two less than fifty;” note the unusual order), although Thucydides does not make clear how he calculated that number.\(^\text{119}\)

Although the most lengthy “official” accounts, 2.13.3–8 and 6.43, use only ascending-ordered numbers, two apparently official accounts, each of which is effectively an inventory, may be engaging in a rhetoric of precision by using descending-ordered numbers. In 1.96.2, Thucydides states the total amount of the first tribute payment by the allies to Athens, τετρακόσια τάλαντα καὶ ἑξήκοντα (“four-hundred talents and sixty”), seemingly drawing attention to this pivotal moment by stating the amount precisely.\(^\text{120}\) In 2.58.3, Thucydides records that, out

\(^{117}\) Unfortunately, *POxy* 49 (1982) #3450 includes Thuc. 1.116.1 only from ὥν ἦσαν αἱ εἴκοσι στρατιώτιδες, some 70 characters after the number τεσσαράκοντα δὲ ναυσὶ καὶ τέσσαρας.

\(^{118}\) Earlier editors often bracketed the whole chapter as intrusive, but Adcock, Gomme v. 2 (1956) 272–277, and Hornblower vol. 1 400–401, all defend the passage as Thucydidean, albeit perhaps displaced.

\(^{119}\) Andrewes in Gomme, Andrewes, Dover, v. 4 (1970) 110–117, explains the 448 = 4 times 4 times 4 times 7; Hornblower, v. 3 180–182, accepts the numbers in the text, but concludes Thucydides erred on Spartan military order; Keyser (2008a) 338 explains as an incomplete calculation.

\(^{120}\) Earlier historians disputed the figure as unhistorical, but Gomme, v. 1 (1956) 273–279; Chambers; and Hornblower, v. 1 145–146, all defend the value.
of an original force of four thousand, a total of χιλίων καὶ πεντήκοντα ("thousand and fifty") Athenian hoplites were destroyed by the plague in about forty days: the extraordinary claim seems intended to be precise.

The remaining five descending-ordered compound numbers, of ships or men, do not admit of any convincing explanation (much like some of the descending-ordered compound numbers in Xenophon’s Hellenica, above §7, and in Demosthenes, above §5), although it should be noted that Thucydides makes a point of his desire for accuracy in his account.\(^\text{121}\) Thucydides gives the total number of ships in the Homeric “catalogue of ships” in descending order (1.10.4): χιλίων καὶ διακοσίων νεῶν (“of the thousand and two-hundred ships”).\(^\text{122}\) Thucydides gives the number of Corinthian ships sent against Corcyra as (1.29.1): ἑβδομήκοντα ναυσὶ καὶ πέντε (“seventy ships and five”) and other numbers in the passage have been disputed.\(^\text{123}\) Thucydides states that (3.20.2): ἐς δὲ ἄνδρας διακοσίους καὶ εἴκοσι μάλιστα (“about two-hundred and twenty men”) persisted in making the sortie from Plataea, an unusual instance of a compound number that is both explicitly approximate and is written in descending order (cf. above §7, Xenophon, Hellenica 5.4.14 and 6.2.5, also of soldiers). As in 1.29.1, Thucydides in 4.11.2 gives the number of Spartan ships in descending order: τεσσαράκοντα καὶ τρισί (“forty and three”).\(^\text{124}\) Finally, in 7.34.3, Thucydides records that the Athenians sailed out from Naupaktos with τριάκοντα ναυσὶ καὶ τρισίν (“thirty ships and three”) against a Peloponnesian fleet of five and twenty. There seems no reason or narrative point to signal precision in any of these.

\(^{121}\) He refers to the ἀκρίβεια of his work both in 1.10.1, and in his programmatic passage, 1.22.1–2

\(^{122}\) Cf. also Keyser (2008a) 338, arguing that it is a kind of calculation manquée.

\(^{123}\) Gomme, v. 1 (1956) 163–164, notes that because the “2000” (Corinthian hoplites) in 1.29.1 disagrees with the “3000” in 1.27.2 (as noted even by a scholiast), editors emend one or the other of those two numbers (e.g., Herwerden suggested ἑβδομήκοντα ναυσὶ καὶ πεντ<ακ>ϑιλίως, instead of … πεντ[ε δ]ιακοσίως, i.e., “seventy ships and five-thousand (men),” removing a descending-ordered compound number). However, Gomme concludes that it is “idle to guess at the true figure,” since we do not know how the numbers in 1.29.1 were written: in words, or in alphabetic numerals, or in acrophonic numerals (that is, he implicitly accepts the need for emending the thousands). However, Hornblower, v. 1 73 denies need to emend either “2000” or “3000.”

\(^{124}\) Accepted by Gomme, v. 1 (1956) 447.
Just as for Xenophon (above, §7), among the compound numbers in the twenties, most (17/29) are “25,” and of values other than “25,” most (10/12) are in book 8. That would seem to be the kind of stylistic difference already adverted in late antiquity by Marcellinus, and used in modern debates about the “strata of composition” in Thucydides. This sort of stylistic difference might arise from editing by a literary executor of the author, or from the author’s own change of style, simply because book 8 happens to cover a lot of naval warfare and compound numbers in the twenties other than “25” more often represented the number of ships deployed, or in other ways to which we no longer have access. It is nevertheless a distinct difference.

Scholars have often intervened in the text of Thucydides to alter numbers, and much of that work is based on the assumption that the numbers were transcribed from words to numerals in various ways and at various times. Unlike, however, the changes proposed in the Hippocratic corpus by Potter (above, §4), none of the changes proposed in Thucydides alters the order in which a compound number is written, although several reduce a compound number to a simple number.

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126 As suggested to me per litteras by Catherine Rubincam, 2014 March 31.

127 See esp. Hemmerdinger (1955) 30–31: “En ce qui concerne la graphie des nombres dans le modèle de l’archétype, on a dû, au moins dans quelques cas, passer de la forme en toutes lettres aux chiffres ioniens. … En revanche, dans nos manuscrits médiévaux de Thucydide, s’il arrive souvent que les marginalia présentent des nombres en chiffres ioniens, les nombres sont régulièrement écrits en toutes lettres dans le texte, et des graphies comme υ´400’, présentée par B en 1, 18, 1 et μ’, ‘40’, présentée par EF en 8, 80, 1, y sont exceptionnelles.”

128 Two changes noted above: see 1.29.1 and 2.13.3. Similarly, some editors excise δύο καὶ from the ascending-ordered number δύο καὶ τεσσαράκοντα ναῦς (“two and forty ships”) in 3.26.1, in order to remove an apparent inconsistency with 3.25.1 plus 3.29.1. E.g., see Gomme, v. 2 (1956) 288, who prefers to imagine that the entire number “forty” was added at 3.29.1, and that Thucydides here wrote “two and forty” without explaining the discrepancy; Hornblower, v. 1 409, accepts the deletion. A fourth case is 7.16.2, where most MSs read εἴκοσι, “twenty,” but one MS and an early Latin translation have “twenty and one-hundred,” a value that D.S. 13.8.7 confirms; see: Hemmerdinger (1955) 58; Andrewes in Gomme, Andrewes, and Dover v. 4 (1970) 393; and Hornblower, v. 3 471.
Furthermore, *POxy* 1 (1898) # 16, col. III, line 4, confirms the descending order in 4.39.1 “seventy days and two”: 129

ΕΒΔΟΜΗΚΟΝΤΑ ΗΜΕΡΑΙ ΚΑΙ ΔΥΟ

Thucydides uses relatively few descending-ordered compound numbers (although many ascending-ordered compound numbers), and most of the descending-ordered compound numbers are in the first part of the war (i.e., up to 5.25). Of the eleven descending-ordered compound numbers in Thucydides, four may be calculations, two are official accounts or inventories, and the other five are uncertain. Most of the compound numbers in the twenties are “25,” and of values other than “25,” most are in book 8. That is, overall Thucydides’ practice with compound numbers is rather similar to that of Xenophon, especially in the later books, although Thucydides uses far fewer in descending order.

9. COMPOUND NUMBERS IN HERODOTOS.

Herodotos uses many compound numbers in his text, 137 in about 189,000 words (or 0.72‰), which is lower than Thucydides (142 in about 153,000 words, or 0.93‰), but higher than other corpora (above, §7). The proportion of those that are descending-ordered is 21/137 (or 15%), which is about twice that in Thucydides (less than 8%), and about half that in Xenophon (29%). Unlike Thucydides and Xenophon, the proportion of compound numbers does not seem to vary greatly from book to book.

It has been argued that the descending-ordered compound numbers in Herodotos result from calculations. 130 Indeed, of the twenty-one compound numbers in Herodotos, these sixteen occur in calculations: 131

1. 1.32.3–4, two: τρίηκοντα πέντε … χίλιαι πεντήκοντα (“thirty-five … thousand fifty”);

129 The same papyrus, col. II, line 49, confirms the value and ascending order of the “twenty and one-hundred” in 4.38.5.

130 Keyser (1986) 231–232, suggesting that the calculations were performed on an abacus or using an algorithm based on the acrophonic numerals.

131 For most of those see Keyser (1986); omitted by Keyser, but surely also a calculation, is 6.117.1, on which see Wyatt.
Three compound numbers written by Herodotos in descending order appear to represent official records, and can be seen as inventories: 2.100.1, 8.1.1, and 8.14.1. In the first case, Herodotos says so explicitly: οἱ ἱρέες ἐκ βύβλου ἄλλων βασιλέων τριηκοσίων τε καὶ δέκα ... πεντήκοντα μυριάδες καὶ μία ... διηκόσια τε μυριάδες καὶ τριήκοντα καὶ μία (“three-myriad and six-thousand and in addition two-hundred and ten ... fifty myriads and one ... two-hundred myriads and thirty and one”).

2. 2.9: χίλιοι καὶ ὀκτακόσιοι (“thousand and eight-hundred”); 132
3. 2.142.3: ἐν μυρίοισι τε ἔτεσι καὶ χιλίοισι καὶ πρὸς τριηκόσιοι τε καὶ τεσσεράκοντα (“in a myriad years and a thousand and in addition three-hundred and forty”);
4. 3.90.3: τριηκόσια καὶ εξήκοντα (“three-hundred and sixty”);
5. 3.95.2: μύρια καὶ τετρακισχίλια καὶ πεντακόσια καὶ εξήκοντα (“myriad and four-thousand and five-hundred and sixty”);
6. 6.117.1, two: ἐξακισχίλιους καὶ τετρακισχίλιας ... έκατόν καὶ ἑνενήκοντα καὶ δύο (“six-thousand and four-hundred ... hundred and ninety and two”);
7. 7.184.2–5, three: τρισμύριοι καὶ εξακισχίλιοι καὶ πρὸς διηκόσιοι τε καὶ δέκα ... πεντήκοντα μυριάδες καὶ μία ... διηκόσια τε μυριάδες καὶ τριήκοντα καὶ μία (“three-myriad and six-thousand and in addition two-hundred and ten ... fifty myriads and one ... two-hundred myriads and thirty and one”);
8. 7.185.3: μυριάδες διηκόσια καὶ εξήκοντα καὶ τέσσερες (“myriads, two-hundred and sixty and four”);
9. 7.186.2: πεντακόσιας τε μυριάδας καὶ εἴκοσι καὶ ὀκτώ (“five-hundred myriads and twenty and eight”); 135
10. 8.2.1: διηκόσια καὶ ἐβδομήκοντα καὶ μία (“two-hundred and seventy and one”); 134
11. 8.48: τριηκόσια καὶ ἐβδομήκοντα καὶ ὀκτώ (“three-hundred and seventy and eight”); 135
12. 9.28.3: χίλιοι καὶ πεντακόσιοι (“thousand and five-hundred”). 136

132 Rosén reports that MSs MJT and DRSV read εἴκοσι for χίλιοι (sic).
133 Rosén reports that in place of εἴκοσι καὶ ὀκτώ, MS S reads τριάκοντα.
134 Rosén reports that MSs DRSV reverse the word order.
135 Rosén reports that MSs DRSV read ὀκτώ καὶ πεντήκοντα καὶ τριηκόσιαι (“eight and fifty and three-hundred”).
136 Note also that the large results in 9.29.1 and 9.30, expressed in myriads and chiliads and hekatontads, are written in descending order as well.
τρίήκοντα οἶνόματα (“the priests read from a scroll the names of another three-hundred and thirty kings”). When Herodotos records the number of ships engaged at Artemision, he gives round figures for the other contingents, but: Ἀθηναῖοι μὲν νέας παρεχόμενοι ἑκατὸν καὶ εἴκοσι καὶ ἑπτά (“the Athenians provided one-hundred and twenty and seven ships”), which is presumably based on official records supplied to Herodotos in Athens. In 8.14.1, Herodotos reports the precise number of Athenian ships arriving as reinforcements and bearing dispatches: τοῖσι δὲ Ἑλληνιστι οὖνες πεντήκοντα καὶ τρεῖς Ἀττικαί (“fifty and three Athenian ships came to aid the Greeks”), and again, the number seems to be based on Athenian records.

Two compound numbers written by Herodotos in descending order do not admit of any simple explanation: 3.47.3 (τριηκοσίας καὶ ἑξήκοντα, “three-hundred and sixty,” threads in the yarn), and 6.27.2 (ἑκατὸν καὶ εἴκοσι, “hundred and twenty,” boys at school). In each case we may guess that the number derives from an inscription recording the data that Herodotos then reported. These probably belong with the sixteen calculations, and the three inventories, as instances of numbers intended to be understood as precise or accurate. Herodotos, like several Hippocrates, and like Thucydides, presents his work as accurate and precise.

Several of the numbers cited above have significant MS variants, in which the descending order is reversed (primarily by the family of MSs DRSV in book eight: 8.1.1, 8.2.1, 8.14.1, 8.48), or even altered in value: in 2.9, the descending-ordered χίλιοι καὶ ὀκτακόσιοί (“1800”) becomes an ascending-ordered ἐκικοσι καὶ ὀκτακόσιοι (“820,” in MSs MJT and the family DRSV); in 7.186.2, the value “521” becomes “530” (MS S); and in 8.48, the value “378” becomes “358” (MSs DRSV). The simplest explanation, and the best way to preserve here the principle

137 Rosén reports that MSs MP and the family DRSV reverse the word order.

138 Keyser (1986) 232, n. 11, refers to 6.27.2 as containing a calculation, which is the “hundred less two equals eight and ninety,” just prior to this “hundred and twenty.”

139 Herodotos refers to the ὀτρεκέξ of his account, or his silence when faced with the lack of that, in twenty-six passages (the * marks those six passages where the issue of accuracy or the lack of accuracy concerns numbers rather than other matters): 1.57.1, 1.140.1–2, 1.160.2*, 1.172.1, 2.145.2–3*, 2.154.4, 2.167.1, 3.98.2, 3.115.1, 3.116.1, 4.16.1–2, 4.25.1, 4.81.1*, 4.187.3, 5.9.1, 5.54.1–2*, 6.14.1, 7.54.3, 7.60.1*, 7.152.1, 7.187.1*, 7.214.2, 8.8.2, 8.87.1, 9.18.2, 9.84.1–2.
of adhering to the lectio difficilior, is to hypothesize a greater degree of scribal intervention in the archetype of the family DRSV, and follow the reading of the other MSs.

Furthermore, papyrological evidence confirms the reading of several compound numbers,\textsuperscript{140} and the family represented by MSs DRSV proves to be unreliable regarding numbers.\textsuperscript{141}

a) First, \textit{POxy} 1 (1898) \# 18, lines 19–20, confirms the ὀκτὼ καὶ εἴκοσι in 1.106.1.

b) Second, in 2.161.2, where MSs DRV (the same family again) read ἐν τε for πέντε, the papyri are read as confirming the number: \textit{POxy} 8 (1911) \# 1092, lines 24–25: ΠΡΟΤΕΡΟΝ ΒΑΣΙΛ[έων, ἐπ’ ἔτεα πέν/ΤΕ ΚΑΙ ΕΙΚΟΣΙ ΑΡΞ[ας …; and \textit{POxy} 48 (1981) \# 3377, lines 5–6: ΕΠ ΕΤΕ[α … / ΤΕ ΚΑΙ ΕΙΚΟΣΙ ΑΡΞΑΣ … (space for three letters after ἔτεα and before -τε)).

c) Third, in 3.10: βασιλεύοσας ὁ Ἀμασις τέσσερα καὶ τεσσεράκοντα ἔτεα ἀπέθανε (“Amasis, having ruled for four and forty years, then died”), the MSs SV (the same family again) omit the τέσσερα καὶ.

d) Fourth, in 3.90.2: ἔξηκοντα καὶ τριηκόσια τάλαντα ἦν φόρος (“sixty and three hundred talents was the tribute”), the MSs DRV (again, the same family) read ἔξηκοντα καὶ τριηκόντα (i.e., “sixty and thirty”) for ἔξηκοντα καὶ τριηκόσια (“sixty and three-hundred”).

e) Fifth, in 3.95.1: τὸ μὲν δὴ ἀργύριον τὸ Βαβυλώνιον πρὸς τὸ Εὐβοϊκόν συμβαλλόμενον τάλαντον γίνεται τεσσεράκοντα καὶ πεντακόσια καὶ εἴνακισχίλια (“the Babylonian silver being computed on the Euboic talent, becomes forty and five-hundred and nine-thousand”), MS S (the same family again) has a marginal ΘΩΠ (“9880”), which has long tempted commentators.\textsuperscript{142}

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\textsuperscript{140} See Paap for an earlier collection of Herodotean papyri.

\textsuperscript{141} Hemmerdinger (1981) 166–167 concludes that the variants are “dues à la usage des chiffres.”

\textsuperscript{142} See de la Barre (1733) 341–344 and (1740) 228–230. Keyser (1986) 238–242 provides further bibliography, and argues that Herodotos wrote the text that the MSs offer, but that he made an error in his calculation.
f) Sixth, in 7.185.1, for τετρακισχίλιοι καὶ δισμύριοι ("four-thousand and two-myriad"), the MSs DRSV (again, the same family) read τετρακισχίλιοι καὶ τρισμύριοι ("four-thousand and three-myriad").

g) Seventh, in 8.1.1, the number of ships supplied by Athens, POxy 48 (1981) # 3382, lines 2–3, confirms the value and the descending order: παρεχόμενοι ἐκατόν καὶ εἴκοσι καὶ ἑκατόν ("seven and twenty and a hundred").

The eighth, ninth, and tenth cases concern anomalous readings by the family of MSs DRSV in 8.2.1, 8.14.1, and 8.48, discussed just above. Finally, an eleventh case is 9.30, ἕξ τε μυριάδες καὶ ἐννέα χιλιάδες καὶ ἑκατοντάδες πέντε ("six myriads and nine chilias and five hectads"), where again it is the family of MSs DRSV that omit the ἑννέα χιλιάδες καὶ (and MS M reads πέντε for ἑπτά).

On the other hand, there is one possible instance of a papyrus using numerals for an ascending-ordered number. Herodotos 2.145.2 reads:

Πανὶ δὲ ἔτι τούτων πλέονα λέγεται εἶναι, Διονύσῳ δὲ ἐλάχιστα τούτων, καὶ τούτῳ πεντακισχίλια καὶ μύρια λογίζονται εἶναι ἐς Άμασι βασιλέα.

From Pan to these they say it is a longer time, and even from the youngest of these, Dionysos, they reckon five-thousand and a myriad (years) to king Amasis.

One lacunose late-antique papyrus seems to have written the number in numerals. Such scribal abbreviations are quite rare, and this is the earliest attested; moreover, the papyrus may be an excerpt, as if from a florilegium, for which the scribe may have been at liberty to abbreviate, much as the Suda does when excerpting Herodotos, giving numerals for words.

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143 Bannert and Harrauer 25–28, pl. 1, lines 5–8, record a third-century CE papyrus in which the number is lost but there would only have been space for a numeral (ιε): εἶναι, ΔιΟΥΣΩ Δόελάχιστα τούτων, καὶ τούτῳ πεντακισχίλια καὶ μύρια λογίζονται εἶναι ἐς Άμασι βασιλέα. Cf. also the alphabetic numeral N for “50” in 1.25.1 (MS D: from the unreliable family), and the alphabetic numeral Δ for “4” in 1.192.1 (MS C), as reported by Hemmerdinger (1981) 167.

144 Suda γ–472, on Gyges (from Herodotos 1.14–18), and Suda α–453 (from 8.61).
All but five of the twenty-one descending-ordered compound numbers in Herodotos occur in calculations, and three of the five exceptions seem to report official accounts, or inventories (Athenian ships or Egyptian records). These sixteen passages in Herodotos are established as calculations on the basis of what the passages say is being done with the numbers, a determination that is independent of the way in which the numbers are recorded. The MSs and the papyri tend to confirm the descending-ordered readings, and the anomalous readings of the family represented by MSs DRSV should be rejected.

10. SUMMARY OF THE SURVEY.

The results of examining the descending-ordered compound numbers in the corpora above are given in Table 2. There, they are categorized as “Larger” (meaning descending-ordered compound numbers larger than some threshold), “Calculation” (meaning descending-ordered compound numbers that result from a calculation), “Precise” (meaning descending-ordered compound numbers that express precision or accuracy or reflect an official account or inventory), and “Other” (meaning descending-ordered compound numbers whose raison d’être has not been elucidated).\footnote{The table does not include the eight descending-ordered compound numbers from intrusive documents in the Demosthenic corpus (cf. §5). The counts for “Xenophon” include the calculation in Aeneas Tacticus, and also the two descending-ordered compound numbers in the Hellenica Oxyrhynchia whose raison d’être is unclear (cf. §7).}

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The overall proportion of descending-ordered compound numbers that readily admit of an authorial explanation is 136/192 (or 71%). Some of the 56 lacking an explicit explanation may nevertheless have had one, e.g., that Aeschines wrote all compound numbers in descending order must be deliberate, even if we cannot say why.
eleven from Aeschines, plus three that are plausibly expressing precision, i.e., Aristotle, *Politics* 2.11, and Herodotos 3.47.3 and 6.27.2, we would have 150/192 or 78%.)

There is great variation across corpora, and even within corpora: Aristotle uses far more compound numbers in more diverse ways than does Plato; whereas Herodotos, and some works of the Hippocratic corpus, deploy far more calculations than other works of the Hippocratic corpus; and the orators are more prone to precision. That is consistent with the expectation raised by Hawke, that there will be different types of numerate culture coexisting within Greek society in a given era; that appears to be the case not only in the era he studied (up to ca. 550 BCE), but also in the more than two centuries thereafter. As Thomas points out regarding literacy, there are different kinds, and Greek society was at any given moment likely populated with individuals mastering different literacies. We may transfer her argument to numeracy: there are different kinds, and Greek society was at any given moment likely populated with individuals mastering different numeracies. The kind of numeracy that allows mastering inventories and calculations we may designate as “commercial” literacy, and we may well expect that it became more widespread as time passed from the archaic period into the mid-fourth century BCE. Similarly, we may well expect that such authors as Herodotos the merchant, itinerant Hippocratics, and orators who dealt with commercial or inheritance cases, would be the ones to manifest a greater degree of “commercial” literacy.

Moreover, this study seems to show that there is a good case that number-words written in ascending order are authorial and not the result of a transcription from numerals (which would be descending-ordered), whereas number-words written in descending order could be authorial (i.e., rather than transcribed from numerals), and written to represent calculations, official accounts, precision, or large values. There is no evidence that ancient Greek writers obeyed a rule similar to that in the *Chicago Manual of Style*, §9.2, according to which numbers smaller than some threshold were written out in words, and larger numbers were written in numerals.

Scholars have argued that numbers written in words could perhaps represent the transcription (whether by author or scribe) of numerals. But many of the descending-ordered numbers in the texts studied contain particles, or even nouns, so that a simple “transcription” from numerals

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146 Hawke 37–38.
is ruled out. Some might still wish to argue that scribes “regularized” number-words that they copied by inverting their order in the text, but there is little evidence in most texts for such drastic and systematic scribal interventions (a few such passages in Herodotos are discussed above, §9). However, scholars often argue that scribes may have changed numerals to words, or words to numerals. Below are three examples of such emendations from the corpora studied herein: in light of the patterns established, none is very likely.

Example 1: Demosthenes, #21 Meidias §154, reads: ὃς δύο καὶ τριάκοντ’ ἔτη γέγονα (“I, who have lived two and thirty years”). Scholars have wanted to increase that number, and have suggested that the δύο arose from a misunderstood Δ (i.e., the alphabetic numeral “four”), or that a Π was omitted from the acrophonic numeral ΔΔΔΠΙΙ. But a papyrus confirms the reading, the age may be a trope (cf. Lysias #11, Theomnestos II.1), and the number is written in ascending order, and thus likely was never represented in numerals.

Example 2: Thucydides 2.2.1, specifying when the war started, reads: Πυθοδώρου ἔτι δύο μῆνας ἀρχοντος Ἀθηναίοις, μετὰ τὴν ἐν Ποτειδαίᾳ μάχην μηνὶ ἕκτῳ (“Pythodorus still had two months to serve as archon at Athens, after the battle at Potidaea in the sixth month”). Here also scholars have wanted to increase the value, arguing that the time interval was too short, and they emend to τέσσερες, arguing that Δ (i.e., the alphabetic numeral “four”) was mistaken for (an abbreviated) ΔΥΟ. Three similar examples are as follows. First, Thucydides 8.67.2, where the MSs mostly read δέκα, but a few MSs are reported to have Δ, taken for the alphabetic numeral “four” rather than the acrophonic numeral “ten.” Second, Herodotos 8.131.3, where the δυῶν of the MSs is explained as the acrophonic numeral Π misread for a hypothetical original acrophonic Π, i.e., “five.” However, an early scribal confusion

147 MacDowell ad loc.

148 POxy 11 (1915) #1378, col II, lines 19–21: … ΟΣ / ΔΥΟ Κ[αὶ τ]ΡΙΑΚΟΝΤ ΕΤΗ / ΓΕΓΟΝΑ …. 

149 Gomme, v 1 (1956) 2; Hornblower, v. 1 238 rightly retains the “two,” and dismisses the worries about the time interval.

150 Hemmerdinger (1955) 29–30; not recorded in the OCT of Jones and Powell.

151 Rosén ad loc.
about the meaning of the phrase containing the emended number, or
even an intrusive gloss, cannot be excluded. Third, Herodotos 9.57.2,
where the δέκα of the MSs is emended to τέσσαρα, for topographical
consistency, and explained as an original Δ, i.e., the alphabetic numeral
“four,” misunderstood as the acrophonic numeral Δ for “ten.”\textsuperscript{152} However, it may be Herodotos’ topography that is at fault.

Example 3: In 2.145, Herodotos means to explain that three gods
whom the Greeks regard as young (2.145.1, Herakles, Dionysos, and
Pan) are regarded as very ancient by the Egyptians (2.145.2–3); he then
gives the Greek chronology of those three “young” gods, from the oldest,
Dionysos, to the youngest, Pan. In all the MSs, 2.145.4 reads:

Διονύσῳ μὲν νυν τῷ ἑκ Σεμέλης τῆς Κάδμου λεγομένῳ γενέσθαι
κατὰ ἐξακόσια ἔτεα καὶ χίλια ἔτεα μάλιστα ἐστι ἐς ἐμέ, Ἡρακλεί δὲ τῷ
Ἀλκμήνης κατὰ εἰνακόσια ἔτεα, Πανὶ δὲ … κατὰ ὀκτακόσια μάλιστα
ἐς ἐμέ.

From the Dionysos said to be the son of Semele, the daughter of
Kadmos, there are about six-hundred and a thousand years down
to my time, and from Herakles the son of Alkmene about nine-
hundred years, and Pan is … about eight-hundred [years] down
to my time.

Here editors (perhaps also seduced by the plausibility of a sequence
1000 – 900 – 800) have wished to reduce the number “1600,” which
seems excessive for the era of Kadmos, and have written χίλια ἔτεα for
the MSs’ reading ἐξακόσια ἔτεα καὶ χίλια, arguing that the abbreviation
χ for χίλια was misread by a scribe as the alphabetic numeral “600,”
who then “corrected” the text with a marginal note that was later taken
into the text.\textsuperscript{153} But we do not have sufficient warrant for believing that
Herodotos’ chronology of Kadmos matches modern estimates. Moreover,
Herodotos’ language suggests that he is estimating: note his equivoca-
tion, λεγομένῳ, regarding the parentage of Dionysos, and note also the
qualifications on all three numbers, κατὰ (… μάλιστα).\textsuperscript{154}

\textsuperscript{152} Rosén\textit{ ad loc.}

\textsuperscript{153} Rosén\textit{ ad loc.}

\textsuperscript{154} As Catherine Rubincam pointed out to me \textit{per litteras}, 2014 March 31.
11. NUMBERS AND NUMERALS IN KALLIXEINOS.

Whatever may be true of descending-ordered compound numbers in general, for values in the teens, as shown in §3 above, descending-order compounds (like δεκαέξ) are rare in early prose in contrast to the “normal” ascending-order words (ἐκκαίδεκα). Those compounds, as well as descending-ordered numbers in general, become more frequent in Hellenistic prose, certainly by the time of Polybius.155 By the first century BCE, their use appears widespread.156 They might represent literal transcriptions of numerals, and LSJ, s.v. δέκα, list among the earliest attestations several inscriptions, where indeed we might expect the model to have been written in acrophonic or alphabetic numerals, and perhaps the cutter was the one who transcribed the numerals to words.

The text of Kallixeinos of Rhodes (FGrHist 627), an older contemporary of Polybius, as preserved in extensive quotations in Athenaeus,157 provides some evidence about how a historian of the early second century BCE wrote his numbers, and how Athenaeus transcribed those numbers. Kallixeinos describes various magnificent productions of the Ptolemies, including especially a lengthy procession held by Ptolemy II early in his reign; his source appears to have been the official records preserved in a now-lost document entitled Pentetērides (F2 at 5.27 [197D]).


156 E.g., D.S. 12.71.2 (ἐτη δεκαεννέα, “nineteen years”), 14.53.6 (νίκας ἔσχε δεκαδύο, “had twelve victories”), 14.84.7 (χρόνον ἤτων δεκαεπτά, “a period of seventeen years”), 15.23.2 (ἐτη δεκατέσσαρα, “fourteen years”), 16.63.2 (ἐτη δεκαπέντε, “fifteen years”); and Strabo 2.5.41–42 (δεκαπέντε … ἑκατὸν εἴκοσι … τετταράκοντα δύο … τετρακισχιλίους καὶ ἑνακοσίους … τρισμυρίους τριακοσίους …, “fifteen … hundred twenty … forty two … four-thousand and nine-hundred … three-myriad three-hundred …”), 6.1.10 (δεκατρεῖς μυριάδας, “thirteen myriads”), 6.2.1 (σταδίων χιλίων καὶ ἑπτακοσίων … σταδίων ὅσον χιλίων καὶ ἑκατόν καὶ τριάκοντα, “thousand and seven-hundred stades … thousand and hundred and thirty stades”), and 9.1.4 (δεκακοκτώ σταδίων, “eighteen stades”).

157 Keyser (2014).
Overall, Kallixeinos’ text has 51 compound numbers, of which 33 are descending-ordered words, 6 are alphabetic numerals, and the remaining 12 are ascending-ordered words. The inclusion of Kallixeinos provides a contrasting case-study of the use of compound numbers in the text of an author of the Hellenistic period: there is ample evidence for the use of numerals rather than words, and for the regular rather than exceptional use of descending-order.

In Kallixeinos’ description of the procession, F2, there are six instances of descending-order compound numbers, in the teens. The numbers are (with equivalents in the alphabetic numerals):

1. 5.28 (198D), 5.32 (200F): “15” written as δεκαπέντε as if from ΙΕ´
2. 5.29 (199D): “16” written as δεκαέξ as if from ΙF´
3. 5.31 (200B): “14” written as δεκατεσσάρων as if from ΙΔ´
4. 5.32 (200F), 5.34 (202E): “12” written as δεκαδύο as if from ΙΒ´

There are also two in Athenaeus’ own voice (based on data from Kallixeinos), 5.36 (203D): “14” written as δεκατέσσαρες, and “17” as δεκαεπτά, as if from ΙΔ´ and ΙΖ´. In addition, compound numbers larger than teens are also often (27 times) written in descending order in the description of the procession, F2, plus twice aboard Kallixeinos’ description of the ship of Ptolemy IIII, F1:

1. F1 at 5.37 (203E): “280” written as διακοσίων ὀγδοήκοντα, as if from ΣΠ´
2. F1 at 5.37 (203E): “48” written as τεσσαράκοντα οκτώ, as if from ΜΗ´
3. F2 at 5.25 (196B), 5.32 (201B): “130” written as ἑκατὸν τριάκοντα, as if from ΡΛ´
4. F2 at 5.27 (197F), 5.31 (200E): “120” written as ἑκατὸν εἴκοσι, as if from ΡΚ´
5. F2 at 5.28 (199A), 5.29 (199C), 5.32 (200F), 5.33 (201F): “24” written as εἴκοσι τεσσάρ-, or εἴκοσι τέτταρα, or εἴκοσι καὶ τεσσάρ-, all as if from ΚΔ´
6. F2 at 5.28 (199A), 5.30 (200A): “25” written as εἴκοσι πέντε, as if from ΚΕ´
7. F2 at 5.29 (199D), 5.32 (201BC): “26” written as εἴκοσι καὶ ἕξ, or εἴκοσι ἕξ, as if from ΚF´
8. F2 at 5.29 (199D): “160” written as ἑκατὸν ἑξήκοντα, as if from ΡΕ´.
9. F2 at 5.30 (199F): “22” written as εἴκοσι δύο, as if from ΚΒ´.
10. F2 at 5.30 (200A): “1600” written as χίλιοι καὶ ἑξακόσιοι, as if from ΑΧ´.
11. F2 at 5.30 (200A): “250” written as διακόσιοι καὶ πεντήκοντα, as if from ΣΝ´.
12. F2 at 5.30 (200A): “320” written as τριακόσιοι καὶ εἴκοσι, as if from ΤΚ´.
13. F2 at 5.31 (200E): “120” twice written as ἑκατὸν εἴκοσι, as if from ΡΚ´.
14. F2 at 5.32 (201B): “2400” written as δισιχλίοι τετρακόσιοι, as if from ΒΥ´.
15. F2 at 5.32 (201B): “150” written as ἑκατὸν πεντήκοντα, as if from ΡΝ´.
16. F2 at 5.34 (202B): “350” written as τριακόσιοι καὶ πεντήκοντα, as if from ΤΝ´.
17. F2 at 5.34 (202D): “3200” written as τρισιχλίοι διακόσιοι, as if from ΎΣ´.
18. F2 at 5.35 (202F–203A): “57,600” and “23,200” written as πέντε μυριάδας καὶ ἑπτακισχιλίους καὶ ἑξακοσίους and as δισμύριοι τρισιχλίοι διακόσιοι, as if from Ν´ΖΧ´ and Κ´ΓΣ´.
19. F2 at 5.35 (203B): “2339” written as δισιχλία διακόσια τριάκοντα ἐννέα, as if from ΒΤ´Λ´Θ´.

There are also two in Athenaeus’ own voice, F2 at 5.34 (202B): “22” written as εἴκοσι δύο, as if from ΚΒ’, and “14” as δεκατεσσάρων, as if from ΙΔ´.

But not all compound numbers are written this way in Kallixeinos’ text, and the ascending order is seen in twelve cases:

1. F1 at 5.37 (203E, 204A) ὀκτὼ καὶ τριάκοντα (“eight and thirty”);
2. F1 at 5.37 (204A) τρεῖς πρὸς τοῖς πεντήκοντα (“three more than fifty”);
3. F1 at 5.37 (204A, B: twice) δώδεκα (“twelve”);
4. F2 at 5.27 (198C) δώδεκα (“twelve”);
5. F2 at 5.28 (198C) τεσσαρεσκαίδεκα … ὄγδοηκοντα καὶ ἑκατὸν (“fourteen … eighty and a hundred”);
Furthermore, at least one simple number is written both as a numeral and as a word: the “two” in F2 at 5.30 (199F) as word—but in the equivalent text F2c, at Athenaeus 11.66 (483EF), as numeral. Finally, twenty numbers, fourteen simple and six compound, are preserved as numerals:

1. F1 at 5.38 (204D) “30” as Λ´;
2. F2 at 5.32 (201B) “200” as Σ´ (by emendation from an impossible Β´),
3. F2 at 5.32 (201C) “14” as ΙΔ´, “16” as ΙΦ´, “4” as Δ´, “3” as Γ´, and “1” as Α´,
4. F2 at 5.33 (201E) “120” as ΡΚ´ and “6” as Φ´,
5. F2 at 5.34 (202B) “4” as Δ´ (by emendation) and “2” as Β´,
6. F2 at 5.34 (202C) “40” as Μ´,
7. F2 at 5.34 (202E) “18” as ΙΗ´ (with emendation), “64” as ΞΔ´, “2” as Β´, “12” as ΙΒ´,
8. F2 at 5.34 (202F) “30” as Λ´,
9. F2 at 5.36 (203D) “30” as Λ´, “37” as ΛΖ´, and “5” as Ε´.

There is also a subtractive number, in F1, 5.37 (204B): γενομένης δὲ ἀναπείρας ἐδέξατο ἐρέτας πλείους τῶν τετρακισχιλίων, εἰς δὲ τὰ ὑπηρεσίας τετρακοσίους· εἰς δὲ τὸ κατάστρωμα ἐπιβάτας τρισχιλίους, ἀποδέοντας ἑκατὸν καὶ πεντήκοντα (“on a trial run, she needed more than 4000 rowers, and 400 for the crew, and for the deck 150 short of 3000 marines”—compare §2 above).

Evidently, in the Pentetērides, or in Kallixeinos, or in Athenaeus, some of the numbers were written out in words (the ascending-ordered numbers), and some were written in descending-ordered words, or in alphabetic numerals, or were later transcribed in one direction or the other. None of the descending-ordered compound numbers written in words contain an intervening particle (or other word), which if they were present would argue for an authorial origin for the words. Only 6 of the 33 descending-ordered compound numbers written in words (18%) contain even the “normal” connective καὶ (found in 168/199 or 84% of
the descending-ordered compound numbers surveyed above), all in F2, at: 5.29 (199D): εἴκοσι καὶ ἕξ; 5.30 (200A): χίλιοι καὶ ἕξακόσιοι; 5.30 (200A): διακόσιοι καὶ πεντῆκοντα; 5.30 (200A): τριακόσιοι καὶ εἴκοσι; 5.34 (202B): τριακόσιοι καὶ πεντῆκοντα; and 5.35 (202F–203A): πέντε μυριάδας καὶ ἕπτακισχιλίους καὶ ἕξακοσίους. The absence of the connective “καὶ” seems more likely to occur when a numeral is transcribed to words, rather than when the number is written out in words in the first place. Overall, an authorial use of alphabetic numerals by Kallixeinos or his source seems likely, though not quite proven.

Ancient Greek scribes and scholars were very well aware that numerals were more prone to corruption than numbers written out in words, and both Kallixeinos and Athenaeus may have made these transcription. We can see Athenaeus or his copyists doing so in the case of one instance of “two:” written in F2 at Athenaeus 5.30 (199F) as a word—but written in F2c at Athenaeus 11.66 (483EF) as an alphabetic numeral. When Athenaeus summarizes in his own voice the data from Kallixeinos, he seems to write out the compound numbers in descending-ordered words (with no connective or intervening words): F1 at 5.36 (203D), δεκατέσσαρες (“fourteen”) and δεκαεπτά (“seventeen”); and F2 at 5.34 (202B) εἴκοσι δύο (“twenty-two”), and δεκατεσσάρων (“fourteen”). Perhaps the Pentetērides had numerals, and either Kallixeinos or else Athenaeus transcribed those into words.

158 Omitted from 11 of the 38 Hippocratic descending-ordered compound numbers (cf. §4 above): Coan Prenotions §156 (Littré 5.618), τριήκοντα πέντε (“thirty-five”); Regimen 3.68.7–8, 13 (Littré 6.598, 604), τεσσάρακοντα τέσσαρας ... τριήκοντα δύο ... ἑννενήκοντα τρεῖς (“forty-four ... thirty-two ... ninety-three”); Internal Affections §12 (Littré 7.198), ἐκατόν πεντῆκοντα (“hundred fifty”), and §§39–40 (Littré 7.262–264), εἰκοσιτέσσαρας ... εἰκοσιτεσσάρων (“twenty-four ... twenty-four”); and Bones §1 (Littré 9.168) εἰκοσιετάπτα ... εἰκοσιτεσσάρα ... ἑννενήκοντα ἑν ... ἕκατον ἑνδεκα (“twenty-seven ... twenty-four ... ninety-one ... hundred eleven”). All but the first of these are calculations. See also among the orators (above §5): seven of the sixteen instances in the Demosthenic Against Phormio; seven of the twelve instances in Apollodōros; and four of the eight instances in interpolated documents. Moreover, there is one instance each in the Athen. Polit. 35.4, χίλιους πεντακοσίους (“thousand five-hundred;” above, §6); and in Xenophon (above, §7), Anabasis 1.2.9 (plus the interpolated passage, 7.8.26).

159 Cf. the two pharmacists, Menekrates, ca. 25 ce, Keyser (2008b), and Damokrates, ca. 75 ce, Vogt; and Galen, Commentary on Hippocrates, Epidemics, Book III 3.71 (Kühn 17a.73).
No matter what was the sequence of inscribing and transcribing, the result appears unsystematic, since every one of the numbers in Kallixeinos could have been intended as a precise value from an inventory (and hence susceptible of being written in descending-ordered words). Hardly any of the values appears to be the result of a calculation, nor would we expect that in a description of a procession; however, the largest value in Kallixeinos, F2 at 5.35 (202F–203A): πέντε μυριάδας καὶ ἑπτακισχιλίους καὶ ἑξακοσίους (“five myriads and seven-thousand and six-hundred”), is written using the kind of word (here, μυριάδας) used already by Herodotos to indicate calculations on an abacus.\(^{160}\) Perhaps this is the result of a sum done by Kallixeinos, adding up all the contingents listed in his source?

**CONCLUSION.**

The survey conducted over authors before ca. 325 bce leads us to two mutually reinforcing conclusions, one about numeracy in classical Greek texts, and the other about the text-tradition of compound and simple numbers. On the one hand, the patterns of recording compound numbers show that there were differing kinds of numeracy, whose presence varied among authors. Recording compound numbers in descending order is rare in earlier texts (found in less than one-fifteenth of the compound numbers), and most compound numbers are recorded in ascending order. This should be seen as peculiar to Greek, as compared with the practices of other cultures (e.g., Egypt and Mesopotamia), where compound numbers were always recorded in descending order. As noted, this peculiarity exists in tension with another peculiarity—that Greeks made a distinction between number-words and number-symbols (numerals), not found in cultures such as those of Egypt and Mesopotamia.\(^{161}\) A greater tendency to record compound numbers in descending order is associated with a stronger presence of what could be called “commercial numeracy,” i.e., a facility with calculation and inventories. Commercial numeracy appears to increase in the mid-fourth century bce, although it was demonstrably

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\(^{160}\) Keyser (2008a) 231–232.

\(^{161}\) The Greek practice may have been encouraged by the greater number of characters that would have been needed to write “300” as ΕΚΑΤΟΝ ΕΚΑΤΟΝ ΕΚΑΤΟΝ instead of as ΤΡΙΑΚΟΣΙΑ or ΗΗΗ. In hieroglyphics and in cuneiform, the number of characters in the repeated word is smaller than in Greek.
present in the mid-fifth century BCE, as seen in some inscriptions, and then in some Hippocratics and in Herodotos.

On the other hand, number-words written in ascending order are authorial and not the result of a transcription from numerals (which would be descending-ordered), whereas number-words written in descending order are probably authorial (i.e., rather than transcribed from numerals), since they reveal authorial intent. These descending-ordered authorial numbers were written to record calculations, official accounts or inventories, precision, or large values. Poets (and apparently Isaios) write compound numbers in descending order to represent large values. The Hippocratic corpus, Herodotos, and to a lesser extent Aristotle and some others, write compound numbers in descending order to represent numbers in calculations. Fourth-century writers, including Xenophon, the orators (to varying degrees), and Aristotle, write compound numbers in descending order to represent values considered accurate, precise, or official, as from an inventory, as was already the case in some fifth-century BCE inscriptions.

However, about one-fifth to one-fourth of the instances of descending-ordered compound numbers in prose before ca. 325 BCE admit of no simple explanation. Nevertheless, for these prose authors there is little evidence in the papyri or in the MS tradition of any systematic transcription of numbers written in words, whether ascending or descending, into numerals. The cases especially of (1) numbers in the teens being almost always written in ascending order, and (2) numbers written in subtractive notation, resist claims that they were originally written in numerals.

In contrast, the case of Kallixeinos of Rhodes suggests that Hellenistic authors preferred to write compound numbers in descending order, perhaps in words or perhaps in numerals. If numerals were used, they seem to have been the alphabetic numerals, and there is no evidence in the manuscripts or papyri for the actual use of the acrophonic numerals. Further study, e.g., of Polybius or of Diodoros of Sicily, will likely enrich this picture.162

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KEYSER: COMPOUND NUMBERS

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