Chapter 3

Text: *Short Epitome* (partial translation)

The page references are to the edition of Badawī [77].

/3.10/ Section: [De Interpretatione]

An expression that applies to many things either applies in a single meaning to equivalent things, in the same way as animal applies to human and horse, and [in this case] it is called univocal; or it applies in differing meanings in the way that *ᶜayn* applies both to a dinar and to the eye, in which case it is called ambiguous; or else it is applied in a single meaning to things that are not equivalent—and in this case it is called doubful—in the way that 'existing' is applied both to a substance and to an accident.

/3.15/ A name is an atomic expression that signifies a meaning without a salient time for it. A verb, also [known as] an action, is an atomic expression signifying both a meaning and the time of it, as when we say 'was'. A sentence is any compound expression. A declarative sentence is one that allows of being assessed as true or false; it is also [called] a proposition. /4.1/ A predicative[1] proposition is one used to judge about whether one thing, [called] the predicate, is true or not true of another thing which is [called] the subject, as when we say

(3.1)   Zayd is a writer[2].

or

(3.2)   Zayd is not a writer.

45

The first [of these two sentences] is called an affirmation and the second is called a denial. A meet-like hypothetical[3] proposition is one in which a judgment is made that a proposition, called the consequent, does or doesn't follow from /4.5/ another proposition, called the antecedent. The first [kind of meet-like hypothetical proposition] is an affirmation, as when you say

(3.3)   If the sun is up then it is day.

and the second [kind] is a denial, as when you say:

(3.4)   It is not the case that when the sun is up then it is night.

A difference-like[4] hypothetical [proposition] is one in which a judgment is made [affirming] the exhaustiveness of the two propositions with reference to a conflict, or the denial of [such a judgment]. An example of the first is

(3.5)   Either this number is even or it is odd.

/4.10/ An example of the second is

(3.6)   It is not the case that either this is even or it is two[5].

There are eight [kinds of] predicative[6] proposition: [(i)] singular affirmative, as when you say

(3.7)   Zayd is a writer.

[(ii)] singular negative, as when you say

(3.8)   Zayd is not a writer.

and the subject in both of these together is a particular[7] expression; [(iii)] unquantified affirmative, as when you say

(3.9)   The person has suffered a loss.

[(iv)] unquantified negative, as when you say

(3.10)   The person has not suffered a loss.

the subject in both of these is a universal and its extent is given by the judgment about it /4.15/ as unquantified; [(v)] quantified universal affirmative, as when you say

(3.11)   Every human is an animal.

[(vi)] quantified universal negative, as when you say

(3.12) No person is a stone.

[(vii)] existential[8] affirmative, as when you say

(3.13) Some person is a writer.

[(viii)] existential negative, as when you say:

(3.14) Not every human is a writer.

and

(3.15) Some person is not a writer.

both of these are negative about 'some', and this allows that the [corresponding] affirmation is true of 'some' [of the subject].

/5.1/ A contradictory pair in the singular [propositions] consists of two propositions which differ as affirmative and negative, where the subjects agree in meaning and so do the predicates, and [where the two propositions agree in] condition[9] and relation and part and whole—if there are a part and a whole—and act and potential and time and place. In the quantified propositions [it is required] that these conditions are satisfied, and also that one of the two propositions is universal and the other is existential.

/5.5/ The modes[10] of propositions are three: necessary, possible and impossible. The necessary mode is as when you say

(3.16) The human is an animal.

The impossible is as when you say

(3.17) The human is a stone.

The possible is as when you say

(3.18) The human is a writer.

Conversion makes the subject a predicate and the predicate a subject, leaving affirmation and denial and truth-value the same as before. The universal negative [proposition] converts symmetrically[11]. Thus when no X

is a Y, then no Y is an X; so when no person is /5.10/ a stone, no stone is a person. As for the universal affirmative and the existential affirmative propositions, they don't have to convert to universal propositions; in fact when every human is an animal or some moving thing is black, that doesn't imply that every animal is a human or every black thing is moving. But they do have to convert to an existential proposition, so when every X or some X is a Y then some of what is a Y is an X. But the existential negative [proposition] doesn't convert, since it is not the case that when /5.15/ not every animal is human, it has to be that not every human is an animal.

<div align="center">Syllogism</div>

A syllogism is composed from sentences, such that when they are assumed, another sentence follows from them by themselves. An example of this is when you assume that every body is composite and that everything composite is created; it follows from this that every body is created.

/5.20/ Some syllogisms are recombinant[12] and some are exceptive[13]. Recombinant syllogisms consisting of predicative propositions are [classified into] three figures. /6.1/ When the [part] that is repeated in the two premises, like 'composite' in the example above, is the predicate in the first of the two propositions and the subject in the second, [the syllogism] is said to [belong to] the first figure. When this repeated [part] is the predicate in both the premises, [the syllogism] is said to be [in] the second figure. Or else [the repeated part] is the subject in both premises and [the syllogism] is said to be [in] the third figure. This middle [term] is of a nature to combine the two extreme [terms] /6.5/ into a conclusion and to be excluded from what is explicit[14] [in the conclusion], so that one of the two extremes, called the minor term, forms the subject of the conclusion, and the premise [containing] it is called the minor premise; while the other extreme, called the major term, forms the predicate of the conclusion, and the premise [containing] it is called the major premise.

<div align="center">Section: [Categorical syllogisms]</div>

The first figure yields a conclusion only when the minor premise is affirmative and the major premise is universal. /6.10/ The dominance[15] in

quality (i.e. affirmative and negative) and in mode (i.e. necessity and non-necessity) belongs to the major premise. An example of the first [mood of the first figure][16] is

(3.19)
Every C is a B;
and every B is an A, however it is[17].
So every C is an A.

[The mode of the conclusion is] as above except when the minor premise is possible and the major premise absolute[18], in which case the conclusion is possible. The second [mood of this figure][19] is

(3.20)
Every C is a B;
and no B is an A, however it is.
So no C is an A, [with mode] as above.

The third [mood of this figure][20] is

(3.21)
Some C is a B;
and every B is an A, however it is.
So some C is an A, [with mode] as above.

The fourth [mood of this figure][21] is

(3.22)
/6.15/ Some C is a B;
and no B is an A.
So some C is not an A.

The remaining [premise-pairs in first figure] have no conclusion following from them[22].

The second figure [premise-pairs yield a conclusion when they obey] the condition that the major premise is universal and the two [premises] differ as affirmative and negative. The first mood of [this figure][23] is when you say:

(3.23)
Every C is a B;
and no A is a B.
We claim that it follows from [the premise-pair] that no C is an A.

The demonstration of this [mood] is that we convert the major premise so that it becomes 'No /6.20/ B is an A', and we reduce[24] [the premise-pair] to the first figure and we infer [the conclusion] above. The second mood [of this figure][25] is:

(3.24)
No /7.1/ C is a B;
and every A is a B.
It yields [a conclusion] as above.

It is proved by converting the minor premise so that it yields 'No A is a C', and then it is converted to 'No C is an A'. The third mood [of this figure][26] is as when you say

> Some C is a B;

(3.25)   and no A is a B.

> It yields [the conclusion] that some C is not an A.

It is proved by converting the major premise. The fourth mood [of this figure][27] is as when you say:

> Not every C is a B;

(3.26)   and every A is a B.

> It yields [the conclusion] that /7.5/ not every C is an A.

It is proved not by conversion but by ecthesis[28] [as follows]. Let the some which is a C but not a B be D. Then we have

> No D is a B;

(3.27)   and every A is B.

> This yields that no D is an A.

But

(3.28) D is some C[29];
> so not[30] every C is an A.

The dominance for the mode [in the second figure] belongs to the negative premise, because the negative premise reduces to the major premise in the first figure by conversion or ecthesis, and the dominance for mode in the first figure belongs to the major premise. But the truth[31] is that when the premises are a mixture, one necessary and the other not necessary, then the conclusion is necessary.

/7.10/ The third figure [premise-pairs yield a conclusion when they obey] the condition that the minor premise is affirmative and there has to be a universal [premise]. The first mood of [this figure][32]:

> Every B is a C;

(3.29)   and every B is an A.

> It yields [the conclusion] that some C is an A.

It reduces to the first [figure] by converting the minor premise. The second mood [of this figure][33] is

> Every B is a C;

(3.30)   and no B is an A.

> So not every C is an A.

It reduces to the first [figure] by converting the minor premise. The third mood [of this figure][34] is

> Some B is a C;
(3.31)   and every B is an A.
> It yields [the conclusion] that some C is an A.

It is proved by converting the minor premise. The fourth mood [of this figure][35]:

> Every /7.15/ B is a C;
(3.32)   and some B is an A.
> It yields [the conclusion] that some C is an A.

It is proved by converting the major premise, and then one converts the conclusion. Or [one proves it] by ecthesis, by specifying the thing that is some B [and] an A to be D, so that every D is an A. Then

> When we say that every D is a B;
(3.33)   and that every B is a C;
> it yields [the conclusion] that every D is a C.

Then

> When we say that every D is a C;
(3.34)   and that every D is an A;
> it yields [the conclusion] that some C is an A.

The fifth mood [of this figure][36]:

> Every B is a C;
(3.35)   and not every B is an A.
> It yields [the conclusion] that not every C is an A.

This is proved not by conversion but by ecthesis. The /7.20/ sixth mood [of this figure][37]:

> Some B is a C;
(3.36)   and no B is an A.
> So some C is not an A.

This is proved by conversion /8.1/ of the minor premise.

The dominance in mode [in the third figure] belongs to the major premise, which is conveyed to the major premise in the first figure by conversion or ecthesis. That is, unless the minor premise is possible and the major premise is absolute.

[Section: Recombinant hypothetical syllogisms][38]

Note that the meet-like hypothetical sentences form premise-pairs that are described in the same way as the figures above, if we put their antecedent in place of the subject and their consequent in place of the predicate. Thus if the antecedent in /8.5/ one of the premises is the consequent in the other, it is [a mood in] the first figure. If [a clause is] consequent in both premises, then it is [a mood in] the second figure. If it is antecedent in both premises, then it is [a mood in] the third figure. The hypothetical proposition that is composed with its antecedent and its consequent being the two extremes [of the premises] is the conclusion. The conditions [for having a conclusion] are the same as the previous ones. The universal affirmative meet-like [proposition] is as when we say

(3.37)   Whenever A is B, C is D.

The universal negative [meet-like proposition] is as when we say

(3.38)   It is never the case when A is B that C is D.

The existential affirmative [meet-like proposition] is as when you say

(3.39)   /8.10/ Sometimes when A is B, C is D.

The existential negative [meet-like proposition] is as when you say

(3.40)   Sometimes it is not the case, when A is B, that C is D.

Or:

(3.41)   It is not the case that whenever A is B, C is D.

An example of the first mood of the first figure is

(3.42)
Whenever A is B then C is D;
and whenever C is D then H is Z.
It yields [the conclusion]: Whenever A is B then H is Z.

An example of the first mood of the second figure is

(3.43)
Whenever A is B then C is D;
and it is never the case when H is Z that C is D.
It yields [the conclusion] that it is never the case when A is B that H is Z.

This is proved as above, /8.15/ by conversion. An example of the first mood of the third figure is

(3.44)
> Whenever C is D then A is B;
> and whenever C is D then H is Z.
> It yields [the conclusion]: Sometimes when A is B, H is Z.

This is proved by conversion. Now it is left to you to formulate and test the remaining compounds of [meet-like premises][39]. Where they use ecthesis, it is like when you say

(3.45)
> It is not the case that whenever C is D then H is Z;
> and whenever A is a B then H is Z.
> We say that it yields [the conclusion]: It is not the case that whenever C is D then A is B'

The demonstration of this is that we specify[40] the posit in which C is D and in which H is not Z, namely just while /8.20/ G is T[41]. So

(3.46)
> It is never the case when G is T that H is Z;
> and whenever A is B then H is Z.
> So it is never the case when G is T that A is B.

Then we say:

(3.47)
> It is sometimes the case, when C is D, that G is T;
> and it is never the case, when G is T, that A is B.
> This yields [the conclusion]: It is not the case that whenever C is D then A is B.

/9.1/ Section: [Exceptive syllogisms][42]

An exceptive syllogism has either a meet-like premise or a difference-like one. If it has a meet-like premise then [there are two cases.] Either it excepts the antecedent [of this premise] unaltered, and its conclusion is the consequent unaltered, as when you say:

(3.48)
> If this is a human then it is an animal;
> but it is a human.
> So it is an animal.

Excepting the contradictory negation /9.5/ of the antecedent doesn't yield a conclusion. Thus [if you except]

(3.49)
> But he is not a human.

it doesn't follow from this that he is an animal or that he is not an animal. If the exception is from the consequent [of the meet-like premise], so that the contradictory negation of the consequent is excepted, it yields [as conclusion] the contradictory negation of the antecedent, as when you say:

(3.50)   But he is not an animal.
          Then it yields [the conclusion] that he is not a human.

But when the consequent is excepted unaltered, it doesn't follow that it yields any conclusion. If you said

(3.51)   But it is an animal.

it wouldn't follow that it is a human or that it is not a human.

/9.10/ In [a premise-pair with] a difference-like [hypothetical premise], when one excepts one of [the clauses of the difference-like premise] unaltered, it yields [as conclusion] the contradictory negation of the remainder as they were, forming a difference-like [conclusion] when there are many [clauses remaining], or the contradictory negation of the sole remainder as it was. An example of the first case is:

(3.52)   This number is either abundant or deficient or equal[43].
          So if one excepts that it is deficient,
          it yields [the conclusion] that it is not abundant and not equal;
          or that it is neither abundant nor equal.

An example of the second is:

(3.53)   This number is either even or odd;
          but it is odd.
          So it is not even.

When one /9.15/ excepts the contradictory negation of one of [the clauses], it yields the remainder, unaltered and as it was, or the one [remaining], unaltered and as it was. An example of this is:

(3.54)   But it is not abundant;
          so it is either deficient or equal.

And also:

(3.55)   But it is not odd;
          so it is even.

When the difference-like premise is not strict—namely when it has both affirmative and negative clauses, or when both clauses are negative[44]—then it yields no conclusion unless one excepts a contradictory negation [of a clause]. An example of this is

(3.56)
>Either Abdullah /10.1/ is in the sea, or he is not drowning;
>but he is drowning.
>So he is in the sea.

[Or:]

(3.57)
>But he is not in the sea;
>so he is not drowning,

And when you say 'But he is in the sea', or 'He is not drowning', nothing follows from [either of these]. And similarly [you can argue]

(3.58)
>Either Zayd is not an animal or Zayd is not a plant;
>but he is an animal;
>so he is not a plant.

[Or:]

(3.59)
>But he is a plant.
>So he is not an animal.

But nothing follows from your saying 'He is not /10.5/ an animal' or 'He is not a plant'.

A strict difference-like proposition is one which includes the expression 'without exception'[45].

Section: [Syllogism of absurdity]

The syllogism of absurdity is that the contradictory negation of the objective[46] is taken and there is added to it [as further premise] a true premise forming a productive syllogism which yields a thing that is clearly impossible, and it is known that the cause of that /10.10/ impossibility is not the composition of the syllogism and not the true premise, but rather its cause is the impossibility of the contradictory negation of the objective. So therefore [the contradictory negation of the objective] is impossible[47], so the contradictory negation [of this contradictory negation] is true. If you prefer, you [can] take the contradictory negation of the impossible [conclusion], and add it to the true [premise], and then it yields the objective directly.

[Section: Induction, likening, enthymeme]

Induction is [a kind of argument] that yields a content applying to a universal because of its truth in all or some of the individuals [of the universal], as when it is juidged that every animal moves its lower jaw when it chews. But this is not a reliable [conclusion], /10.15/ since sometimes animals are different from what you think, like the crocodile.

Likening[48] is where a content is applied to something that is absent, by means of something present, using something observed as an example. But sometimes [the present and the absent] differ. The most reliable cases of [likening] are where the thing represented or overlapped is a thing that causes the content to apply to what is observed. But it is not reliable, because sometimes what causes the content to apply to the observed case is because of what it is that is observed. And sometimes the overlap consists of a universal meaning that divides into two parts, in such a way that the cause is one of the two parts and the classification is not included /10.20/ in the subdivision that is referred to the cause. But if [the likening] is not obstructed by a two-way division of this kind, and if it is true that the content holds because of a cause, then the likening can be rearranged into a demonstration.

/11.1/ The enthymeme[49] is a syllogism in which only the minor premise is stated, as when people say

(3.60)   He wanders about at night, so therefore he is confused.

so that the major premise is suppressed, or else [it is suppressed] through redundancy or sophistry.

Notes to Chapter 3

1 *ḥamlī*, from *ḥaml* 'predicate'. See Section 4.2 below for the relationship between 'categorical' and 'predicative'.

2 *kātib*. The word is an active participle, and hence it is ambiguous between 'writer' (i.e. literate) and '(is) writing'. Either way it expresses a separable accident, i.e. a property that the same thing can have and not have at different times of its existence.

3 'Meet-like' is *muttaṣil*, from *waṣl* 'junction'. 'Hypothetical' is *sharṭī*, literally 'conditional'. The history that led to these names is chaotic, and in *Short Epitome* Ibn Sīnā adds to the chaos; see Section 6.2 below.

4 'Difference-like' is *munfaṣil*, from *faṣl* 'separation'. Again Ibn Sīnā's usage adds to the chaos of the terminology; see Chapter 17 below.

5 Badawī reads *farḍan* 'odd'. A better reading is *ithnayni* 'two' in two manuscripts.

6 These sentence forms are in fact the categorical ones, cf. Note 1 above. This illustrates how the context can shrink the class of predicative propositions.

7 *juz'ī* is literally 'particular', though one would have expected *shakhṣī* 'singular' here.

8 *juz'ī* again, but here the contrast is with *kullī* 'universally quantified', so 'existential(ly quantified)' is a better fit with modern logical terminology.

9 *sharṭ* is 'condition' as in 'meeting a condition', not as in 'in good condition'. From this text alone it is not clear what 'condition' means here, but see Section 4.3 below.

10 *jiha* here seems to mean 'mode', though the word has a range of meanings including 'aspect', 'point of view', 'interpretation'. The triple 'necessary', 'possible' and 'imposible' appear together in al-Fārābī *Syllogism* [37] 16.8–17.8 as three kinds of 'matter' (*mādda*). But the author of *Short Epitome* seems to have another source; like Ammonius he regards the thrree as the three matters rather than as kinds of matter, and his word for 'necessary' is *wājib* rather than al-Fārābī's *ḍarūrī*. See Chapter 7 below for further discussion.

11 A predicative sentence converts 'symmetrically' (Arabic *mithla nafsihi*, literally 'like itself') if it is equivalent to the sentence got from it by transposing the subject and the predicate. A predicative sentence form is said to convert symmetrically if every sentence of that form converts symmetrically. For example the categorical sentence form 'No B is an A' converts symmetrically, since for every choice of nouns A and B, 'No B is an A' is equivalent to 'No A is a B'.

12 This seems to be the first recorded occurrence of *iqtirānī* as a term of logic. See Chapter 5 below on its probable origin.

13 *istithnā'ī*. The word is taken from al-Fārābī, who borrowed it from the linguists; cf. [20] pp. 56f. The use of this linguistic term is ingenious but not of much help for understanding the logic. Later logicians, and perhaps already Ibn Sīnā, may have read the word etymologically as 'involving a duplication'.

14 Badawī thinks *min al-bayyini* 'from what is explicit' is really *min al-bayna* 'from the between', i.e. from between the extremes. But Badawī's reading makes sense only for syllogisms in the first figure.

15 The Arabic word for 'conclusion', *natīja*, is a metaphor: literally a *natīja* is a brood of sheep or camels. The underlying idea is that a conclusion is generated by the marriage of the two premises. The origin of the metaphor is

unknown—it has not been found in Greek or Syriac sources. But several Arabic logicians (including the Brethren of Purity, Ibn Sīnā and Ibn Rushd) made use of the metaphor. Ibn Sīnā's contribution was that each property of the conclusion can be assumed to be inherited from one of the premises, so we can determine the conclusion by determining which premise is responsible for each property. Ibn Sīnā describes the premise in question as having the *ᶜibra* for the given property; I translate *ᶜibra* as 'dominance'. See further Hodges [64].

16 Later the Latin Scholastics introduced names for these moods. The names contained coded information about the mood; for example a stands for universal affirmative, e for universal negative, i for existential affirmative and o for existential negative. (The three vowels in order describe the major premise, the minor premise and the conclusion, reflecting the usual order in which the Latins put the premises.) The present mood was called *Barbara*.

17 *kayfa kāna*, 'however it is'. This and the similar phrase *kayfa ittafaqa* 'however it happens to be' occur quite often in Ibn Sīnā's logical expositions. Here the implication is that the sentence 'Every B is an A' can be varied in some way. Of course it can be varied by putting different words for B and for A; but this applies to all formal sentences and doesn't call for special mention here. More likely the variation that Ibn Sīnā has in mind here is putting modes on the sentence. Then the phrase is picked up by the sentence below which says that the conclusion is 'as above' (*ka-dhālika*) except in a special case; i.e. the conclusion has the same mode as the second premise (apart from the special case). So this is a restatement of the rule for dominance in mode.

18 *muṭlaq*. The word is used in the Baghdad Standard translation of *Prior Analytics* for sentences that are categorical, i.e. not modalised, for example in translating *Prior Analytics* i.2, 25a1. It doesn't appear in al-Fārābī *Sylllogism* [37]. There are just two occurrences in *Short Epitome*, namely here ([77] 6/12) and at the statement of dominance for mode in third figure ([77] 8.2). These occurrences are not explained, but they copy the usage in the Baghdad Standard translation; there is not yet any hint of the central place that various kinds of absolute sentence will take in Ibn Sīnā's logic from *Middle Summary* onwards.

19 Scholastic *Celarent*.

20 Scholastic *Darii*.

21 Scholastic *Ferio*.

22 From *Middle Summary* onwards, Ibn Sīnā describes premise-pairs from which no conclusion follows as *ᶜaqīm* 'sterile', exploiting the metaphor discussed in Note 15 above. The absence of this word here is an indication that *Short Epitome* is an early work.

23 Scholastic *Cesare*.

24 *nurjiᶜu*. Reduction to first figure moods is Aristotle's way of justifying second- and third-figure moods. In *Middle Summary* Ibn Sīnā will defy Aristotle by giving justifications that don't involve reduction to first figure; see Section 14.3 below.

25 Scholastic *Camestres*.

26 Scholastic *Festino*.

27 Scholastic *Baroco*.

28 *iftirāḍ*; see BELOW for more on the method of ecthesis, which derives from Aristotle.

29 This inverted sentence 'D is some B' is copied from al-Fārābī *Syllogism* [37] 27.1, where it seems to be an attempt by al-Fārābī to magic his way out of a logical gap (see Chatti and Hodges [20] p. 52). Later Ibn Sīnā developed a sharp nose for such things; cf. his criticism of a similar piece of 'sophistry' by al-Fārābī at *Syllogism* [89] 209.9–14. So its appearance here should be seen as evidence that *Short Epitome* is an immature work.

30 Badawī [77] omits the *laysa* 'it is not the case that', after *fa-yakūnu*. This seems to be an oversight, since Ülken [78] 7.1 reads the word and it is required by the logic.

31 This is an example of the Aristotle-versus-truth format discussed in Section 2.2 above.

32 Scholastic *Darapti*.

33 Scholastic *Felapton*.

34 Scholastic *Datisi*.

35 Scholastic *Disamis*.

36 Scholastic *Bocardo*.

37 Scholastic *Ferison*.

38 The recombinant hypothetical syllogisms form Ibn Sīnā's first new logic, which is HL2 in our notation. We examine it in detail in Chapter 7 below.

39 This sentence is characteristic of Ibn Sīnā from two points of view: the reader is set some homework (see Section 2.1 above), and Ibn Sīnā invokes *imtiḥān* 'testing' as a method of research in logic (see BELOW).

40 Where Badawī [77] 8.19 reads *immā nafsa al-waḍᶜi*, read *anna nuᶜayyina al-waḍᶜa* following Ülken [78] 8.11. Neither edition gives any critical apparatus at this point.

41 Here Ibn Sīnā introduces two new letters T and G with the intention that the sentence 'T is G' expresses the posit (or assumption) that C is D and H is not Z. But there is not the slightest reason to think that this assumption has the form 'T is G'. This is evidence that the expressions 'C is D', 'T is G' and so on are essentially propositional variables. Aristotle almost never uses single letters to represent propositions, and Ibn Sīnā is dutifully following Aristotle's notation here.

42 The exceptive syllogisms are taken from al-Fārābī *Syllogism* [37] 31.7–33.17 (see [20] 53–58 and 133–136), except that Ibn Sīnā replaces al-Fārābī's exclusive disjunctions by inclusive disjunctions. The resulting logic is HL1 in our notation. It is examined in Section 6.1 below.

43 This classification of natural numbers (i.e. positive integers) was for some reason of great interest to Neoplatonist mathematicians. A proper factor of n is a number that divides n and is less than n. For each number n write $S(n)$ for the sum of the proper factors of n. One says that n is abundant if $S(n)$ is greater than n, deficient if $S(n)$ is less than n, and equal if $S(n)$ equals n. Today the numbers n with $S(n) = n$ are called perfect; examples are 6 and 28.

44 This is most easily read not as an explanation of the meaning of strict difference-like sentences, but as a syntactic criterion for distinguishing between strict and non-strict difference-like sentences. Curiously Ibn Sīnā seems to be still using this criterion in his later logic HL3 (cf. Chapter 17), though this sentence in *Short Epitome* may be the last place where he states the criterion explicitly. This is a striking illustration of the continuity of his logical assumptions throughout his career.

45 By contrast with Note 44, here he seems to be describing ther difference in meaning between strict and non-strict difference-like sentences. But has he stated it correctly? See BELOW.

46 *maṭlūb* 'objective'. The name refers to a fiction, perpetuated by Alexander of Aphrodisias and al-Fārābī among others, that whenever we consider a premise-pair we have in mind a proposed conclusion that we am to prove or refute from the premise-pair. This proposed conclusion is called the objective. The standard criterion for distinguishing between major and minor terms in a syllogism depended on the objective: the major term was the predicate of the objective. (Cf. BELOW.) In *Short Epitome* Ibn Sīnā speaks of objectives only in two cases where it is plausible that we have a proposed conclusion before making the syllogism. The first is here at [77] 10.8, where we prove a conclusion by forming a syllogism with the contradictory negation of the objective as one of its premises. The second case is where we are systematically building up a deductive science; cf. Badawī [77] 11.16.

47 *Short Epitome* 10.9ff commits a logical error, by requiring that the second syllogism, say with premises p and q, yields a conclusion that is 'clearly

impossible', and then arguing that at least one of p and q must entail an impossibility. The author lands himself in this error by copying al-Fārābī's requirement at *Syllogism* [37] 34.3 that the conclusion of the second syllogism is 'clearly false and impossible'. In al-Fārābī's *Short Syllogism* [38], which is a slimmed down and corrected version of *Syllogism*, al-Fārābī avoids the error by requiring at 86.7 only that the conclusion is 'clearly false'. (See the discussion of this logical error at [20] pp. 60f, and [20] pp. 21ff for further evidence that *Short Syllogism* came after *Syllogism*.) We infer that the author of *Short Epitome* was following *Syllogism* and not *Short Syllogism*.

48 Likening (*tamthīl*) is Aristotle's *parádeigma* in *Prior Analytics* ii.24, but seen through the lens of al-Fārābī *Syllogism* [37] 36.1–37.6 (cf. [20] 67–69).

49 *ḍamīr*, 'implicit'. The word appears to be one of al-Fārābī's many coinages of logical terminology; cf. [20] p. 35. In his *Syllogism* [37] 14.16, 15.8–12 he uses it for discourse where some things are not said because it can be assumed that everybody is thinking them. Elsewhere (though not in *Syllogism*) he uses it more specifically for syllogisms where one premise is left unspoken because it says something that is generally believed. This kind of syllogism is one of the things that Aristotle means when he speaks of *enthúmēma*, particularly in connection with rhetoric; in *Prior Analytics* ii.27, 70a10–25 he speaks of *enthúmēma* and says that one kind is a syllogism with a premise suppressed. Now *Short Epitome* [77] 11.1f mentions *ḍamīr* at a point which corresponds to Aristotle's mention of *enthúmēma*, between likening and the end of *Prior Analytics*. But al-Fārābī's *Syllogism* says nothing to connect *ḍamīr* with this part of *Prior Analytics*, so *Short Epitome* is presumably relying on a translation of *Prior Analytics* at this point. But the Baghdad Standard translation here spells out *anthūmīmā* and uses the root *kbt* rather than *ḍmr* to express suppression of a part of the syllogism. So *Short Epitome* may have been relying on a further source for this material. We might draw the same conclusion from the example syllogism at *Short Epitome* [77] 11.1, which is an unusual form of a standard enthymeme; the standard version appears later at *Short Epitome* [77] 13.8f in the section on rhetorical syllogisms.

[20] Saloua Chatti and Wilfrid Hodges, *Al-Fārābī, Syllogism: An Abridgement of Aristotle's Prior Analytics*, Ancient Commentators on Aristotle, Bloomsbury Academic, London 2020.

[37] Al-Fārābī, *Kitāb al-qiyās (Syllogism)*, in Rafīq al-ᶜAjam (ed.), *Al-manṭiq ᶜinda al-Fārābī (The Logic of al-Fārābī)*, vol. 2, Dar el-Mashreq, Beirut, (1986) pp. 11–64.

[38] Al-Fārābī, *Kitāb al-qiyās al-ṣaghīr (Short Syllogism)*, in Rafīq al-ᶜAjam (ed.), *Al-manṭiq ᶜinda al-Fārābī (The Logic of al-Fārābī)*, vol. 2, Dar el-Mashreq, Beirut, (1986) pp. 65–93.

[64] Wilfrid Hodges, 'A biological metaphor for logical consequence', *Ishraq* 9 (2019) 54–79.

[77] Ibn Sīnā, *ᶜUyūn al-ḥikma, Fontes Sapientiae*, ed. Abdurraḥmān Badawī, al-Maᶜhad al-ᶜIlmī al-Faransī lil-Āthār al-Sharqīya, Cairo 1954.

[78] Ibn Sīnā, *Les opuscules d'Ibn Sīnā Uyun al-hikma et l'opuscule d'Abu'l Faraj et la réfutation d'Ibn Sīnā*, ed. Hilmi Ziya Ülken, Türk Tarih Kurumu Basımevi, Ankara 1953.

[89] Ibn Sīnā, *Al-qiyās (Syllogism)*. Ed. S. Zayed, Cairo 1964.