

# Prior Analytics

## By Aristotle

Based on the translation by A.J. Jenkinson, with minor emendations by Daniel Kolak.

### BOOK I

#### Chapter I

We must first state the subject of our inquiry and the faculty to which it belongs. Its subject is demonstration and the faculty that carries it out is demonstrative science. We must next define a premise, a term, and a syllogism, and the nature of a perfect and of an imperfect syllogism; and after that, the inclusion or noninclusion of one term in another as in a whole, and what we mean by predicating one term of all, or none, of another.

A premise then is a sentence affirming or denying one thing of another. This is either universal or particular or indefinite. By universal I mean the statement that something belongs to all or none of something else; by particular that it belongs to some or not to some or not to all; by indefinite that it does or does not belong, without any mark to show whether it is universal or particular, e.g. 'contraries are subjects of the same science', or 'pleasure is not good'. The demonstrative premise differs from the dialectical, because the demonstrative premise is the assertion of one of two contradictory statements (the demonstrator does not ask for his premise, but lays it down), whereas the dialectical premise depends on the adversary's choice between two contradictories. But this will make no difference to the production of a syllogism in either case; for both the demonstrator and the dialectician argue syllogistically after stating that something does or does not belong to something else. Therefore a syllogistic premise without qualification will be an affirmation or denial of something concerning something else in the way we have described; it will be demonstrative, if it is true and obtained through the first principles of its science; while a dialectical premise is the giving of a choice between two contradictories, when a man is proceeding by question, but when he is syllogizing it is the assertion of that which is apparent and generally admitted, as has been said in the Topics. The nature then of a premise and the difference between syllogistic, demonstrative, and dialectical premises, may be taken as sufficiently defined by us in relation to our present need, but will be stated accurately in the sequel.

I call that a term into which the premise is resolved, i.e. both the predicate and that of which it is predicated, 'being' being added and 'not being' removed, or vice versa.

A syllogism is discourse in which, certain things being stated, something other than what is stated follows of necessity from their being so. I mean by the last phrase that they produce the consequence, and by this, that no further term is required from without in order to make the consequence necessary.

I call that a perfect syllogism which needs nothing other than what has been stated to make plain what necessarily follows; a syllogism is imperfect, if it needs either one or more propositions, which are indeed the necessary consequences of the terms set down, but have not been expressly stated as premises.

That one term should be included in another as in a whole is the same as for the other to be predicated of all of the first. And we say that one term is predicated of all of another, whenever no instance of the subject can be found of which the other term cannot be asserted: 'to be predicated of none' must be understood in the same way.

## **Chapter 2**

Every premise states that something either is or must be or may be the attribute of something else; of premises of these three kinds some are affirmative, others negative, in respect of each of the three modes of attribution; again some affirmative and negative premises are universal, others particular, others indefinite. It is necessary then that in universal attribution the terms of the negative premise should be convertible, e.g. if no pleasure is good, then no good will be pleasure; the terms of the affirmative must be convertible, not however, universally, but in part, e.g. if every pleasure is good, some good must be pleasure; the particular affirmative must convert in part (for if some pleasure is good, then some good will be pleasure); but the particular negative need not convert, for if some animal is not man, it does not follow that some man is not animal.

First then take a universal negative with the terms A and B. If no B is A, neither can any A be B. For if some A (say C) were B, it would not be true that no B is A; for C is a B. But if every B is A then some A is B. For if no A were B, then no B could be A. But we assumed that every B is A. Similarly too, if the premise is particular. For if some B is A, then some of the As must be B. For if none were, then no B would be A. But if some B is not A, there is no necessity that some of the As should not be B; e.g. let B stand for animal and A for man. Not every animal is a man; but every man is an animal.

## **Chapter 3**

The same manner of conversion will hold good also in respect of necessary premises. The universal negative converts universally; each of the affirmatives converts into a particular. If it is necessary that no B is A, it is necessary also that no A is B. For if it is possible that some A is B, it would be possible also that some B is A. If all or some B is A of necessity, it is necessary also that some A is B: for if there were no necessity, neither would some of the Bs be A necessarily. But the particular negative does not convert, for the same reason which we have already stated.

In respect of possible premises, since possibility is used in several senses (for we say that what is necessary and what is not necessary and what is potential is possible), affirmative statements will all convert in a manner similar to those described. For if it is possible that all or some B is A, it will be possible that some A is B. For if that were not possible, then no B could possibly be A. This has been already proved. But in negative statements the case is different. Whatever is said to be possible, either because B necessarily is A, or because B is not necessarily A, admits of conversion like other negative statements, e.g. if one should say, it is possible that man is not horse, or that no garment is white. For in the former case the one term necessarily does not

belong to the other; in the latter there is no necessity that it should: and the premise converts like other negative statements. For if it is possible for no man to be a horse, it is also admissible for no horse to be a man; and if it is admissible for no garment to be white, it is also admissible for nothing white to be a garment. For if any white thing must be a garment, then some garment will necessarily be white. This has been already proved. The particular negative also must be treated like those dealt with above. But if anything is said to be possible because it is the general rule and natural (and it is in this way we define the possible), the negative premises can no longer be converted like the simple negatives; the universal negative premise does not convert, and the particular does. This will be plain when we speak about the possible. At present we may take this much as clear in addition to what has been said: the statement that it is possible that no B is A or some B is not A is affirmative in form: for the expression 'is possible' ranks along with 'is', and 'is' makes an affirmation always and in every case, whatever the terms to which it is added, in predication, e.g. 'it is not-good' or 'it is not-white' or in a word 'it is not-this'. But this also will be proved in the sequel. In conversion these premises will behave like the other affirmative propositions.

#### **Chapter 4**

After these distinctions we now state by what means, when, and how every syllogism is produced; subsequently we must speak of demonstration. Syllogism should be discussed before demonstration because syllogism is the general: the demonstration is a sort of syllogism, but not every syllogism is a demonstration.

Whenever three terms are so related to one another that the last is contained in the middle as in a whole, and the middle is either contained in, or excluded from, the first as in or from a whole, the extremes must be related by a perfect syllogism. I call that term middle which is itself contained in another and contains another in itself: in position also this comes in the middle. By extremes I mean both that term which is itself contained in another and that in which another is contained. If A is predicated of all B, and B of all C, A must be predicated of all C: we have already explained what we mean by 'predicated of all'. Similarly also, if A is predicated of no B, and B of all C, it is necessary that no C will be A.

But if the first term belongs to all the middle, but the middle to none of the last term, there will be no syllogism in respect of the extremes; for nothing necessary follows from the terms being so related; for it is possible that the first should belong either to all or to none of the last, so that neither a particular nor a universal conclusion is necessary. But if there is no necessary consequence, there cannot be a syllogism by means of these premises. As an example of a universal affirmative relation between the extremes we may take the terms animal, man, horse; of a universal negative relation, the terms animal, man, stone. Nor again can syllogism be formed when neither the first term belongs to any of the middle, nor the middle to any of the last. As an example of a positive relation between the extremes take the terms science, line, medicine: of a negative relation science, line, unit.

If then the terms are universally related, it is clear in this figure when a syllogism will be possible and when not, and that if a syllogism is possible the terms must be related as described, and if they are so related there will be a syllogism.

But if one term is related universally, the other in part only, to its subject, there must be a perfect syllogism whenever universality is posited with reference to the major term either affirmatively or negatively, and particularity with reference to the minor term affirmatively: but whenever the universality is posited in relation to the minor term, or the terms are related in any other way, a syllogism is impossible. I call that term the major in which the middle is contained and that term the minor which comes under the middle. Let all B be A and some C be B. Then if 'predicated of all' means what was said above, it is necessary that some C is A. And if no B is A but some C is B, it is necessary that some C is not A. The meaning of 'predicated of none' has also been defined. So there will be a perfect syllogism. This holds good also if the premise BC should be indefinite, provided that it is affirmative: for we shall have the same syllogism whether the premise is indefinite or particular.

But if the universality is posited with respect to the minor term either affirmatively or negatively, a syllogism will not be possible, whether the major premise is positive or negative, indefinite or particular: e.g. if some B is or is not A, and all C is B. As an example of a positive relation between the extremes take the terms good, state, wisdom: of a negative relation, good, state, ignorance. Again if no C is B, but some B is or is not A or not every B is A, there cannot be a syllogism. Take the terms white, horse, swan: white, horse, raven. The same terms may be taken also if the premise BA is indefinite.

Nor when the major premise is universal, whether affirmative or negative, and the minor premise is negative and particular, can there be a syllogism, whether the minor premise be indefinite or particular: e.g. if all B is A and some C is not B, or if not all C is B. For the major term may be predicable both of all and of none of the minor, to some of which the middle term cannot be attributed. Suppose the terms are animal, man, white: next take some of the white things of which man is not predicated—swan and snow: animal is predicated of all of the one, but of none of the other. Consequently there cannot be a syllogism. Again let no B be A, but let some C not be B. Take the terms inanimate, man, white: then take some white things of which man is not predicated—swan and snow: the term inanimate is predicated of all of the one, of none of the other.

Further since it is indefinite to say some C is not B, and it is true that some C is not B, whether no C is B, or not all C is B, and since if terms are assumed such that no C is B, no syllogism follows (this has already been stated) it is clear that this arrangement of terms will not afford a syllogism: otherwise one would have been possible with a universal negative minor premise. A similar proof may also be given if the universal premise is negative.

Nor can there in any way be a syllogism if both the relations of subject and predicate are particular, either positively or negatively, or the one negative and the other affirmative, or one indefinite and the other definite, or both indefinite. Terms common to all the above are animal, white, horse: animal, white, stone.

It is clear then from what has been said that if there is a syllogism in this figure with a particular conclusion, the terms must be related as we have stated: if they are related otherwise, no syllogism is possible anyhow. It is evident also that all the syllogisms in this figure are perfect (for they are all completed by means of the premises originally taken) and that all conclusions are proved by this figure, viz. universal and particular, affirmative and negative. Such a figure I call the first.

## Chapter 5

Whenever the same thing belongs to all of one subject, and to none of another, or to all of each subject or to none of either, I call such a figure the second; by middle term in it I mean that which is predicated of both subjects, by extremes the terms of which this is said, by major extreme that which lies near the middle, by minor that which is further away from the middle. The middle term stands outside the extremes, and is first in position. A syllogism cannot be perfect anyhow in this figure, but it may be valid whether the terms are related universally or not.

If then the terms are related universally a syllogism will be possible, whenever the middle belongs to all of one subject and to none of another (it does not matter which has the negative relation), but in no other way. Let M be predicated of no N, but of all O. Since, then, the negative relation is convertible, N will belong to no M: but M was assumed to belong to all O: consequently N will belong to no O. This has already been proved. Again if M belongs to all N, but to no O, then N will belong to no O. For if M belongs to no O, O belongs to no M: but M (as was said) belongs to all N: O then will belong to no N: for the first figure has again been formed. But since the negative relation is convertible, N will belong to no O. Thus it will be the same syllogism that proves both conclusions.

It is possible to prove these results also by reductio ad impossibile.

It is clear then that a syllogism is formed when the terms are so related, but not a perfect syllogism; for necessity is not perfectly established merely from the original premises; others also are needed.

But if M is predicated of every N and O, there cannot be a syllogism. Terms to illustrate a positive relation between the extremes are substance, animal, man; a negative relation, substance, animal, number-substance being the middle term.

Nor is a syllogism possible when M is predicated neither of any N nor of any O. Terms to illustrate a positive relation are line, animal, man: a negative relation, line, animal, stone.

It is clear then that if a syllogism is formed when the terms are universally related, the terms must be related as we stated at the outset: for if they are otherwise related no necessary consequence follows.

If the middle term is related universally to one of the extremes, a particular negative syllogism must result whenever the middle term is related universally to the major whether positively or negatively, and particularly to the minor and in a manner opposite to that of the universal statement: by 'an opposite manner' I mean, if the universal statement is negative, the particular is affirmative: if the universal is affirmative, the particular is negative. For if M belongs to no N, but to some O, it is necessary that N does not belong to some O. For since the negative statement is convertible, N will belong to no M: but M was admitted to belong to some O: therefore N will not belong to some O: for the result is reached by means of the first figure. Again if M belongs to all N, but not to some O, it is necessary that N does not belong to some O: for if N belongs to all O, and M is predicated also of all N, M must belong to all O: but we assumed that M does not belong to some O. And if M belongs to all N but not to all O, we shall conclude that N does not belong to all O: the proof is the same as the above. But if M is predicated of all O, but not of all N, there will be no syllogism. Take the terms animal, substance, raven; animal, white, raven. Nor

will there be a conclusion when M is predicated of no O, but of some N. Terms to illustrate a positive relation between the extremes are animal, substance, unit: a negative relation, animal, substance, science.

If then the universal statement is opposed to the particular, we have stated when a syllogism will be possible and when not: but if the premises are similar in form, I mean both negative or both affirmative, a syllogism will not be possible anyhow. First let them be negative, and let the major premise be universal, e.g. let M belong to no N, and not to some O. It is possible then for N to belong either to all O or to no O. Terms to illustrate the negative relation are black, snow, animal. But it is not possible to find terms of which the extremes are related positively and universally, if M belongs to some O, and does not belong to some O. For if N belonged to all O, but M to no N, then M would belong to no O: but we assumed that it belongs to some O. In this way then it is not admissible to take terms: our point must be proved from the indefinite nature of the particular statement. For since it is true that M does not belong to some O, even if it belongs to no O, and since if it belongs to no O a syllogism is (as we have seen) not possible, clearly it will not be possible now either.

Again let the premises be affirmative, and let the major premise as before be universal, e.g. let M belong to all N and to some O. It is possible then for N to belong to all O or to no O. Terms to illustrate the negative relation are white, swan, stone. But it is not possible to take terms to illustrate the universal affirmative relation, for the reason already stated: the point must be proved from the indefinite nature of the particular statement. But if the minor premise is universal, and M belongs to no O, and not to some N, it is possible for N to belong either to all O or to no O. Terms for the positive relation are white, animal, raven: for the negative relation, white, stone, raven. If the premises are affirmative, terms for the negative relation are white, animal, snow; for the positive relation, white, animal, swan. Evidently then, whenever the premises are similar in form, and one is universal, the other particular, a syllogism can, not be formed anyhow. Nor is one possible if the middle term belongs to some of each of the extremes, or does not belong to some of either, or belongs to some of the one, not to some of the other, or belongs to neither universally, or is related to them indefinitely. Common terms for all the above are white, animal, man: white, animal, inanimate. It is clear then from what has been said that if the terms are related to one another in the way stated, a syllogism results of necessity; and if there is a syllogism, the terms must be so related. But it is evident also that all the syllogisms in this figure are imperfect: for all are made perfect by certain supplementary statements, which either are contained in the terms of necessity or are assumed as hypotheses, i.e. when we prove per impossibile. And it is evident that an affirmative conclusion is not attained by means of this figure, but all are negative, whether universal or particular.

## Chapter 6

But if one term belongs to all, and another to none, of a third, or if both belong to all, or to none, of it, I call such a figure the third; by middle term in it I mean that of which both the predicates are predicated, by extremes I mean the predicates, by the major extreme that which is further from the middle, by the minor that which is nearer to it. The middle term stands outside the extremes, and is last in position. A syllogism cannot be perfect in this figure either, but it may be valid whether the terms are related universally or not to the middle term.

If they are universal, whenever both P and R belong to S, it follows that P will necessarily belong to some R. For, since the affirmative statement is convertible, S will belong to some R: consequently since P belongs to all S, and S to some R, P must belong to some R: for a syllogism in the first figure is produced. It is possible to demonstrate this also per impossibile and by exposition. For if both P and R belong to all S, should one of the Ss, e.g. N, be taken, both P and R will belong to this, and thus P will belong to some R.

If R belongs to all S, and P to no S, there will be a syllogism to prove that P will necessarily not belong to some R. This may be demonstrated in the same way as before by converting the premise RS. It might be proved also per impossibile, as in the former cases. But if R belongs to no S, P to all S, there will be no syllogism. Terms for the positive relation are animal, horse, man: for the negative relation animal, inanimate, man.

Nor can there be a syllogism when both terms are asserted of no S. Terms for the positive relation are animal, horse, inanimate; for the negative relation man, horse, inanimate-inanimate being the middle term.

It is clear then in this figure also when a syllogism will be possible and when not, if the terms are related universally. For whenever both the terms are affirmative, there will be a syllogism to prove that one extreme belongs to some of the other; but when they are negative, no syllogism will be possible. But when one is negative, the other affirmative, if the major is negative, the minor affirmative, there will be a syllogism to prove that the one extreme does not belong to some of the other: but if the relation is reversed, no syllogism will be possible. If one term is related universally to the middle, the other in part only, when both are affirmative there must be a syllogism, no matter which of the premises is universal. For if R belongs to all S, P to some S, P must belong to some R. For since the affirmative statement is convertible S will belong to some P: consequently since R belongs to all S, and S to some P, R must also belong to some P: therefore P must belong to some R.

Again if R belongs to some S, and P to all S, P must belong to some R. This may be demonstrated in the same way as the preceding. And it is possible to demonstrate it also per impossibile and by exposition, as in the former cases. But if one term is affirmative, the other negative, and if the affirmative is universal, a syllogism will be possible whenever the minor term is affirmative. For if R belongs to all S, but P does not belong to some S, it is necessary that P does not belong to some R. For if P belongs to all R, and R belongs to all S, then P will belong to all S: but we assumed that it did not. Proof is possible also without reduction ad impossibile, if one of the Ss be taken to which P does not belong.

But whenever the major is affirmative, no syllogism will be possible, e.g. if P belongs to all S and R does not belong to some S. Terms for the universal affirmative relation are animate, man, animal. For the universal negative relation it is not possible to get terms, if R belongs to some S, and does not belong to some S. For if P belongs to all S, and R to some S, then P will belong to some R: but we assumed that it belongs to no R. We must put the matter as before.' Since the expression 'it does not belong to some' is indefinite, it may be used truly of that also which belongs to none. But if R belongs to no S, no syllogism is possible, as has been shown. Clearly then no syllogism will be possible here.

But if the negative term is universal, whenever the major is negative and the minor affirmative there will be a syllogism. For if P belongs to no S, and R belongs to some S, P will not belong to some R: for we shall have the first figure again, if the premise RS is converted.

But when the minor is negative, there will be no syllogism. Terms for the positive relation are animal, man, wild: for the negative relation, animal, science, wild-the middle in both being the term wild.

Nor is a syllogism possible when both are stated in the negative, but one is universal, the other particular. When the minor is related universally to the middle, take the terms animal, science, wild; animal, man, wild. When the major is related universally to the middle, take as terms for a negative relation raven, snow, white. For a positive relation terms cannot be found, if R belongs to some S, and does not belong to some S. For if P belongs to all R, and R to some S, then P belongs to some S: but we assumed that it belongs to no S. Our point, then, must be proved from the indefinite nature of the particular statement.

Nor is a syllogism possible anyhow, if each of the extremes belongs to some of the middle or does not belong, or one belongs and the other does not to some of the middle, or one belongs to some of the middle, the other not to all, or if the premises are indefinite. Common terms for all are animal, man, white: animal, inanimate, white.

It is clear then in this figure also when a syllogism will be possible, and when not; and that if the terms are as stated, a syllogism results of necessity, and if there is a syllogism, the terms must be so related. It is clear also that all the syllogisms in this figure are imperfect (for all are made perfect by certain supplementary assumptions), and that it will not be possible to reach a universal conclusion by means of this figure, whether negative or affirmative.

## **Chapter 7**

It is evident also that in all the figures, whenever a proper syllogism does not result, if both the terms are affirmative or negative nothing necessary follows at all, but if one is affirmative, the other negative, and if the negative is stated universally, a syllogism always results relating the minor to the major term, e.g. if A belongs to all or some B, and B belongs to no C: for if the premises are converted it is necessary that C does not belong to some A. Similarly also in the other figures: a syllogism always results by means of conversion. It is evident also that the substitution of an indefinite for a particular affirmative will effect the same syllogism in all the figures.

It is clear too that all the imperfect syllogisms are made perfect by means of the first figure. For all are brought to a conclusion either ostensively or per impossibile. In both ways the first figure is formed: if they are made perfect ostensively, because (as we saw) all are brought to a conclusion by means of conversion, and conversion produces the first figure: if they are proved per impossibile, because on the assumption of the false statement the syllogism comes about by means of the first figure, e.g. in the last figure, if A and B belong to all C, it follows that A belongs to some B: for if A belonged to no B, and B belongs to all C, A would belong to no C: but (as we stated) it belongs to all C. Similarly also with the rest.

It is possible also to reduce all syllogisms to the universal syllogisms in the first figure. Those in the second figure are clearly made perfect by these, though not all in the same way; the universal

syllogisms are made perfect by converting the negative premise, each of the particular syllogisms by *reductio ad impossibile*. In the first figure particular syllogisms are indeed made perfect by themselves, but it is possible also to prove them by means of the second figure, reducing them ad *impossibile*, e.g. if A belongs to all B, and B to some C, it follows that A belongs to some C. For if it belonged to no C, and belongs to all B, then B will belong to no C: this we know by means of the second figure. Similarly also demonstration will be possible in the case of the negative. For if A belongs to no B, and B belongs to some C, A will not belong to some C: for if it belonged to all C, and belongs to no B, then B will belong to no C: and this (as we saw) is the middle figure. Consequently, since all syllogisms in the middle figure can be reduced to universal syllogisms in the first figure, and since particular syllogisms in the first figure can be reduced to syllogisms in the middle figure, it is clear that particular syllogisms can be reduced to universal syllogisms in the first figure. Syllogisms in the third figure, if the terms are universal, are directly made perfect by means of those syllogisms; but, when one of the premises is particular, by means of the particular syllogisms in the first figure: and these (we have seen) may be reduced to the universal syllogisms in the first figure: consequently also the particular syllogisms in the third figure may be so reduced. It is clear then that all syllogisms may be reduced to the universal syllogisms in the first figure.

We have stated then how syllogisms which prove that something belongs or does not belong to something else are constituted, both how syllogisms of the same figure are constituted in themselves, and how syllogisms of different figures are related to one another.

## Chapter 8

Since there is a difference according as something belongs, necessarily belongs, or may belong to something else (for many things belong indeed, but not necessarily, others neither necessarily nor indeed at all, but it is possible for them to belong), it is clear that there will be different syllogisms to prove each of these relations, and syllogisms with differently related terms, one syllogism concluding from what is necessary, another from what is, a third from what is possible.

There is hardly any difference between syllogisms from necessary premises and syllogisms from premises which merely assert. When the terms are put in the same way, then, whether something belongs or necessarily belongs (or does not belong) to something else, a syllogism will or will not result alike in both cases, the only difference being the addition of the expression 'necessarily' to the terms. For the negative statement is convertible alike in both cases, and we should give the same account of the expressions 'to be contained in something as in a whole' and 'to be predicated of all of something'. With the exceptions to be made below, the conclusion will be proved to be necessary by means of conversion, in the same manner as in the case of simple predication. But in the middle figure when the universal statement is affirmative, and the particular negative, and again in the third figure when the universal is affirmative and the particular negative, the demonstration will not take the same form, but it is necessary by the 'exposition' of a part of the subject of the particular negative proposition, to which the predicate does not belong, to make the syllogism in reference to this: with terms so chosen the conclusion will necessarily follow. But if the relation is necessary in respect of the part taken, it must hold of some of that term in which this part is included: for the part taken is just some of that. And each of the resulting syllogisms is in the appropriate figure.

## Chapter 9

It happens sometimes also that when one premise is necessary the conclusion is necessary, not however when either premise is necessary, but only when the major is, e.g. if A is taken as necessarily belonging or not belonging to B, but B is taken as simply belonging to C: for if the premises are taken in this way, A will necessarily belong or not belong to C. For since necessarily belongs, or does not belong, to every B, and since C is one of the Bs, it is clear that for C also the positive or the negative relation to A will hold necessarily. But if the major premise is not necessary, but the minor is necessary, the conclusion will not be necessary. For if it were, it would result both through the first figure and through the third that A belongs necessarily to some B. But this is false; for B may be such that it is possible that A should belong to none of it. Further, an example also makes it clear that the conclusion not be necessary, e.g. if A were movement, B animal, C man: man is an animal necessarily, but an animal does not move necessarily, nor does man. Similarly also if the major premise is negative; for the proof is the same.

In particular syllogisms, if the universal premise is necessary, then the conclusion will be necessary; but if the particular, the conclusion will not be necessary, whether the universal premise is negative or affirmative. First let the universal be necessary, and let A belong to all B necessarily, but let B simply belong to some C: it is necessary then that A belongs to some C necessarily: for C falls under B, and A was assumed to belong necessarily to all B. Similarly also if the syllogism should be negative: for the proof will be the same. But if the particular premise is necessary, the conclusion will not be necessary: for from the denial of such a conclusion nothing impossible results, just as it does not in the universal syllogisms. The same is true of negative syllogisms. Try the terms movement, animal, white.

## Chapter 10

In the second figure, if the negative premise is necessary, then the conclusion will be necessary, but if the affirmative, not necessary. First let the negative be necessary; let A be possible of no B, and simply belong to C. Since then the negative statement is convertible, B is possible of no A. But A belongs to all C; consequently B is possible of no C. For C falls under A. The same result would be obtained if the minor premise were negative: for if A is possible of no C, C is possible of no A: but A belongs to all B, consequently C is possible of none of the Bs: for again we have obtained the first figure. Neither then is B possible of C: for conversion is possible without modifying the relation.

But if the affirmative premise is necessary, the conclusion will not be necessary. Let A belong to all B necessarily, but to no C simply. If then the negative premise is converted, the first figure results. But it has been proved in the case of the first figure that if the negative major premise is not necessary the conclusion will not be necessary either. Therefore the same result will obtain here. Further, if the conclusion is necessary, it follows that C necessarily does not belong to some A. For if B necessarily belongs to no C, C will necessarily belong to no B. But B at any rate must belong to some A, if it is true (as was assumed) that A necessarily belongs to all B. Consequently it is necessary that C does not belong to some A. But nothing prevents such an A being taken that it is possible for C to belong to all of it. Further one might show by an exposition of terms that the conclusion is not necessary without qualification, though it is a necessary conclusion from the premises. For example let A be animal, B man, C white, and let the premises be assumed to correspond to what we had before: it is possible that animal should belong to nothing white. Man then will not belong to anything white, but not necessarily: for it is

possible for man to be born white, not however so long as animal belongs to nothing white. Consequently under these conditions the conclusion will be necessary, but it is not necessary without qualification.

Similar results will obtain also in particular syllogisms. For whenever the negative premise is both universal and necessary, then the conclusion will be necessary: but whenever the affirmative premise is universal, the negative particular, the conclusion will not be necessary. First then let the negative premise be both universal and necessary: let it be possible for no B that A should belong to it, and let A simply belong to some C. Since the negative statement is convertible, it will be possible for no A that B should belong to it: but A belongs to some C; consequently B necessarily does not belong to some of the Cs. Again let the affirmative premise be both universal and necessary, and let the major premise be affirmative. If then A necessarily belongs to all B, but does not belong to some C, it is clear that B will not belong to some C, but not necessarily. For the same terms can be used to demonstrate the point, which were used in the universal syllogisms. Nor again, if the negative statement is necessary but particular, will the conclusion be necessary. The point can be demonstrated by means of the same terms.

## Chapter 11

In the last figure when the terms are related universally to the middle, and both premises are affirmative, if one of the two is necessary, then the conclusion will be necessary. But if one is negative, the other affirmative, whenever the negative is necessary the conclusion also will be necessary, but whenever the affirmative is necessary the conclusion will not be necessary. First let both the premises be affirmative, and let A and B belong to all C, and let AC be necessary. Since then B belongs to all C, C also will belong to some B, because the universal is convertible into the particular: consequently if A belongs necessarily to all C, and C belongs to some B, it is necessary that A should belong to some B also. For B is under C. The first figure then is formed. A similar proof will be given also if BC is necessary. For C is convertible with some A: consequently if B belongs necessarily to all C, it will belong necessarily also to some A.

Again let AC be negative, BC affirmative, and let the negative premise be necessary. Since then C is convertible with some B, but A necessarily belongs to no C, A will necessarily not belong to some B either: for B is under C. But if the affirmative is necessary, the conclusion will not be necessary. For suppose BC is affirmative and necessary, while AC is negative and not necessary. Since then the affirmative is convertible, C also will belong to some B necessarily: consequently if A belongs to none of the Cs, while C belongs to some of the Bs, A will not belong to some of the Bs-but not of necessity; for it has been proved, in the case of the first figure, that if the negative premise is not necessary, neither will the conclusion be necessary. Further, the point may be made clear by considering the terms. Let the term A be 'good', let that which B signifies be 'animal', let the term C be 'horse'. It is possible then that the term good should belong to no horse, and it is necessary that the term animal should belong to every horse: but it is not necessary that some animal should not be good, since it is possible for every animal to be good. Or if that is not possible, take as the term 'awake' or 'asleep': for every animal can accept these.

If, then, the premises are universal, we have stated when the conclusion will be necessary. But if one premise is universal, the other particular, and if both are affirmative, whenever the universal is necessary the conclusion also must be necessary. The demonstration is the same as before; for the particular affirmative also is convertible. If then it is necessary that B should belong to all C,

and A falls under C, it is necessary that B should belong to some A. But if B must belong to some A, then A must belong to some B: for conversion is possible. Similarly also if AC should be necessary and universal: for B falls under C. But if the particular premise is necessary, the conclusion will not be necessary. Let the premise BC be both particular and necessary, and let A belong to all C, not however necessarily. If the proposition BC is converted the first figure is formed, and the universal premise is not necessary, but the particular is necessary. But when the premises were thus, the conclusion (as we proved was not necessary: consequently it is not here either. Further, the point is clear if we look at the terms. Let A be waking, B biped, and C animal. It is necessary that B should belong to some C, but it is possible for A to belong to C, and that A should belong to B is not necessary. For there is no necessity that some biped should be asleep or awake. Similarly and by means of the same terms proof can be made, should the proposition AC be both particular and necessary.

But if one premise is affirmative, the other negative, whenever the universal is both negative and necessary the conclusion also will be necessary. For if it is not possible that A should belong to any C, but B belongs to some C, it is necessary that A should not belong to some B. But whenever the affirmative proposition is necessary, whether universal or particular, or the negative is particular, the conclusion will not be necessary. The proof of this by reduction will be the same as before; but if terms are wanted, when the universal affirmative is necessary, take the terms 'waking'-'animal'-'man', 'man' being middle, and when the affirmative is particular and necessary, take the terms 'waking'-'animal'-'white': for it is necessary that animal should belong to some white thing, but it is possible that waking should belong to none, and it is not necessary that waking should not belong to some animal. But when the negative proposition being particular is necessary, take the terms 'biped', 'moving', 'animal', 'animal' being middle.

## **Chapter 12**

It is clear then that a simple conclusion is not reached unless both premises are simple assertions, but a necessary conclusion is possible although one only of the premises is necessary. But in both cases, whether the syllogisms are affirmative or negative, it is necessary that one premise should be similar to the conclusion. I mean by 'similar', if the conclusion is a simple assertion, the premise must be simple; if the conclusion is necessary, the premise must be necessary. Consequently this also is clear, that the conclusion will be neither necessary nor simple unless a necessary or simple premise is assumed.

## **Chapter 13**

Perhaps enough has been said about the proof of necessity, how it comes about and how it differs from the proof of a simple statement. We proceed to discuss that which is possible, when and how and by what means it can be proved. I use the terms 'to be possible' and 'the possible' of that which is not necessary but, being assumed, results in nothing impossible. We say indeed ambiguously of the necessary that it is possible. But that my definition of the possible is correct is clear from the phrases by which we deny or on the contrary affirm possibility. For the expressions 'it is not possible to belong', 'it is impossible to belong', and 'it is necessary not to belong' are either identical or follow from one another; consequently their opposites also, 'it is possible to belong', 'it is not impossible to belong', and 'it is not necessary not to belong', will either be identical or follow from one another. For of everything the affirmation or the denial holds good. That which is possible then will be not necessary and that which is not necessary

will be possible. It results that all premises in the mode of possibility are convertible into one another. I mean not that the affirmative are convertible into the negative, but that those which are affirmative in form admit of conversion by opposition, e.g. 'it is possible to belong' may be converted into 'it is possible not to belong', and 'it is possible for A to belong to all B' into 'it is possible for A to belong to no B' or 'not to all B', and 'it is possible for A to belong to some B' into 'it is possible for A not to belong to some B'. And similarly the other propositions in this mode can be converted. For since that which is possible is not necessary, and that which is not necessary may possibly not belong, it is clear that if it is possible that A should belong to B, it is possible also that it should not belong to B: and if it is possible that it should belong to all, it is also possible that it should not belong to all. The same holds good in the case of particular affirmations: for the proof is identical. And such premises are affirmative and not negative; for 'to be possible' is in the same rank as 'to be', as was said above.

Having made these distinctions we next point out that the expression 'to be possible' is used in two ways. In one it means to happen generally and fall short of necessity, e.g. man's turning gray or growing or decaying, or generally what naturally belongs to a thing (for this has not its necessity unbroken, since man's existence is not continuous for ever, although if a man does exist, it comes about either necessarily or generally). In another sense the expression means the indefinite, which can be both thus and not thus, e.g. an animal's walking or an earthquake's taking place while it is walking, or generally what happens by chance: for none of these inclines by nature in the one way more than in the opposite.

That which is possible in each of its two senses is convertible into its opposite, not however in the same way: but what is natural is convertible because it does not necessarily belong (for in this sense it is possible that a man should not grow gray) and what is indefinite is convertible because it inclines this way no more than that. Science and demonstrative syllogism are not concerned with things which are indefinite, because the middle term is uncertain; but they are concerned with things that are natural, and as a rule arguments and inquiries are made about things which are possible in this sense. Syllogisms indeed can be made about the former, but it is unusual at any rate to inquire about them.

These matters will be treated more definitely in the sequel; our business at present is to state the moods and nature of the syllogism made from possible premises. The expression 'it is possible for this to belong to that' may be understood in two senses: 'that' may mean either that to which 'that' belongs or that to which it may belong; for the expression 'A is possible of the subject of B' means that it is possible either of that of which B is stated or of that of which B may possibly be stated. It makes no difference whether we say, A is possible of the subject of B, or all B admits of A. It is clear then that the expression 'A may possibly belong to all B' might be used in two senses. First then we must state the nature and characteristics of the syllogism which arises if B is possible of the subject of C, and A is possible of the subject of B. For thus both premises are assumed in the mode of possibility; but whenever A is possible of that of which B is true, one premise is a simple assertion, the other a problematic. Consequently we must start from premises which are similar in form, as in the other cases.

## Chapter 14

Whenever A may possibly belong to all B, and B to all C, there will be a perfect syllogism to prove that A may possibly belong to all C. This is clear from the definition: for it was in this way

that we explained 'to be possible for one term to belong to all of another'. Similarly if it is possible for A to belong to no B, and for B to belong to all C, then it is possible for A to belong to no C. For the statement that it is possible for A not to belong to that of which B may be true means (as we saw) that none of those things which can possibly fall under the term B is left out of account. But whenever A may belong to all B, and B may belong to no C, then indeed no syllogism results from the premises assumed, but if the premise BC is converted after the manner of problematic propositions, the same syllogism results as before. For since it is possible that B should belong to no C, it is possible also that it should belong to all C. This has been stated above. Consequently if B is possible for all C, and A is possible for all B, the same syllogism again results. Similarly if in both the premises the negative is joined with 'it is possible': e.g. if A may belong to none of the Bs, and B to none of the Cs. No syllogism results from the assumed premises, but if they are converted we shall have the same syllogism as before. It is clear then that if the minor premise is negative, or if both premises are negative, either no syllogism results, or if one it is not perfect. For the necessity results from the conversion.

But if one of the premises is universal, the other particular, when the major premise is universal there will be a perfect syllogism. For if A is possible for all B, and B for some C, then A is possible for some C. This is clear from the definition of being possible. Again if A may belong to no B, and B may belong to some of the Cs, it is necessary that A may possibly not belong to some of the Cs. The proof is the same as above. But if the particular premise is negative, and the universal is affirmative, the major still being universal and the minor particular, e.g. A is possible for all B, B may possibly not belong to some C, then a clear syllogism does not result from the assumed premises, but if the particular premise is converted and it is laid down that B possibly may belong to some C, we shall have the same conclusion as before, as in the cases given at the beginning.

But if the major premise is the minor universal, whether both are affirmative, or negative, or different in quality, or if both are indefinite or particular, in no way will a syllogism be possible. For nothing prevents B from reaching beyond A, so that as predicates cover unequal areas. Let C be that by which B extends beyond A. To C it is not possible that A should belong-either to all or to none or to some or not to some, since premises in the mode of possibility are convertible and it is possible for B to belong to more things than A can. Further, this is obvious if we take terms; for if the premises are as assumed, the major term is both possible for none of the minor and must belong to all of it. Take as terms common to all the cases under consideration 'animal'-'white'-'man', where the major belongs necessarily to the minor; 'animal'-'white'-'garment', where it is not possible that the major should belong to the minor. It is clear then that if the terms are related in this manner, no syllogism results. For every syllogism proves that something belongs either simply or necessarily or possibly. It is clear that there is no proof of the first or of the second. For the affirmative is destroyed by the negative, and the negative by the affirmative. There remains the proof of possibility. But this is impossible. For it has been proved that if the terms are related in this manner it is both necessary that the major should belong to all the minor and not possible that it should belong to any. Consequently there cannot be a syllogism to prove the possibility; for the necessary (as we stated) is not possible.

It is clear that if the terms are universal in possible premises a syllogism always results in the first figure, whether they are affirmative or negative, only a perfect syllogism results in the first

case, an imperfect in the second. But possibility must be understood according to the definition laid down, not as covering necessity. This is sometimes forgotten.

## Chapter 15

If one premise is a simple proposition, the other a problematic, whenever the major premise indicates possibility all the syllogisms will be perfect and establish possibility in the sense defined; but whenever the minor premise indicates possibility all the syllogisms will be imperfect, and those which are negative will establish not possibility according to the definition, but that the major does not necessarily belong to any, or to all, of the minor. For if this is so, we say it is possible that it should belong to none or not to all. Let A be possible for all B, and let B belong to all C. Since C falls under B, and A is possible for all B, clearly it is possible for all C also. So a perfect syllogism results. Likewise if the premise AB is negative, and the premise BC is affirmative, the former stating possible, the latter simple attribution, a perfect syllogism results proving that A possibly belongs to no C.

It is clear that perfect syllogisms result if the minor premise states simple belonging: but that syllogisms will result if the modality of the premises is reversed, must be proved per impossibile. At the same time it will be evident that they are imperfect: for the proof proceeds not from the premises assumed. First we must state that if B's being follows necessarily from A's being, B's possibility will follow necessarily from A's possibility. Suppose, the terms being so related, that A is possible, and B is impossible. If then that which is possible, when it is possible for it to be, might happen, and if that which is impossible, when it is impossible, could not happen, and if at the same time A is possible and B impossible, it would be possible for A to happen without B, and if to happen, then to be. For that which has happened, when it has happened, is. But we must take the impossible and the possible not only in the sphere of becoming, but also in the spheres of truth and predictability, and the various other spheres in which we speak of the possible: for it will be alike in all. Further we must understand the statement that B's being depends on A's being, not as meaning that if some single thing A is, B will be: for nothing follows of necessity from the being of some one thing, but from two at least, i.e. when the premises are related in the manner stated to be that of the syllogism. For if C is predicated of D, and D of F, then C is necessarily predicated of F. And if each is possible, the conclusion also is possible. If then, for example, one should indicate the premises by A, and the conclusion by B, it would not only result that if A is necessary B is necessary, but also that if A is possible, B is possible.

Since this is proved it is evident that if a false and not impossible assumption is made, the consequence of the assumption will also be false and not impossible: e.g. if A is false, but not impossible, and if B is the consequence of A, B also will be false but not impossible. For since it has been proved that if B's being is the consequence of A's being, then B's possibility will follow from A's possibility (and A is assumed to be possible), consequently B will be possible: for if it were impossible, the same thing would at the same time be possible and impossible.

Since we have defined these points, let A belong to all B, and B be possible for all C: it is necessary then that should be a possible attribute for all C. Suppose that it is not possible, but assume that B belongs to all C: this is false but not impossible. If then A is not possible for C but B belongs to all C, then A is not possible for all B: for a syllogism is formed in the third degree. But it was assumed that A is a possible attribute for all B. It is necessary then that A is possible for all C. For though the assumption we made is false and not impossible, the conclusion is

impossible. It is possible also in the first figure to bring about the impossibility, by assuming that B belongs to C. For if B belongs to all C, and A is possible for all B, then A would be possible for all C. But the assumption was made that A is not possible for all C.

We must understand 'that which belongs to all' with no limitation in respect of time, e.g. to the present or to a particular period, but simply without qualification. For it is by the help of such premises that we make syllogisms, since if the premise is understood with reference to the present moment, there cannot be a syllogism. For nothing perhaps prevents 'man' belonging at a particular time to everything that is moving, i.e. if nothing else were moving: but 'moving' is possible for every horse; yet 'man' is possible for no horse. Further let the major term be 'animal', the middle 'moving', the minor 'man'. The premises then will be as before, but the conclusion necessary, not possible. For man is necessarily animal. It is clear then that the universal must be understood simply, without limitation in respect of time.

Again let the premise AB be universal and negative, and assume that A belongs to no B, but B possibly belongs to all C. These propositions being laid down, it is necessary that A possibly belongs to no C. Suppose that it cannot belong, and that B belongs to C, as above. It is necessary then that A belongs to some B: for we have a syllogism in the third figure: but this is impossible. Thus it will be possible for A to belong to no C; for if it is supposed false, the consequence is an impossible one. This syllogism then does not establish that which is possible according to the definition, but that which does not necessarily belong to any part of the subject (for this is the contradictory of the assumption which was made: for it was supposed that A necessarily belongs to some C, but the syllogism per impossibile establishes the contradictory which is opposed to this). Further, it is clear also from an example that the conclusion will not establish possibility. Let A be 'raven', B 'intelligent', and C 'man'. A then belongs to no B: for no intelligent thing is a raven. But B is possible for all C: for every man may possibly be intelligent. But A necessarily belongs to no C: so the conclusion does not establish possibility. But neither is it always necessary. Let A be 'moving', B 'science', C 'man'. A then will belong to no B; but B is possible for all C. And the conclusion will not be necessary. For it is not necessary that no man should move; rather it is not necessary that any man should move. Clearly then the conclusion establishes that one term does not necessarily belong to any instance of another term. But we must take our terms better.

If the minor premise is negative and indicates possibility, from the actual premises taken there can be no syllogism, but if the problematic premise is converted, a syllogism will be possible, as before. Let A belong to all B, and let B possibly belong to no C. If the terms are arranged thus, nothing necessarily follows: but if the proposition BC is converted and it is assumed that B is possible for all C, a syllogism results as before: for the terms are in the same relative positions. Likewise if both the relations are negative, if the major premise states that A does not belong to B, and the minor premise indicates that B may possibly belong to no C. Through the premises actually taken nothing necessary results in any way; but if the problematic premise is converted, we shall have a syllogism. Suppose that A belongs to no B, and B may possibly belong to no C. Through these comes nothing necessary. But if B is assumed to be possible for all C (and this is true) and if the premise AB remains as before, we shall again have the same syllogism. But if it be assumed that B does not belong to any C, instead of possibly not belonging, there cannot be a syllogism anyhow, whether the premise AB is negative or affirmative. As common instances of a necessary and positive relation we may take the terms white-animal-snow: of a necessary and

negative relation, white-animal-pitch. Clearly then if the terms are universal, and one of the premises is assertoric, the other problematic, whenever the minor premise is problematic a syllogism always results, only sometimes it results from the premises that are taken, sometimes it requires the conversion of one premise. We have stated when each of these happens and the reason why. But if one of the relations is universal, the other particular, then whenever the major premise is universal and problematic, whether affirmative or negative, and the particular is affirmative and assertoric, there will be a perfect syllogism, just as when the terms are universal. The demonstration is the same as before. But whenever the major premise is universal, but assertoric, not problematic, and the minor is particular and problematic, whether both premises are negative or affirmative, or one is negative, the other affirmative, in all cases there will be an imperfect syllogism. Only some of them will be proved per impossibile, others by the conversion of the problematic premise, as has been shown above. And a syllogism will be possible by means of conversion when the major premise is universal and assertoric, whether positive or negative, and the minor particular, negative, and problematic, e.g. if A belongs to all B or to no B, and B may possibly not belong to some C. For if the premise BC is converted in respect of possibility, a syllogism results. But whenever the particular premise is assertoric and negative, there cannot be a syllogism. As instances of the positive relation we may take the terms white-animal-snow; of the negative, white-animal-pitch. For the demonstration must be made through the indefinite nature of the particular premise. But if the minor premise is universal, and the major particular, whether either premise is negative or affirmative, problematic or assertoric, nohow is a syllogism possible. Nor is a syllogism possible when the premises are particular or indefinite, whether problematic or assertoric, or the one problematic, the other assertoric. The demonstration is the same as above. As instances of the necessary and positive relation we may take the terms animal-white-man; of the necessary and negative relation, animal-white-garment. It is evident then that if the major premise is universal, a syllogism always results, but if the minor is universal nothing at all can ever be proved.

## Chapter 16

Whenever one premise is necessary, the other problematic, there will be a syllogism when the terms are related as before; and a perfect syllogism when the minor premise is necessary. If the premises are affirmative the conclusion will be problematic, not assertoric, whether the premises are universal or not: but if one is affirmative, the other negative, when the affirmative is necessary the conclusion will be problematic, not negative assertoric; but when the negative is necessary the conclusion will be problematic negative, and assertoric negative, whether the premises are universal or not. Possibility in the conclusion must be understood in the same manner as before. There cannot be an inference to the necessary negative proposition: for 'not necessarily to belong' is different from 'necessarily not to belong'.

If the premises are affirmative, clearly the conclusion which follows is not necessary. Suppose A necessarily belongs to all B, and let B be possible for all C. We shall have an imperfect syllogism to prove that A may belong to all C. That it is imperfect is clear from the proof: for it will be proved in the same manner as above. Again, let A be possible for all B, and let B necessarily belong to all C. We shall then have a syllogism to prove that A may belong to all C, not that A does belong to all C: and it is perfect, not imperfect: for it is completed directly through the original premises.

But if the premises are not similar in quality, suppose first that the negative premise is necessary, and let necessarily A not be possible for any B, but let B be possible for all C. It is necessary then that A belongs to no C. For suppose A to belong to all C or to some C. Now we assumed that A is not possible for any B. Since then the negative proposition is convertible, B is not possible for any A. But A is supposed to belong to all C or to some C. Consequently B will not be possible for any C or for all C. But it was originally laid down that B is possible for all C. And it is clear that the possibility of belonging can be inferred, since the fact of not belonging is inferred. Again, let the affirmative premise be necessary, and let A possibly not belong to any B, and let B necessarily belong to all C. The syllogism will be perfect, but it will establish a problematic negative, not an assertoric negative. For the major premise was problematic, and further it is not possible to prove the assertoric conclusion per impossibile. For if it were supposed that A belongs to some C, and it is laid down that A possibly does not belong to any B, no impossible relation between B and C follows from these premises. But if the minor premise is negative, when it is problematic a syllogism is possible by conversion, as above; but when it is necessary no syllogism can be formed. Nor again when both premises are negative, and the minor is necessary. The same terms as before serve both for the positive relation-white-animal-snow, and for the negative relation-white-animal-pitch.

The same relation will obtain in particular syllogisms. Whenever the negative proposition is necessary, the conclusion will be negative assertoric: e.g. if it is not possible that A should belong to any B, but B may belong to some of the Cs, it is necessary that A should not belong to some of the Cs. For if A belongs to all C, but cannot belong to any B, neither can B belong to any A. So if A belongs to all C, to none of the Cs can B belong. But it was laid down that B may belong to some C. But when the particular affirmative in the negative syllogism, e.g. BC the minor premise, or the universal proposition in the affirmative syllogism, e.g. AB the major premise, is necessary, there will not be an assertoric conclusion. The demonstration is the same as before. But if the minor premise is universal, and problematic, whether affirmative or negative, and the major premise is particular and necessary, there cannot be a syllogism. Premises of this kind are possible both where the relation is positive and necessary, e.g. animal-white-man, and where it is necessary and negative, e.g. animal-white-garment. But when the universal is necessary, the particular problematic, if the universal is negative we may take the terms animal-white-raven to illustrate the positive relation, or animal-white-pitch to illustrate the negative; and if the universal is affirmative we may take the terms animal-white-swan to illustrate the positive relation, and animal-white-snow to illustrate the negative and necessary relation. Nor again is a syllogism possible when the premises are indefinite, or both particular. Terms applicable in either case to illustrate the positive relation are animal-white-man: to illustrate the negative, animal-white-inanimate. For the relation of animal to some white, and of white to some inanimate, is both necessary and positive and necessary and negative. Similarly if the relation is problematic: so the terms may be used for all cases.

Clearly then from what has been said a syllogism results or not from similar relations of the terms whether we are dealing with simple existence or necessity, with this exception, that if the negative premise is assertoric the conclusion is problematic, but if the negative premise is necessary the conclusion is both problematic and negative assertoric. [It is clear also that all the syllogisms are imperfect and are perfected by means of the figures above mentioned.]

## Chapter 17

In the second figure whenever both premises are problematic, no syllogism is possible, whether the premises are affirmative or negative, universal or particular. But when one premise is assertoric, the other problematic, if the affirmative is assertoric no syllogism is possible, but if the universal negative is assertoric a conclusion can always be drawn. Similarly when one premise is necessary, the other problematic. Here also we must understand the term 'possible' in the conclusion, in the same sense as before.

First we must point out that the negative problematic proposition is not convertible, e.g. if A may belong to no B, it does not follow that B may belong to no A. For suppose it to follow and assume that B may belong to no A. Since then problematic affirmations are convertible with negations, whether they are contraries or contradictories, and since B may belong to no A, it is clear that B may belong to all A. But this is false: for if all this can be that, it does not follow that all that can be this: consequently the negative proposition is not convertible. Further, these propositions are not incompatible, 'A may belong to no B', 'B necessarily does not belong to some of the As'; e.g. it is possible that no man should be white (for it is also possible that every man should be white), but it is not true to say that it is possible that no white thing should be a man: for many white things are necessarily not men, and the necessary (as we saw) other than the possible.

Moreover it is not possible to prove the convertibility of these propositions by a *reductio ad absurdum*, i.e. by claiming assent to the following argument: 'since it is false that B may belong to no A, it is true that it cannot belong to no A, for the one statement is the contradictory of the other. But if this is so, it is true that B necessarily belongs to some of the As: consequently A necessarily belongs to some of the Bs. But this is impossible.' The argument cannot be admitted, for it does not follow that some A is necessarily B, if it is not possible that no A should be B. For the latter expression is used in two senses, one if A some is necessarily B, another if some A is necessarily not B. For it is not true to say that that which necessarily does not belong to some of the As may possibly not belong to any A, just as it is not true to say that what necessarily belongs to some A may possibly belong to all A. If any one then should claim that because it is not possible for C to belong to all D, it necessarily does not belong to some D, he would make a false assumption: for it does belong to all D, but because in some cases it belongs necessarily, therefore we say that it is not possible for it to belong to all. Hence both the propositions 'A necessarily belongs to some B' and 'A necessarily does not belong to some B' are opposed to the proposition 'A belongs to all B'. Similarly also they are opposed to the proposition 'A may belong to no B'. It is clear then that in relation to what is possible and not possible, in the sense originally defined, we must assume, not that A necessarily belongs to some B, but that A necessarily does not belong to some B. But if this is assumed, no absurdity results: consequently no syllogism. It is clear from what has been said that the negative proposition is not convertible.

This being proved, suppose it possible that A may belong to no B and to all C. By means of conversion no syllogism will result: for the major premise, as has been said, is not convertible. Nor can a proof be obtained by a *reductio ad absurdum*: for if it is assumed that B can belong to all C, no false consequence results: for A may belong both to all C and to no C. In general, if there is a syllogism, it is clear that its conclusion will be problematic because neither of the premises is assertoric; and this must be either affirmative or negative. But neither is possible. Suppose the conclusion is affirmative: it will be proved by an example that the predicate cannot belong to the subject. Suppose the conclusion is negative: it will be proved that it is not

problematic but necessary. Let A be white, B man, C horse. It is possible then for A to belong to all of the one and to none of the other. But it is not possible for B to belong nor not to belong to C. That it is not possible for it to belong, is clear. For no horse is a man. Neither is it possible for it not to belong. For it is necessary that no horse should be a man, but the necessary we found to be different from the possible. No syllogism then results. A similar proof can be given if the major premise is negative, the minor affirmative, or if both are affirmative or negative. The demonstration can be made by means of the same terms. And whenever one premise is universal, the other particular, or both are particular or indefinite, or in whatever other way the premises can be altered, the proof will always proceed through the same terms. Clearly then, if both the premises are problematic, no syllogism results.

## **Chapter 18**

But if one premise is assertoric, the other problematic, if the affirmative is assertoric and the negative problematic no syllogism will be possible, whether the premises are universal or particular. The proof is the same as above, and by means of the same terms. But when the affirmative premise is problematic, and the negative assertoric, we shall have a syllogism. Suppose A belongs to no B, but can belong to all C. If the negative proposition is converted, B will belong to no A. But ex hypothesi can belong to all C: so a syllogism is made, proving by means of the first figure that B may belong to no C. Similarly also if the minor premise is negative. But if both premises are negative, one being assertoric, the other problematic, nothing follows necessarily from these premises as they stand, but if the problematic premise is converted into its complementary affirmative a syllogism is formed to prove that B may belong to no C, as before: for we shall again have the first figure. But if both premises are affirmative, no syllogism will be possible. This arrangement of terms is possible both when the relation is positive, e.g. health, animal, man, and when it is negative, e.g. health, horse, man.

The same will hold good if the syllogisms are particular. Whenever the affirmative proposition is assertoric, whether universal or particular, no syllogism is possible (this is proved similarly and by the same examples as above), but when the negative proposition is assertoric, a conclusion can be drawn by means of conversion, as before. Again if both the relations are negative, and the assertoric proposition is universal, although no conclusion follows from the actual premises, a syllogism can be obtained by converting the problematic premise into its complementary affirmative as before. But if the negative proposition is assertoric, but particular, no syllogism is possible, whether the other premise is affirmative or negative. Nor can a conclusion be drawn when both premises are indefinite, whether affirmative or negative, or particular. The proof is the same and by the same terms.

## **Chapter 19**

If one of the premises is necessary, the other problematic, then if the negative is necessary a syllogistic conclusion can be drawn, not merely a negative problematic but also a negative assertoric conclusion; but if the affirmative premise is necessary, no conclusion is possible. Suppose that A necessarily belongs to no B, but may belong to all C. If the negative premise is converted B will belong to no A: but A ex hypothesi is capable of belonging to all C: so once more a conclusion is drawn by the first figure that B may belong to no C. But at the same time it is clear that B will not belong to any C. For assume that it does: then if A cannot belong to any B, and B belongs to some of the Cs, A cannot belong to some of the Cs: but ex hypothesi it may

belong to all. A similar proof can be given if the minor premise is negative. Again let the affirmative proposition be necessary, and the other problematic; i.e. suppose that A may belong to no B, but necessarily belongs to all C. When the terms are arranged in this way, no syllogism is possible. For (1) it sometimes turns out that B necessarily does not belong to C. Let A be white, B man, C swan. White then necessarily belongs to swan, but may belong to no man; and man necessarily belongs to no swan; Clearly then we cannot draw a problematic conclusion; for that which is necessary is admittedly distinct from that which is possible. (2) Nor again can we draw a necessary conclusion: for that presupposes that both premises are necessary, or at any rate the negative premise. (3) Further it is possible also, when the terms are so arranged, that B should belong to C: for nothing prevents C falling under B, A being possible for all B, and necessarily belonging to C; e.g. if C stands for 'awake', B for 'animal', A for 'motion'. For motion necessarily belongs to what is awake, and is possible for every animal: and everything that is awake is animal. Clearly then the conclusion cannot be the negative assertion, if the relation must be positive when the terms are related as above. Nor can the opposite affirmations be established: consequently no syllogism is possible. A similar proof is possible if the major premise is affirmative.

But if the premises are similar in quality, when they are negative a syllogism can always be formed by converting the problematic premise into its complementary affirmative as before. Suppose A necessarily does not belong to B, and possibly may not belong to C: if the premises are converted B belongs to no A, and A may possibly belong to all C: thus we have the first figure. Similarly if the minor premise is negative. But if the premises are affirmative there cannot be a syllogism. Clearly the conclusion cannot be a negative assertoric or a negative necessary proposition because no negative premise has been laid down either in the assertoric or in the necessary mode. Nor can the conclusion be a problematic negative proposition. For if the terms are so related, there are cases in which B necessarily will not belong to C; e.g. suppose that A is white, B swan, C man. Nor can the opposite affirmations be established, since we have shown a case in which B necessarily does not belong to C. A syllogism then is not possible at all.

Similar relations will obtain in particular syllogisms. For whenever the negative proposition is universal and necessary, a syllogism will always be possible to prove both a problematic and a negative assertoric proposition (the proof proceeds by conversion); but when the affirmative proposition is universal and necessary, no syllogistic conclusion can be drawn. This can be proved in the same way as for universal propositions, and by the same terms. Nor is a syllogistic conclusion possible when both premises are affirmative: this also may be proved as above. But when both premises are negative, and the premise that definitely disconnects two terms is universal and necessary, though nothing follows necessarily from the premises as they are stated, a conclusion can be drawn as above if the problematic premise is converted into its complementary affirmative. But if both are indefinite or particular, no syllogism can be formed. The same proof will serve, and the same terms.

It is clear then from what has been said that if the universal and negative premise is necessary, a syllogism is always possible, proving not merely a negative problematic, but also a negative assertoric proposition; but if the affirmative premise is necessary no conclusion can be drawn. It is clear too that a syllogism is possible or not under the same conditions whether the mode of the premises is assertoric or necessary. And it is clear that all the syllogisms are imperfect, and are completed by means of the figures mentioned.

## Chapter 20

In the last figure a syllogism is possible whether both or only one of the premises is problematic. When the premises are problematic the conclusion will be problematic; and also when one premise is problematic, the other assertoric. But when the other premise is necessary, if it is affirmative the conclusion will be neither necessary or assertoric; but if it is negative the syllogism will result in a negative assertoric proposition, as above. In these also we must understand the expression 'possible' in the conclusion in the same way as before.

First let the premises be problematic and suppose that both A and B may possibly belong to every C. Since then the affirmative proposition is convertible into a particular, and B may possibly belong to every C, it follows that C may possibly belong to some B. So, if A is possible for every C, and C is possible for some of the Bs, then A is possible for some of the Bs. For we have got the first figure. And A if may possibly belong to no C, but B may possibly belong to all C, it follows that A may possibly not belong to some B: for we shall have the first figure again by conversion. But if both premises should be negative no necessary consequence will follow from them as they are stated, but if the premises are converted into their corresponding affirmatives there will be a syllogism as before. For if A and B may possibly not belong to C, if 'may possibly belong' is substituted we shall again have the first figure by means of conversion. But if one of the premises is universal, the other particular, a syllogism will be possible, or not, under the arrangement of the terms as in the case of assertoric propositions. Suppose that A may possibly belong to all C, and B to some C. We shall have the first figure again if the particular premise is converted. For if A is possible for all C, and C for some of the Bs, then A is possible for some of the Bs. Similarly if the proposition BC is universal. Likewise also if the proposition AC is negative, and the proposition BC affirmative: for we shall again have the first figure by conversion. But if both premises should be negative-the one universal and the other particular-although no syllogistic conclusion will follow from the premises as they are put, it will follow if they are converted, as above. But when both premises are indefinite or particular, no syllogism can be formed: for A must belong sometimes to all B and sometimes to no B. To illustrate the affirmative relation take the terms animal-man-white; to illustrate the negative, take the terms horse-man-white--white being the middle term.

## Chapter 21

If one premise is pure, the other problematic, the conclusion will be problematic, not pure; and a syllogism will be possible under the same arrangement of the terms as before. First let the premises be affirmative: suppose that A belongs to all C, and B may possibly belong to all C. If the proposition BC is converted, we shall have the first figure, and the conclusion that A may possibly belong to some of the Bs. For when one of the premises in the first figure is problematic, the conclusion also (as we saw) is problematic. Similarly if the proposition BC is pure, AC problematic; or if AC is negative, Bc affirmative, no matter which of the two is pure; in both cases the conclusion will be problematic: for the first figure is obtained once more, and it has been proved that if one premise is problematic in that figure the conclusion also will be problematic. But if the minor premise BC is negative, or if both premises are negative, no syllogistic conclusion can be drawn from the premises as they stand, but if they are converted a syllogism is obtained as before.

If one of the premises is universal, the other particular, then when both are affirmative, or when the universal is negative, the particular affirmative, we shall have the same sort of syllogisms: for all are completed by means of the first figure. So it is clear that we shall have not a pure but a problematic syllogistic conclusion. But if the affirmative premise is universal, the negative particular, the proof will proceed by a *reductio ad impossibile*. Suppose that B belongs to all C, and A may possibly not belong to some C: it follows that A may possibly not belong to some B. For if A necessarily belongs to all B, and B (as has been assumed) belongs to all C, A will necessarily belong to all C: for this has been proved before. But it was assumed at the outset that A may possibly not belong to some C.

Whenever both premises are indefinite or particular, no syllogism will be possible. The demonstration is the same as was given in the case of universal premises, and proceeds by means of the same terms.

## Chapter 22

If one of the premises is necessary, the other problematic, when the premises are affirmative a problematic affirmative conclusion can always be drawn; when one proposition is affirmative, the other negative, if the affirmative is necessary a problematic negative can be inferred; but if the negative proposition is necessary both a problematic and a pure negative conclusion are possible. But a necessary negative conclusion will not be possible, any more than in the other figures. Suppose first that the premises are affirmative, i.e. that A necessarily belongs to all C, and B may possibly belong to all C. Since then A must belong to all C, and C may belong to some B, it follows that A may (not does) belong to some B: for so it resulted in the first figure. A similar proof may be given if the proposition BC is necessary, and AC is problematic. Again suppose one proposition is affirmative, the other negative, the affirmative being necessary: i.e. suppose A may possibly belong to no C, but B necessarily belongs to all C. We shall have the first figure once more: and-since the negative premise is problematic-it is clear that the conclusion will be problematic: for when the premises stand thus in the first figure, the conclusion (as we found) is problematic. But if the negative premise is necessary, the conclusion will be not only that A may possibly not belong to some B but also that it does not belong to some B. For suppose that A necessarily does not belong to C, but B may belong to all C. If the affirmative proposition BC is converted, we shall have the first figure, and the negative premise is necessary. But when the premises stood thus, it resulted that A might possibly not belong to some C, and that it did not belong to some C; consequently here it follows that A does not belong to some B. But when the minor premise is negative, if it is problematic we shall have a syllogism by altering the premise into its complementary affirmative, as before; but if it is necessary no syllogism can be formed. For A sometimes necessarily belongs to all B, and sometimes cannot possibly belong to any B. To illustrate the former take the terms sleep-sleeping horse-man; to illustrate the latter take the terms sleep-waking horse-man.

Similar results will obtain if one of the terms is related universally to the middle, the other in part. If both premises are affirmative, the conclusion will be problematic, not pure; and also when one premise is negative, the other affirmative, the latter being necessary. But when the negative premise is necessary, the conclusion also will be a pure negative proposition; for the same kind of proof can be given whether the terms are universal or not. For the syllogisms must be made perfect by means of the first figure, so that a result which follows in the first figure follows also in the third. But when the minor premise is negative and universal, if it is

problematic a syllogism can be formed by means of conversion; but if it is necessary a syllogism is not possible. The proof will follow the same course as where the premises are universal; and the same terms may be used.

It is clear then in this figure also when and how a syllogism can be formed, and when the conclusion is problematic, and when it is pure. It is evident also that all syllogisms in this figure are imperfect, and that they are made perfect by means of the first figure.

### **Chapter 23**

It is clear from what has been said that the syllogisms in these figures are made perfect by means of universal syllogisms in the first figure and are reduced to them. That every syllogism without qualification can be so treated, will be clear presently, when it has been proved that every syllogism is formed through one or other of these figures.

It is necessary that every demonstration and every syllogism should prove either that something belongs or that it does not, and this either universally or in part, and further either ostensively or hypothetically. One sort of hypothetical proof is the *reductio ad impossibile*. Let us speak first of ostensive syllogisms: for after these have been pointed out the truth of our contention will be clear with regard to those which are proved *per impossibile*, and in general hypothetically.

If then one wants to prove syllogistically A of B, either as an attribute of it or as not an attribute of it, one must assert something of something else. If now A should be asserted of B, the proposition originally in question will have been assumed. But if A should be asserted of C, but C should not be asserted of anything, nor anything of it, nor anything else of A, no syllogism will be possible. For nothing necessarily follows from the assertion of some one thing concerning some other single thing. Thus we must take another premise as well. If then A be asserted of something else, or something else of A, or something different of C, nothing prevents a syllogism being formed, but it will not be in relation to B through the premises taken. Nor when C belongs to something else, and that to something else and so on, no connection however being made with B, will a syllogism be possible concerning A in its relation to B. For in general we stated that no syllogism can establish the attribution of one thing to another, unless some middle term is taken, which is somehow related to each by way of predication. For the syllogism in general is made out of premises, and a syllogism referring to this out of premises with the same reference, and a syllogism relating this to that proceeds through premises which relate this to that. But it is impossible to take a premise in reference to B, if we neither affirm nor deny anything of it; or again to take a premise relating A to B, if we take nothing common, but affirm or deny peculiar attributes of each. So we must take something midway between the two, which will connect the predications, if we are to have a syllogism relating this to that. If then we must take something common in relation to both, and this is possible in three ways (either by predicating A of C, and C of B, or C of both, or both of C), and these are the figures of which we have spoken, it is clear that every syllogism must be made in one or other of these figures. The argument is the same if several middle terms should be necessary to establish the relation to B; for the figure will be the same whether there is one middle term or many.

It is clear then that the ostensive syllogisms are effected by means of the aforesaid figures; these considerations will show that *reducciones ad impossibile* also are effected in the same way. For all who effect an argument *per impossibile* infer syllogistically what is false, and prove the original conclusion

hypothetically when something impossible results from the assumption of its contradictory; e.g. that the diagonal of the square is incommensurate with the side, because odd numbers are equal to evens if it is supposed to be commensurate. One infers syllogistically that odd numbers come out equal to evens, and one proves hypothetically the incommensurability of the diagonal, since a falsehood results through contradicting this. For this we found to be reasoning per impossibile, viz. proving something impossible by means of an hypothesis conceded at the beginning. Consequently, since the falsehood is established in reductions ad impossibile by an ostensive syllogism, and the original conclusion is proved hypothetically, and we have already stated that ostensive syllogisms are effected by means of these figures, it is evident that syllogisms per impossibile also will be made through these figures. Likewise all the other hypothetical syllogisms: for in every case the syllogism leads up to the proposition that is substituted for the original thesis; but the original thesis is reached by means of a concession or some other hypothesis. But if this is true, every demonstration and every syllogism must be formed by means of the three figures mentioned above. But when this has been shown it is clear that every syllogism is perfected by means of the first figure and is reducible to the universal syllogisms in this figure.

## Chapter 24

Further in every syllogism one of the premises must be affirmative, and universality must be present: unless one of the premises is universal either a syllogism will not be possible, or it will not refer to the subject proposed, or the original position will be begged. Suppose we have to prove that pleasure in music is good. If one should claim as a premise that pleasure is good without adding 'all', no syllogism will be possible; if one should claim that some pleasure is good, then if it is different from pleasure in music, it is not relevant to the subject proposed; if it is this very pleasure, one is assuming that which was proposed at the outset to be proved. This is more obvious in geometrical proofs, e.g. that the angles at the base of an isosceles triangle are equal. Suppose the lines A and B have been drawn to the center. If then one should assume that the angle AC is equal to the angle BD, without claiming generally that angles of semicircles are equal; and again if one should assume that the angle C is equal to the angle D, without the additional assumption that every angle of a segment is equal to every other angle of the same segment; and further if one should assume that when equal angles are taken from the whole angles, which are themselves equal, the remainders E and F are equal, he will beg the thing to be proved, unless he also states that when equals are taken from equals the remainders are equal.

It is clear then that in every syllogism there must be a universal premise, and that a universal statement is proved only when all the premises are universal, while a particular statement is proved both from two universal premises and from one only: consequently if the conclusion is universal, the premises also must be universal, but if the premises are universal it is possible that the conclusion may not be universal. And it is clear also that in every syllogism either both or one of the premises must be like the conclusion. I mean not only in being affirmative or negative, but also in being necessary, pure, problematic. We must consider also the other forms of predication.

It is clear also when a syllogism in general can be made and when it cannot; and when a valid, when a perfect syllogism can be formed; and that if a syllogism is formed the terms must be arranged in one of the ways that have been mentioned.

## Chapter 25

It is clear too that every demonstration will proceed through three terms and no more, unless the same conclusion is established by different pairs of propositions; e.g. the conclusion E may be established through the propositions A and B, and through the propositions C and D, or through the propositions A and B, or A and C, or B and C. For nothing prevents there being several middles for the same terms. But in that case there is not one but several syllogisms. Or again when each of the propositions A and B is obtained by syllogistic inference, e.g. by means of D and E, and again B by means of F and G. Or one may be obtained by syllogistic, the other by inductive inference. But thus also the syllogisms are many; for the conclusions are many, e.g. A and B and C. But if this can be called one syllogism, not many, the same conclusion may be reached by more than three terms in this way, but it cannot be reached as C is established by means of A and B. Suppose that the proposition E is inferred from the premises A, B, C, and D. It is necessary then that of these one should be related to another as whole to part: for it has already been proved that if a syllogism is formed some of its terms must be related in this way. Suppose then that A stands in this relation to B. Some conclusion then follows from them. It must either be E or one or other of C and D, or something other than these.

(1) If it is E the syllogism will have A and B for its sole premises. But if C and D are so related that one is whole, the other part, some conclusion will follow from them also; and it must be either E, or one or other of the propositions A and B, or something other than these. And if it is (i) E, or (ii) A or B, either (i) the syllogisms will be more than one, or (ii) the same thing happens to be inferred by means of several terms only in the sense which we saw to be possible. But if (iii) the conclusion is other than E or A or B, the syllogisms will be many, and unconnected with one another. But if C is not so related to D as to make a syllogism, the propositions will have been assumed to no purpose, unless for the sake of induction or of obscuring the argument or something of the sort.

(2) But if from the propositions A and B there follows not E but some other conclusion, and if from C and D either A or B follows or something else, then there are several syllogisms, and they do not establish the conclusion proposed: for we assumed that the syllogism proved E. And if no conclusion follows from C and D, it turns out that these propositions have been assumed to no purpose, and the syllogism does not prove the original proposition.

So it is clear that every demonstration and every syllogism will proceed through three terms only.

This being evident, it is clear that a syllogistic conclusion follows from two premises and not from more than two. For the three terms make two premises, unless a new premise is assumed, as was said at the beginning, to perfect the syllogisms. It is clear therefore that in whatever syllogistic argument the premises through which the main conclusion follows (for some of the preceding conclusions must be premises) are not even in number, this argument either has not been drawn syllogistically or it has assumed more than was necessary to establish its thesis.

If then syllogisms are taken with respect to their main premises, every syllogism will consist of an even number of premises and an odd number of terms (for the terms exceed the premises by one), and the conclusions will be half the number of the premises. But whenever a conclusion is reached by means of prosyllogisms or by means of several continuous middle terms, e.g. the

proposition AB by means of the middle terms C and D, the number of the terms will similarly exceed that of the premises by one (for the extra term must either be added outside or inserted: but in either case it follows that the relations of predication are one fewer than the terms related), and the premises will be equal in number to the relations of predication. The premises however will not always be even, the terms odd; but they will alternate-when the premises are even, the terms must be odd; when the terms are even, the premises must be odd: for along with one term one premise is added, if a term is added from any quarter. Consequently since the premises were (as we saw) even, and the terms odd, we must make them alternately even and odd at each addition. But the conclusions will not follow the same arrangement either in respect to the terms or to the premises. For if one term is added, conclusions will be added less by one than the pre-existing terms: for the conclusion is drawn not in relation to the single term last added, but in relation to all the rest, e.g. if to ABC the term D is added, two conclusions are thereby added, one in relation to A, the other in relation to B. Similarly with any further additions. And similarly too if the term is inserted in the middle: for in relation to one term only, a syllogism will not be constructed. Consequently the conclusions will be much more numerous than the terms or the premises.

## **Chapter 26**

Since we understand the subjects with which syllogisms are concerned, what sort of conclusion is established in each figure, and in how many moods this is done, it is evident to us both what sort of problem is difficult and what sort is easy to prove. For that which is concluded in many figures and through many moods is easier; that which is concluded in few figures and through few moods is more difficult to attempt. The universal affirmative is proved by means of the first figure only and by this in only one mood; the universal negative is proved both through the first figure and through the second, through the first in one mood, through the second in two. The particular affirmative is proved through the first and through the last figure, in one mood through the first, in three moods through the last. The particular negative is proved in all the figures, but once in the first, in two moods in the second, in three moods in the third. It is clear then that the universal affirmative is most difficult to establish, most easy to overthrow. In general, universals are easier game for the destroyer than particulars: for whether the predicate belongs to none or not to some, they are destroyed: and the particular negative is proved in all the figures, the universal negative in two. Similarly with universal negatives: the original statement is destroyed, whether the predicate belongs to all or to some: and this we found possible in two figures. But particular statements can be refuted in one way only-by proving that the predicate belongs either to all or to none. But particular statements are easier to establish: for proof is possible in more figures and through more moods. And in general we must not forget that it is possible to refute statements by means of one another, I mean, universal statements by means of particular, and particular statements by means of universal: but it is not possible to establish universal statements by means of particular, though it is possible to establish particular statements by means of universal. At the same time it is evident that it is easier to refute than to establish.

The manner in which every syllogism is produced, the number of the terms and premises through which it proceeds, the relation of the premises to one another, the character of the problem proved in each figure, and the number of the figures appropriate to each problem, all these matters are clear from what has been said.

## **Chapter 27**

We must now state how we may ourselves always have a supply of syllogisms in reference to the problem proposed and by what road we may reach the principles relative to the problem: for perhaps we ought not only to investigate the construction of syllogisms, but also to have the power of making them.

Of all the things which exist some are such that they cannot be predicated of anything else truly and universally, e.g. Cleon and Callias, i.e. the individual and sensible, but other things may be predicated of them (for each of these is both man and animal); and some things are themselves predicated of others, but nothing prior is predicated of them; and some are predicated of others, and yet others of them, e.g. man of Callias and animal of man. It is clear then that some things are naturally not stated of anything: for as a rule each sensible thing is such that it cannot be predicated of anything, save incidentally: for we sometimes say that that white object is Socrates, or that that which approaches is Callias. We shall explain in another place that there is an upward limit also to the process of predicating: for the present we must assume this. Of these ultimate predicates it is not possible to demonstrate another predicate, save as a matter of opinion, but these may be predicated of other things. Neither can individuals be predicated of other things, though other things can be predicated of them. Whatever lies between these limits can be spoken of in both ways: they may be stated of others, and others stated of them. And as a rule arguments and inquiries are concerned with these things. We must select the premises suitable to each problem in this manner: first we must lay down the subject and the definitions and the properties of the thing; next we must lay down those attributes which follow the thing, and again those which the thing follows, and those which cannot belong to it. But those to which it cannot belong need not be selected, because the negative statement implied above is convertible. Of the attributes which follow we must distinguish those which fall within the definition, those which are predicated as properties, and those which are predicated as accidents, and of the latter those which apparently and those which really belong. The larger the supply a man has of these, the more quickly will he reach a conclusion; and in proportion as he apprehends those which are truer, the more cogently will he demonstrate. But he must select not those which follow some particular but those which follow the thing as a whole, e.g. not what follows a particular man but what follows every man: for the syllogism proceeds through universal premises. If the statement is indefinite, it is uncertain whether the premise is universal, but if the statement is definite, the matter is clear. Similarly one must select those attributes which the subject follows as wholes, for the reason given. But that which follows one must not suppose to follow as a whole, e.g. that every animal follows man or every science music, but only that it follows, without qualification, and indeed we state it in a proposition: for the other statement is useless and impossible, e.g. that every man is every animal or justice is all good. But that which something follows receives the mark 'every'. Whenever the subject, for which we must obtain the attributes that follow, is contained by something else, what follows or does not follow the highest term universally must not be selected in dealing with the subordinate term (for these attributes have been taken in dealing with the superior term; for what follows animal also follows man, and what does not belong to animal does not belong to man); but we must choose those attributes which are peculiar to each subject. For some things are peculiar to the species as distinct from the genus; for species being distinct there must be attributes peculiar to each. Nor must we take as things which the superior term follows, those things which the inferior term follows, e.g. take as subjects of the predicate 'animal' what are really subjects of the predicate 'man'. It is necessary indeed, if animal follows man, that it should follow all these also. But these belong more properly to the choice of what concerns man. One must apprehend also normal consequents and

normal antecedents-, for propositions which obtain normally are established syllogistically from premises which obtain normally, some if not all of them having this character of normality. For the conclusion of each syllogism resembles its principles. We must not however choose attributes which are consequent upon all the terms: for no syllogism can be made out of such premises. The reason why this is so will be clear in the sequel.

## Chapter 28

If men wish to establish something about some whole, they must look to the subjects of that which is being established (the subjects of which it happens to be asserted), and the attributes which follow that of which it is to be predicated. For if any of these subjects is the same as any of these attributes, the attribute originally in question must belong to the subject originally in question. But if the purpose is to establish not a universal but a particular proposition, they must look for the terms of which the terms in question are predicable: for if any of these are identical, the attribute in question must belong to some of the subject in question. Whenever the one term has to belong to none of the other, one must look to the consequents of the subject, and to those attributes which cannot possibly be present in the predicate in question: or conversely to the attributes which cannot possibly be present in the subject, and to the consequents of the predicate. If any members of these groups are identical, one of the terms in question cannot possibly belong to any of the other. For sometimes a syllogism in the first figure results, sometimes a syllogism in the second. But if the object is to establish a particular negative proposition, we must find antecedents of the subject in question and attributes which cannot possibly belong to the predicate in question. If any members of these two groups are identical, it follows that one of the terms in question does not belong to some of the other. Perhaps each of these statements will become clearer in the following way. Suppose the consequents of A are designated by B, the antecedents of A by C, attributes which cannot possibly belong to A by D. Suppose again that the attributes of E are designated by F, the antecedents of E by G, and attributes which cannot belong to E by H. If then one of the Cs should be identical with one of the Fs, A must belong to all E: for F belongs to all E, and A to all C, consequently A belongs to all E. If C and G are identical, A must belong to some of the Es: for A follows C, and E follows all G. If F and D are identical, A will belong to none of the Es by a prosyllogism: for since the negative proposition is convertible, and F is identical with D, A will belong to none of the Fs, but F belongs to all E. Again, if B and H are identical, A will belong to none of the Es: for B will belong to all A, but to no E: for it was assumed to be identical with H, and H belonged to none of the Es. If D and G are identical, A will not belong to some of the Es: for it will not belong to G, because it does not belong to D: but G falls under E: consequently A will not belong to some of the Es. If B is identical with G, there will be a converted syllogism: for E will belong to all A since B belongs to A and E to B (for B was found to be identical with G): but that A should belong to all E is not necessary, but it must belong to some E because it is possible to convert the universal statement into a particular.

It is clear then that in every proposition which requires proof we must look to the aforesaid relations of the subject and predicate in question: for all syllogisms proceed through these. But if we are seeking consequents and antecedents we must look for those which are primary and most universal, e.g. in reference to E we must look to KF rather than to F alone, and in reference to A we must look to KC rather than to C alone. For if A belongs to KF, it belongs both to F and to E: but if it does not follow KF, it may yet follow F. Similarly we must consider the antecedents of

A itself: for if a term follows the primary antecedents, it will follow those also which are subordinate, but if it does not follow the former, it may yet follow the latter.

It is clear too that the inquiry proceeds through the three terms and the two premises, and that all the syllogisms proceed through the aforesaid figures. For it is proved that A belongs to all E, whenever an identical term is found among the Cs and Fs. This will be the middle term; A and E will be the extremes. So the first figure is formed. And A will belong to some E, whenever C and G are apprehended to be the same. This is the last figure: for G becomes the middle term. And A will belong to no E, when D and F are identical. Thus we have both the first figure and the middle figure; the first, because A belongs to no F, since the negative statement is convertible, and F belongs to all E: the middle figure because D belongs to no A, and to all E. And A will not belong to some E, whenever D and G are identical. This is the last figure: for A will belong to no G, and E will belong to all G. Clearly then all syllogisms proceed through the aforesaid figures, and we must not select consequents of all the terms, because no syllogism is produced from them. For (as we saw) it is not possible at all to establish a proposition from consequents, and it is not possible to refute by means of a consequent of both the terms in question: for the middle term must belong to the one, and not belong to the other.

It is clear too that other methods of inquiry by selection of middle terms are useless to produce a syllogism, e.g. if the consequents of the terms in question are identical, or if the antecedents of A are identical with those attributes which cannot possibly belong to E, or if those attributes are identical which cannot belong to either term: for no syllogism is produced by means of these. For if the consequents are identical, e.g. B and F, we have the middle figure with both premises affirmative: if the antecedents of A are identical with attributes which cannot belong to E, e.g. C with H, we have the first figure with its minor premise negative. If attributes which cannot belong to either term are identical, e.g. C and H, both premises are negative, either in the first or in the middle figure. But no syllogism is possible in this way.

It is evident too that we must find out which terms in this inquiry are identical, not which are different or contrary, first because the object of our investigation is the middle term, and the middle term must be not diverse but identical. Secondly, wherever it happens that a syllogism results from taking contraries or terms which cannot belong to the same thing, all arguments can be reduced to the aforesaid moods, e.g. if B and F are contraries or cannot belong to the same thing. For if these are taken, a syllogism will be formed to prove that A belongs to none of the Es, not however from the premises taken but in the aforesaid mood. For B will belong to all A and to no E. Consequently B must be identical with one of the Hs. Again, if B and G cannot belong to the same thing, it follows that A will not belong to some of the Es: for then too we shall have the middle figure: for B will belong to all A and to no G. Consequently B must be identical with some of the Hs. For the fact that B and G cannot belong to the same thing differs in no way from the fact that B is identical with some of the Hs: for that includes everything which cannot belong to E.

It is clear then that from the inquiries taken by themselves no syllogism results; but if B and F are contraries B must be identical with one of the Hs, and the syllogism results through these terms. It turns out then that those who inquire in this manner are looking gratuitously for some other way than the necessary way because they have failed to observe the identity of the Bs with the Hs.

## Chapter 29

Syllogisms which lead to impossible conclusions are similar to ostensive syllogisms; they also are formed by means of the consequents and antecedents of the terms in question. In both cases the same inquiry is involved. For what is proved ostensively may also be concluded syllogistically *per impossibile* by means of the same terms; and what is proved *per impossibile* may also be proved ostensively, e.g. that A belongs to none of the Es. For suppose A to belong to some E: then since B belongs to all A and A to some of the Es, B will belong to some of the Es: but it was assumed that it belongs to none. Again we may prove that A belongs to some E: for if A belonged to none of the Es, and E belongs to all G, A will belong to none of the Gs: but it was assumed to belong to all. Similarly with the other propositions requiring proof. The proof *per impossibile* will always and in all cases be from the consequents and antecedents of the terms in question. Whatever the problem the same inquiry is necessary whether one wishes to use an ostensive syllogism or a reduction to impossibility. For both the demonstrations start from the same terms, e.g. suppose it has been proved that A belongs to no E, because it turns out that otherwise B belongs to some of the Es and this is impossible-if now it is assumed that B belongs to no E and to all A, it is clear that A will belong to no E. Again if it has been proved by an ostensive syllogism that A belongs to no E, assume that A belongs to some E and it will be proved *per impossibile* to belong to no E. Similarly with the rest. In all cases it is necessary to find some common term other than the subjects of inquiry, to which the syllogism establishing the false conclusion may relate, so that if this premise is converted, and the other remains as it is, the syllogism will be ostensive by means of the same terms. For the ostensive syllogism differs from the *reductio ad impossibile* in this: in the ostensive syllogism both premises are laid down in accordance with the truth, in the *reductio ad impossibile* one of the premises is assumed falsely.

These points will be made clearer by the sequel, when we discuss the reduction to impossibility: at present this much must be clear, that we must look to terms of the kinds mentioned whether we wish to use an ostensive syllogism or a reduction to impossibility. In the other hypothetical syllogisms, I mean those which proceed by substitution, or by positing a certain quality, the inquiry will be directed to the terms of the problem to be proved-not the terms of the original problem, but the new terms introduced; and the method of the inquiry will be the same as before. But we must consider and determine in how many ways hypothetical syllogisms are possible.

Each of the problems then can be proved in the manner described; but it is possible to establish some of them syllogistically in another way, e.g. universal problems by the inquiry which leads up to a particular conclusion, with the addition of an hypothesis. For if the Cs and the Gs should be identical, but E should be assumed to belong to the Gs only, then A would belong to every E: and again if the Ds and the Gs should be identical, but E should be predicated of the Gs only, it follows that A will belong to none of the Es. Clearly then we must consider the matter in this way also. The method is the same whether the relation is necessary or possible. For the inquiry will be the same, and the syllogism will proceed through terms arranged in the same order whether a possible or a pure proposition is proved. We must find in the case of possible relations, as well as terms that belong, terms which can belong though they actually do not: for we have proved that the syllogism which establishes a possible relation proceeds through these terms as well. Similarly also with the other modes of predication.

It is clear then from what has been said not only that all syllogisms can be formed in this way, but also that they cannot be formed in any other. For every syllogism has been proved to be formed through one of the aforementioned figures, and these cannot be composed through other terms than the consequents and antecedents of the terms in question: for from these we obtain the premises and find the middle term. Consequently a syllogism cannot be formed by means of other terms.

### **Chapter 30**

The method is the same in all cases, in philosophy, in any art or study. We must look for the attributes and the subjects of both our terms, and we must supply ourselves with as many of these as possible, and consider them by means of the three terms, refuting statements in one way, confirming them in another, in the pursuit of truth starting from premises in which the arrangement of the terms is in accordance with truth, while if we look for dialectical syllogisms we must start from probable premises. The principles of syllogisms have been stated in general terms, both how they are characterized and how we must hunt for them, so as not to look to everything that is said about the terms of the problem or to the same points whether we are confirming or refuting, or again whether we are confirming of all or of some, and whether we are refuting of all or some. we must look to fewer points and they must be definite. We have also stated how we must select with reference to everything that is, e.g. about good or knowledge. But in each science the principles which are peculiar are the most numerous. Consequently it is the business of experience to give the principles which belong to each subject. I mean for example that astronomical experience supplies the principles of astronomical science: for once the phenomena were adequately apprehended, the demonstrations of astronomy were discovered. Similarly with any other art or science. Consequently, if the attributes of the thing are apprehended, our business will then be to exhibit readily the demonstrations. For if none of the true attributes of things had been omitted in the historical survey, we should be able to discover the proof and demonstrate everything which admitted of proof, and to make that clear, whose nature does not admit of proof.

In general then we have explained fairly well how we must select premises: we have discussed the matter accurately in the treatise concerning dialectic.

### **Chapter 31**

It is easy to see that division into classes is a small part of the method we have described: for division is, so to speak, a weak syllogism; for what it ought to prove, it begs, and it always establishes something more general than the attribute in question. First, this very point had escaped all those who used the method of division; and they attempted to persuade men that it was possible to make a demonstration of substance and essence. Consequently they did not understand what it is possible to prove syllogistically by division, nor did they understand that it was possible to prove syllogistically in the manner we have described. In demonstrations, when there is a need to prove a positive statement, the middle term through which the syllogism is formed must always be inferior to and not comprehend the first of the extremes. But division has a contrary intention: for it takes the universal as middle. Let animal be the term signified by A, mortal by B, and immortal by C, and let man, whose definition is to be got, be signified by D. The man who divides assumes that every animal is either mortal or immortal: i.e. whatever is A is all either B or C. Again, always dividing, he lays it down that man is an animal, so he assumes

A of D as belonging to it. Now the true conclusion is that every D is either B or C, consequently man must be either mortal or immortal, but it is not necessary that man should be a mortal animal-this is begged: and this is what ought to have been proved syllogistically. And again, taking A as mortal animal, B as footed, C as footless, and D as man, he assumes in the same way that A inheres either in B or in C (for every mortal animal is either footed or footless), and he assumes A of D (for he assumed man, as we saw, to be a mortal animal); consequently it is necessary that man should be either a footed or a footless animal; but it is not necessary that man should be footed: this he assumes: and it is just this again which he ought to have demonstrated. Always dividing then in this way it turns out that these logicians assume as middle the universal term, and as extremes that which ought to have been the subject of demonstration and the differentiae. In conclusion, they do not make it clear, and show it to be necessary, that this is man or whatever the subject of inquiry may be: for they pursue the other method altogether, never even suspecting the presence of the rich supply of evidence which might be used. It is clear that it is neither possible to refute a statement by this method of division, nor to draw a conclusion about an accident or property of a thing, nor about its genus, nor in cases in which it is unknown whether it is thus or thus, e.g. whether the diagonal is incommensurate. For if he assumes that every length is either commensurate or incommensurate, and the diagonal is a length, he has proved that the diagonal is either incommensurate or commensurate. But if he should assume that it is incommensurate, he will have assumed what he ought to have proved. He cannot then prove it: for this is his method, but proof is not possible by this method. Let A stand for 'incommensurate or commensurate', B for 'length', C for 'diagonal'. It is clear then that this method of investigation is not suitable for every inquiry, nor is it useful in those cases in which it is thought to be most suitable.

From what has been said it is clear from what elements demonstrations are formed and in what manner, and to what points we must look in each problem.

## **Chapter 32**

Our next business is to state how we can reduce syllogisms to the aforementioned figures: for this part of the inquiry still remains. If we should investigate the production of the syllogisms and had the power of discovering them, and further if we could resolve the syllogisms produced into the aforementioned figures, our original problem would be brought to a conclusion. It will happen at the same time that what has been already said will be confirmed and its truth made clearer by what we are about to say. For everything that is true must in every respect agree with itself First then we must attempt to select the two premises of the syllogism (for it is easier to divide into large parts than into small, and the composite parts are larger than the elements out of which they are made); next we must inquire which are universal and which particular, and if both premises have not been stated, we must ourselves assume the one which is missing. For sometimes men put forward the universal premise, but do not posit the premise which is contained in it, either in writing or in discussion: or men put forward the premises of the principal syllogism, but omit those through which they are inferred, and invite the concession of others to no purpose. We must inquire then whether anything unnecessary has been assumed, or anything necessary has been omitted, and we must posit the one and take away the other, until we have reached the two premises: for unless we have these, we cannot reduce arguments put forward in the way described. In some arguments it is easy to see what is wanting, but some escape us, and appear to be syllogisms, because something necessary results from what has been

laid down, e.g. if the assumptions were made that substance is not annihilated by the annihilation of what is not substance, and that if the elements out of which a thing is made are annihilated, then that which is made out of them is destroyed: these propositions being laid down, it is necessary that any part of substance is substance; this has not however been drawn by syllogism from the propositions assumed, but premises are wanting. Again if it is necessary that animal should exist, if man does, and that substance should exist, if animal does, it is necessary that substance should exist if man does: but as yet the conclusion has not been drawn syllogistically: for the premises are not in the shape we required. We are deceived in such cases because something necessary results from what is assumed, since the syllogism also is necessary. But that which is necessary is wider than the syllogism: for every syllogism is necessary, but not everything which is necessary is a syllogism. Consequently, though something results when certain propositions are assumed, we must not try to reduce it directly, but must first state the two premises, then divide them into their terms. We must take that term as middle which is stated in both the premises: for it is necessary that the middle should be found in both premises in all the figures.

If then the middle term is a predicate and a subject of predication, or if it is a predicate, and something else is denied of it, we shall have the first figure: if it both is a predicate and is denied of something, the middle figure: if other things are predicated of it, or one is denied, the other predicated, the last figure. For it was thus that we found the middle term placed in each figure. It is placed similarly too if the premises are not universal: for the middle term is determined in the same way. Clearly then, if the same term is not stated more than once in the course of an argument, a syllogism cannot be made: for a middle term has not been taken. Since we know what sort of thesis is established in each figure, and in which the universal, in what sort the particular is described, clearly we must not look for all the figures, but for that which is appropriate to the thesis in hand. If the thesis is established in more figures than one, we shall recognize the figure by the position of the middle term.

### **Chapter 33**

Men are frequently deceived about syllogisms because the inference is necessary, as has been said above; sometimes they are deceived by the similarity in the positing of the terms; and this ought not to escape our notice. E.g. if A is stated of B, and B of C: it would seem that a syllogism is possible since the terms stand thus: but nothing necessary results, nor does a syllogism. Let A represent the term 'being eternal', B 'Aristomenes as an object of thought', C 'Aristomenes'. It is true then that A belongs to B. For Aristomenes as an object of thought is eternal. But B also belongs to C: for Aristomenes is Aristomenes as an object of thought. But A does not belong to C: for Aristomenes is perishable. For no syllogism was made although the terms stood thus: that required that the premise AB should be stated universally. But this is false, that every Aristomenes who is an object of thought is eternal, since Aristomenes is perishable. Again let C stand for 'Miccalus', B for 'musical Miccalus', A for 'perishing to-morrow'. It is true to predicate B of C: for Miccalus is musical Miccalus. Also A can be predicated of B: for musical Miccalus might perish to-morrow. But to state A of C is false at any rate. This argument then is identical with the former; for it is not true universally that musical Miccalus perishes to-morrow: but unless this is assumed, no syllogism (as we have shown) is possible.

This deception then arises through ignoring a small distinction. For if we accept the conclusion as though it made no difference whether we said 'This belong to that' or 'This belongs to all of that'.

### **Chapter 34**

Men will frequently fall into fallacies through not setting out the terms of the premise well, e.g. suppose A to be health, B disease, C man. It is true to say that A cannot belong to any B (for health belongs to no disease) and again that B belongs to every C (for every man is capable of disease). It would seem to follow that health cannot belong to any man. The reason for this is that the terms are not set out well in the statement, since if the things which are in the conditions are substituted, no syllogism can be made, e.g. if 'healthy' is substituted for 'health' and 'diseased' for 'disease'. For it is not true to say that being healthy cannot belong to one who is diseased. But unless this is assumed no conclusion results, save in respect of possibility: but such a conclusion is not impossible: for it is possible that health should belong to no man. Again the fallacy may occur in a similar way in the middle figure: 'it is not possible that health should belong to any disease, but it is possible that health should belong to every man, consequently it is not possible that disease should belong to any man'. In the third figure the fallacy results in reference to possibility. For health and disease and knowledge and ignorance, and in general contraries, may possibly belong to the same thing, but cannot belong to one another. This is not in agreement with what was said before: for we stated that when several things could belong to the same thing, they could belong to one another.

It is evident then that in all these cases the fallacy arises from the setting out of the terms: for if the things that are in the conditions are substituted, no fallacy arises. It is clear then that in such premises what possesses the condition ought always to be substituted for the condition and taken as the term.

### **Chapter 35**

We must not always seek to set out the terms a single word: for we shall often have complexes of words to which a single name is not given. Hence it is difficult to reduce syllogisms with such terms. Sometimes too fallacies will result from such a search, e.g. the belief that syllogism can establish that which has no mean. Let A stand for two right angles, B for triangle, C for isosceles triangle. A then belongs to C because of B: but A belongs to B without the mediation of another term: for the triangle in virtue of its own nature contains two right angles, consequently there will be no middle term for the proposition AB, although it is demonstrable. For it is clear that the middle must not always be assumed to be an individual thing, but sometimes a complex of words, as happens in the case mentioned.

### **Chapter 36**

That the first term belongs to the middle, and the middle to the extreme, must not be understood in the sense that they can always be predicated of one another or that the first term will be predicated of the middle in the same way as the middle is predicated of the last term. The same holds if the premises are negative. But we must suppose the verb 'to belong' to have as many meanings as the senses in which the verb 'to be' is used, and in which the assertion that a thing 'is' may be said to be true. Take for example the statement that there is a single science of contraries.

Let A stand for 'there being a single science', and B for things which are contrary to one another. Then A belongs to B, not in the sense that contraries are the fact of there being a single science of them, but in the sense that it is true to say of the contraries that there is a single science of them.

It happens sometimes that the first term is stated of the middle, but the middle is not stated of the third term, e.g. if wisdom is knowledge, and wisdom is of the good, the conclusion is that there is knowledge of the good. The good then is not knowledge, though wisdom is knowledge. Sometimes the middle term is stated of the third, but the first is not stated of the middle, e.g. if there is a science of everything that has a quality, or is a contrary, and the good both is a contrary and has a quality, the conclusion is that there is a science of the good, but the good is not science, nor is that which has a quality or is a contrary, though the good is both of these. Sometimes neither the first term is stated of the middle, nor the middle of the third, while the first is sometimes stated of the third, and sometimes not: e.g. if there is a genus of that of which there is a science, and if there is a science of the good, we conclude that there is a genus of the good. But nothing is predicated of anything. And if that of which there is a science is a genus, and if there is a science of the good, we conclude that the good is a genus. The first term then is predicated of the extreme, but in the premises one thing is not stated of another.

The same holds good where the relation is negative. For 'that does not belong to this' does not always mean that 'this is not that', but sometimes that 'this is not of that' or 'for that', e.g. 'there is not a motion of a motion or a becoming of a becoming, but there is a becoming of pleasure: so pleasure is not a becoming.' Or again it may be said that there is a sign of laughter, but there is not a sign of a sign, consequently laughter is not a sign. This holds in the other cases too, in which the thesis is refuted because the genus is asserted in a particular way, in relation to the terms of the thesis. Again take the inference 'opportunity is not the right time: for opportunity belongs to God, but the right time does not, since nothing is useful to God'. We must take as terms opportunity-right time-God: but the premise must be understood according to the case of the noun. For we state this universally without qualification, that the terms ought always to be stated in the nominative, e.g. man, good, contraries, not in oblique cases, e.g. of man, of a good, of contraries, but the premises ought to be understood with reference to the cases of each term—either the dative, e.g. 'equal to this', or the genitive, e.g. 'double of this', or the accusative, e.g. 'that which strikes or sees this', or the nominative, e.g. 'man is an animal', or in whatever other way the word falls in the premise.

### **Chapter 37**

The expressions 'this belongs to that' and 'this holds true of that' must be understood in as many ways as there are different categories, and these categories must be taken either with or without qualification, and further as simple or compound: the same holds good of the corresponding negative expressions. We must consider these points and define them better.

### **Chapter 38**

A term which is repeated in the premises ought to be joined to the first extreme, not to the middle. I mean for example that if a syllogism should be made proving that there is knowledge of justice, that it is good, the expression 'that it is good' (or 'qua good') should be joined to the first term. Let A stand for 'knowledge that it is good', B for good, C for justice. It is true to

predicate A of B. For of the good there is knowledge that it is good. Also it is true to predicate B of C. For justice is identical with a good. In this way an analysis of the argument can be made. But if the expression 'that it is good' were added to B, the conclusion will not follow: for A will be true of B, but B will not be true of C. For to predicate of justice the term 'good that it is good' is false and not intelligible. Similarly if it should be proved that the healthy is an object of knowledge qua good, of goat-stag an object of knowledge qua not existing, or man perishable qua an object of sense: in every case in which an addition is made to the predicate, the addition must be joined to the extreme.

The position of the terms is not the same when something is established without qualification and when it is qualified by some attribute or condition, e.g. when the good is proved to be an object of knowledge and when it is proved to be an object of knowledge that it is good. If it has been proved to be an object of knowledge without qualification, we must put as middle term 'that which is', but if we add the qualification 'that it is good', the middle term must be 'that which is something'. Let A stand for 'knowledge that it is something', B stand for 'something', and C stand for 'good'. It is true to predicate A of B: for ex hypothesi there is a science of that which is something, that it is something. B too is true of C: for that which C represents is something. Consequently A is true of C: there will then be knowledge of the good, that it is good: for ex hypothesi the term 'something' indicates the thing's special nature. But if 'being' were taken as middle and 'being' simply were joined to the extreme, not 'being something', we should not have had a syllogism proving that there is knowledge of the good, that it is good, but that it is; e.g. let A stand for knowledge that it is, B for being, C for good. Clearly then in syllogisms which are thus limited we must take the terms in the way stated.

### **Chapter 39**

We ought also to exchange terms which have the same value, word for word, and phrase for phrase, and word and phrase, and always take a word in preference to a phrase: for thus the setting out of the terms will be easier. For example if it makes no difference whether we say that the supposable is not the genus of the opinable or that the opinable is not identical with a particular kind of supposable (for what is meant is the same in both statements), it is better to take as the terms the supposable and the opinable in preference to the phrase suggested.

### **Chapter 40**

Since the expressions 'pleasure is good' and 'pleasure is the good' are not identical, we must not set out the terms in the same way; but if the syllogism is to prove that pleasure is the good, the term must be 'the good', but if the object is to prove that pleasure is good, the term will be 'good'. Similarly in all other cases.

### **Chapter 41**

It is not the same, either in fact or in speech, that A belongs to all of that to which B belongs, and that A belongs to all of that to all of which B belongs: for nothing prevents B from belonging to C, though not to all C: e.g. let B stand for beautiful, and C for white. If beauty belongs to something white, it is true to say that beauty belongs to that which is white; but not perhaps to everything that is white. If then A belongs to B, but not to everything of which B is predicated, then whether B belongs to all C or merely belongs to C, it is not necessary that A should belong,

I do not say to all C, but even to C at all. But if A belongs to everything of which B is truly stated, it will follow that A can be said of all of that of all of which B is said. If however A is said of that of all of which B may be said, nothing prevents B belonging to C, and yet A not belonging to all C or to any C at all. If then we take three terms it is clear that the expression 'A is said of all of which B is said' means this, 'A is said of all the things of which B is said'. And if B is said of all of a third term, so also is A: but if B is not said of all of the third term, there is no necessity that A should be said of all of it.

We must not suppose that something absurd results through setting out the terms: for we do not use the existence of this particular thing, but imitate the geometrician who says that 'this line a foot long' or 'this straight line' or 'this line without breadth' exists although it does not, but does not use the diagrams in the sense that he reasons from them. For in general, if two things are not related as whole to part and part to whole, the prover does not prove from them, and so no syllogism is formed. We (I mean the learner) use the process of setting out terms like perception by sense, not as though it were impossible to demonstrate without these illustrative terms, as it is to demonstrate without the premises of the syllogism.

## **Chapter 42**

We should not forget that in the same syllogism not all conclusions are reached through one figure, but one through one figure, another through another. Clearly then we must analyze arguments in accordance with this. Since not every problem is proved in every figure, but certain problems in each figure, it is clear from the conclusion in what figure the premises should be sought.

## **Chapter 43**

In reference to those arguments aiming at a definition which have been directed to prove some part of the definition, we must take as a term the point to which the argument has been directed, not the whole definition: for so we shall be less likely to be disturbed by the length of the term: e.g. if a man proves that water is a drinkable liquid, we must take as terms drinkable and water.

## **Chapter 44**

Further we must not try to reduce hypothetical syllogisms; for with the given premises it is not possible to reduce them. For they have not been proved by syllogism, but assented to by agreement. For instance if a man should suppose that unless there is one faculty of contraries, there cannot be one science, and should then argue that not every faculty is of contraries, e.g. of what is healthy and what is sickly: for the same thing will then be at the same time healthy and sickly. He has shown that there is not one faculty of all contraries, but he has not proved that there is not a science. And yet one must agree. But the agreement does not come from a syllogism, but from an hypothesis. This argument cannot be reduced: but the proof that there is not a single faculty can. The latter argument perhaps was a syllogism: but the former was an hypothesis.

The same holds good of arguments which are brought to a conclusion per impossibile. These cannot be analyzed either; but the reduction to what is impossible can be analyzed since it is proved by syllogism, though the rest of the argument cannot, because the conclusion is reached from an hypothesis. But these differ from the previous arguments: for in the former a preliminary

agreement must be reached if one is to accept the conclusion; e.g. an agreement that if there is proved to be one faculty of contraries, then contraries fall under the same science; whereas in the latter, even if no preliminary agreement has been made, men still accept the reasoning, because the falsity is patent, e.g. the falsity of what follows from the assumption that the diagonal is commensurate, viz. that then odd numbers are equal to evens.

Many other arguments are brought to a conclusion by the help of an hypothesis; these we ought to consider and mark out clearly. We shall describe in the sequel their differences, and the various ways in which hypothetical arguments are formed: but at present this much must be clear, that it is not possible to resolve such arguments into the figures. And we have explained the reason.

## Chapter 45

Whatever problems are proved in more than one figure, if they have been established in one figure by syllogism, can be reduced to another figure, e.g. a negative syllogism in the first figure can be reduced to the second, and a syllogism in the middle figure to the first, not all however but some only. The point will be clear in the sequel. If A belongs to no B, and B to all C, then A belongs to no C. Thus the first figure; but if the negative statement is converted, we shall have the middle figure. For B belongs to no A, and to all C. Similarly if the syllogism is not universal but particular, e.g. if A belongs to no B, and B to some C. Convert the negative statement and you will have the middle figure.

The universal syllogisms in the second figure can be reduced to the first, but only one of the two particular syllogisms. Let A belong to no B and to all C. Convert the negative statement, and you will have the first figure. For B will belong to no A and A to all C. But if the affirmative statement concerns B, and the negative C, C must be made first term. For C belongs to no A, and A to all B: therefore C belongs to no B. B then belongs to no C: for the negative statement is convertible.

But if the syllogism is particular, whenever the negative statement concerns the major extreme, reduction to the first figure will be possible, e.g. if A belongs to no B and to some C: convert the negative statement and you will have the first figure. For B will belong to no A and A to some C. But when the affirmative statement concerns the major extreme, no resolution will be possible, e.g. if A belongs to all B, but not to all C: for the statement AB does not admit of conversion, nor would there be a syllogism if it did.

Again syllogisms in the third figure cannot all be resolved into the first, though all syllogisms in the first figure can be resolved into the third. Let A belong to all B and B to some C. Since the particular affirmative is convertible, C will belong to some B: but A belonged to all B: so that the third figure is formed. Similarly if the syllogism is negative: for the particular affirmative is convertible: therefore A will belong to no B, and to some C.

Of the syllogisms in the last figure one only cannot be resolved into the first, viz. when the negative statement is not universal: all the rest can be resolved. Let A and B be affirmed of all C: then C can be converted partially with either A or B: C then belongs to some B. Consequently we shall get the first figure, if A belongs to all C, and C to some of the Bs. If A belongs to all C and B to some C, the argument is the same: for B is convertible in reference to C. But if B

belongs to all C and A to some C, the first term must be B: for B belongs to all C, and C to some A, therefore B belongs to some A. But since the particular statement is convertible, A will belong to some B. If the syllogism is negative, when the terms are universal we must take them in a similar way. Let B belong to all C, and A to no C: then C will belong to some B, and A to no C; and so C will be middle term. Similarly if the negative statement is universal, the affirmative particular: for A will belong to no C, and C to some of the Bs. But if the negative statement is particular, no resolution will be possible, e.g. if B belongs to all C, and A not belong to some C: convert the statement BC and both premises will be particular.

It is clear that in order to resolve the figures into one another the premise which concerns the minor extreme must be converted in both the figures: for when this premise is altered, the transition to the other figure is made.

One of the syllogisms in the middle figure can, the other cannot, be resolved into the third figure. Whenever the universal statement is negative, resolution is possible. For if A belongs to no B and to some C, both B and C alike are convertible in relation to A, so that B belongs to no A and C to some A. A therefore is middle term. But when A belongs to all B, and not to some C, resolution will not be possible: for neither of the premises is universal after conversion.

Syllogisms in the third figure can be resolved into the middle figure, whenever the negative statement is universal, e.g. if A belongs to no C, and B to some or all C. For C then will belong to no A and to some B. But if the negative statement is particular, no resolution will be possible: for the particular negative does not admit of conversion.

It is clear then that the same syllogisms cannot be resolved in these figures which could not be resolved into the first figure, and that when syllogisms are reduced to the first figure these alone are confirmed by reduction to what is impossible.

It is clear from what we have said how we ought to reduce syllogisms, and that the figures may be resolved into one another.

## Chapter 46

In establishing or refuting, it makes some difference whether we suppose the expressions 'not to be this' and 'to be not-this' are identical or different in meaning, e.g. 'not to be white' and 'to be not-white'. For they do not mean the same thing, nor is 'to be not-white' the negation of 'to be white', but 'not to be white'. The reason for this is as follows. The relation of 'he can walk' to 'he can not-walk' is similar to the relation of 'it is white' to 'it is not-white'; so is that of 'he knows what is good' to 'he knows what is not-good'. For there is no difference between the expressions 'he knows what is good' and 'he is knowing what is good', or 'he can walk' and 'he is able to walk': therefore there is no difference between their contraries 'he cannot walk'-'he is not able to walk'. If then 'he is not able to walk' means the same as 'he is able not to walk', capacity to walk and incapacity to walk will belong at the same time to the same person (for the same man can both walk and not-walk, and is possessed of knowledge of what is good and of what is not-good), but an affirmation and a denial which are opposed to one another do not belong at the same time to the same thing. As then 'not to know what is good' is not the same as 'to know what is not good', so 'to be not-good' is not the same as 'not to be good'. For when two pairs correspond, if the one pair are different from one another, the other pair also must be different.

Nor is 'to be not-equal' the same as 'not to be equal': for there is something underlying the one, viz. that which is not-equal, and this is the unequal, but there is nothing underlying the other. Wherefore not everything is either equal or unequal, but everything is equal or is not equal. Further the expressions 'it is a not-white log' and 'it is not a white log' do not imply one another's truth. For if 'it is a not-white log', it must be a log: but that which is not a white log need not be a log at all. Therefore it is clear that 'it is not-good' is not the denial of 'it is good'. If then every single statement may truly be said to be either an affirmation or a negation, if it is not a negation clearly it must in a sense be an affirmation. But every affirmation has a corresponding negation. The negation then of 'it is not-good' is 'it is not not-good'. The relation of these statements to one another is as follows. Let A stand for 'to be good', B for 'not to be good', let C stand for 'to be not-good' and be placed under B, and let D stand for not to be not-good' and be placed under A. Then either A or B will belong to everything, but they will never belong to the same thing; and either C or D will belong to everything, but they will never belong to the same thing. And B must belong to everything to which C belongs. For if it is true to say 'it is a not-white', it is true also to say 'it is not white': for it is impossible that a thing should simultaneously be white and be not-white, or be a not-white log and be a white log; consequently if the affirmation does not belong, the denial must belong. But C does not always belong to B: for what is not a log at all, cannot be a not-white log either. On the other hand D belongs to everything to which A belongs. For either C or D belongs to everything to which A belongs. But since a thing cannot be simultaneously not-white and white, D must belong to everything to which A belongs. For of that which is white it is true to say that it is not not-white. But A is not true of all D. For of that which is not a log at all it is not true to say A, viz. that it is a white log. Consequently D is true, but A is not true, i.e. that it is a white log. It is clear also that A and C cannot together belong to the same thing, and that B and D may possibly belong to the same thing.

Privative terms are similarly related positive terms respect of this arrangement. Let A stand for 'equal', B for 'not equal', C for 'unequal', D for 'not unequal'.

In many things also, to some of which something belongs which does not belong to others, the negation may be true in a similar way, viz. that all are not white or that each is not white, while that each is not-white or all are not-white is false. Similarly also 'every animal is not-white' is not the negation of 'every animal is white' (for both are false): the proper negation is 'every animal is not white'. Since it is clear that 'it is not-white' and 'it is not white' mean different things, and one is an affirmation, the other a denial, it is evident that the method of proving each cannot be the same, e.g. that whatever is an animal is not white or may not be white, and that it is true to call it not-white; for this means that it is not-white. But we may prove that it is true to call it white or not-white in the same way for both are proved constructively by means of the first figure. For the expression 'it is true' stands on a similar footing to 'it is'. For the negation of 'it is true to call it white' is not 'it is true to call it not-white' but 'it is not true to call it white'. If then it is to be true to say that whatever is a man is musical or is not-musical, we must assume that whatever is an animal either is musical or is not-musical; and the proof has been made. That whatever is a man is not musical is proved destructively in the three ways mentioned.

In general whenever A and B are such that they cannot belong at the same time to the same thing, and one of the two necessarily belongs to everything, and again C and D are related in the same way, and A follows C but the relation cannot be reversed, then D must follow B and the relation cannot be reversed. And A and D may belong to the same thing, but B and C cannot.

First it is clear from the following consideration that D follows B. For since either C or D necessarily belongs to everything; and since C cannot belong to that to which B belongs, because it carries A along with it and A and B cannot belong to the same thing; it is clear that D must follow B. Again since C does not reciprocate with but A, but C or D belongs to everything, it is possible that A and D should belong to the same thing. But B and C cannot belong to the same thing, because A follows C; and so something impossible results. It is clear then that B does not reciprocate with D either, since it is possible that D and A should belong at the same time to the same thing.

It results sometimes even in such an arrangement of terms that one is deceived through not apprehending the opposites rightly, one of which must belong to everything, e.g. we may reason that 'if A and B cannot belong at the same time to the same thing, but it is necessary that one of them should belong to whatever the other does not belong to: and again C and D are related in the same way, and follows everything which C follows: it will result that B belongs necessarily to everything to which D belongs': but this is false. 'Assume that F stands for the negation of A and B, and again that H stands for the negation of C and D. It is necessary then that either A or F should belong to everything: for either the affirmation or the denial must belong. And again either C or H must belong to everything: for they are related as affirmation and denial. And ex hypothesi A belongs to everything ever thing to which C belongs. Therefore H belongs to everything to which F belongs. Again since either F or B belongs to everything, and similarly either H or D, and since H follows F, B must follow D: for we know this. If then A follows C, B must follow D'. But this is false: for as we proved the sequence is reversed in terms so constituted. The fallacy arises because perhaps it is not necessary that A or F should belong to everything, or that F or B should belong to everything: for F is not the denial of A. For not good is the negation of good: and not-good is not identical with 'neither good nor not-good'. Similarly also with C and D. For two negations have been assumed in respect to one term.