PRIOR ANALYTICS

by Aristotle

Table of Contents

Table of Contents

PRIOR ANALYTICS

by Aristotle

translated by A. J. Jenkinson

Book I

1

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 demonstrative science. We must next define a premiss, 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 premiss 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 premiss differs from the dialectical, because the demonstrative premiss is the assertion of one of two contradictory statements (the demonstrator does not ask for his premiss, but lays it down), whereas the dialectical premiss 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 premiss 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 premiss 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 premiss and the difference between syllogistic, demonstrative, and dialectical premisses, 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 premiss 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 premisses.

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.

2

Every premiss states that something either is or must be or may be the attribute of something else; of premisses of these three kinds some are affirmative, others negative, in respect of each of the three modes of attribution; again some affirmative and negative premisses are universal, others particular, others indefinite. It is necessary then that in universal attribution the terms of the negative premiss 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 premiss 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.

3

The same manner of conversion will hold good also in respect of necessary premisses. 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 premisses, 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 premiss 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 premisses can no longer be converted like the simple negatives; the universal negative premiss 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 premisses will behave like the other affirmative propositions.

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 premisses. 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 premiss BC should be indefinite, provided that it is affirmative: for we shall have the same syllogism whether the premiss 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 premiss 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 premiss BA is indefinite.

Nor when the major premiss is universal, whether affirmative or negative, and the minor premiss is negative and particular, can there be a syllogism, whether the minor premiss 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 premiss. A similar proof may also be given if the universal premiss 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 premisses 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.

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 premisses; 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 premisses 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 premiss 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 premisses be affirmative, and let the major premiss 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 premiss 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 premisses are affirmative, terms for the negative relation are white, animal, snow; for the positive relation, white, animal, swan. Evidently then, whenever the premisses 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.

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 premiss 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 premisses 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 premiss 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 premisses 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.

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 premisses 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 premiss, 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 premisses 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.

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 premisses and syllogisms from premisses 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.

9

It happens sometimes also that when one premiss is necessary the conclusion is necessary, not however when either premiss 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 premisses 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 premiss 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 premiss is negative; for the proof is the same.

In particular syllogisms, if the universal premiss is necessary, then the conclusion will be necessary; but if the particular, the conclusion will not be necessary, whether the universal premiss 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 premiss 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.

10

In the second figure, if the negative premiss 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 premiss were negative: for if A is possible be 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 premiss is necessary, the conclusion will not be necessary. Let A belong to all B necessarily, but to no C simply. If then the negative premiss is converted, the first figure results. But it has been proved in the case of the first figure that if the negative major premiss 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 premisses. For example let A be animal, B man, C white, and let the premisses 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 premiss is both universal and necessary, then the conclusion will be necessary: but whenever the affirmative premiss is universal, the negative particular, the conclusion will not be necessary. First then let the negative premiss 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 premiss be both universal and necessary, and let the major premiss 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.

11

In the last figure when the terms are related universally to the middle, and both premisses 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 premisses 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 premiss 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 premiss 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 premisses are universal, we have stated when the conclusion will be necessary. But if one premiss 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 premiss is necessary, the conclusion will not be necessary. Let the premiss 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 premiss is not necessary, but the particular is necessary. But when the premisses 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 premiss 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.

12

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

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 premisses 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 premisses 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 grey 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 grey) 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 premisses. 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 premisses are assumed in the mode of possibility; but whenever A is possible of that of which B is true, one premiss is a simple assertion, the other a problematic. Consequently we must start from premisses which are similar in form, as in the other cases.

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 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 premisses assumed, but if the premiss 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 premisses 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 premisses, but if they are converted we shall have the same syllogism as before. It is clear then that if the minor premiss is negative, or if both premisses 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 premisses is universal, the other particular, when the major premiss 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 premiss 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 premisses, but if the particular premiss 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 premiss 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 premisses 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 premisses 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 premisses 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.

15

If one premiss is a simple proposition, the other a problematic, whenever the major premiss indicates possibility all the syllogisms will be perfect and establish possibility in the sense defined; but whenever the minor premiss 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 premiss AB is negative, and the premiss 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 premiss states simple belonging: but that syllogisms will result if the modality of the premisses 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 premisses 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 predicability, 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 premisses 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 premisses 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 premisses that we make syllogisms, since if the premiss 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 the minor 'man'. The premisses 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 premiss 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 at 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 premiss is negative and indicates possibility, from the actual premisses taken there can be no syllogism, but if the problematic premiss 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 premiss states that A does not belong to B, and the minor premiss indicates that B may possibly belong to no C. Through the premisses actually taken nothing necessary results in any way; but if the problematic premiss 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 premiss 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 premiss 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

premisses is assertoric, the other problematic, whenever the minor premiss is problematic a syllogism always results, only sometimes it results from the premisses that are taken, sometimes it requires the conversion of one premiss. 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 premiss 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 premiss is universal, but assertoric, not problematic, and the minor is particular and problematic, whether both premisses 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 premiss, as has been shown above. And a syllogism will be possible by means of conversion when the major premiss 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 premiss BC is converted in respect of possibility, a syllogism results. But whenever the particular premiss 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 premiss. But if the minor premiss is universal, and the major particular, whether either premiss is negative or affirmative, problematic or assertoric, nohow is a syllogism possible. Nor is a syllogism possible when the premisses 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 premiss is universal, a syllogism always results, but if the minor is universal nothing at all can ever be proved.

16

Whenever one premiss is necessary, the other problematic, there will be a syllogism when the terms are related as before; and a perfect syllogism when the minor premiss is necessary. If the premisses are affirmative the conclusion will be problematic, not assertoric, whether the premisses 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 premisses 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 premisses 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 premisses.

But if the premisses are not similar in quality, suppose first that the negative premiss 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 premiss 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 premiss 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 premisses. But if the minor premiss 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 premisses 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 premiss, or the universal proposition in the affirmative syllogism, e.g. AB the major premiss, is necessary, there will not be an assertoric conclusion. The demonstration is the same as before. But if the minor premiss is universal, and problematic, whether affirmative or negative, and the major premiss is particular and necessary, there cannot be a syllogism. Premisses 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 premisses 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 premiss is assertoric the conclusion is problematic, but if the negative premiss 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.]

17

In the second figure whenever both premisses are problematic, no syllogism is possible, whether the premisses are affirmative or negative, universal or particular. But when one premiss 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 premiss 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 premiss, 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 premisses 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 premiss 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 premiss is universal, the other particular, or both are particular or indefinite, or in whatever other way the premisses can be altered, the proof will always proceed through the same terms. Clearly then, if both the premisses are problematic, no syllogism results.

18

But if one premiss is assertoric, the other problematic, if the affirmative is assertoric and the negative problematic no syllogism will be possible, whether the premisses are universal or particular. The proof is the same as above, and by means of the same terms. But when the affirmative premiss 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 premiss is negative. But if both premisses are negative, one being assertoric, the other problematic, nothing follows necessarily from these premisses as they stand, but if the problematic premiss 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 premisses 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 premisses, a syllogism can be obtained by converting the problematic premiss into its complementary affirmative as before. But if the negative proposition is assertoric, but particular, no syllogism is possible, whether the other premiss is affirmative or negative. Nor can a conclusion be drawn when both premisses are indefinite, whether affirmative or negative, or particular. The proof is the same and by the same terms.

19

If one of the premisses 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 premiss is necessary, no conclusion is possible. Suppose that A necessarily belongs to no B, but may belong to all C. If the negative premiss 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 premiss 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 premisses are necessary, or at any rate the negative premiss. (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 premiss is affirmative.

But if the premisses are similar in quality, when they are negative a syllogism can always be formed by converting the problematic premiss into its complementary affirmative as before. Suppose A necessarily does not belong to B, and possibly may not belong to C: if the premisses 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 premiss is negative. But if the premisses are affirmative there cannot be a syllogism. Clearly the conclusion cannot be a negative assertoric or a negative necessary proposition because no negative premiss 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 premisses are affirmative: this also may be proved as above. But when both premisses are negative, and the premiss that definitely disconnects two terms is universal and necessary, though nothing follows necessarily from the premisses as they are stated, a conclusion can be

drawn as above if the problematic premiss 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 premiss is necessary, a syllogism is always possible, proving not merely a negative problematic, but also a negative assertoric proposition; but if the affirmative premiss 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 premisses is assertoric or necessary. And it is clear that all the syllogisms are imperfect, and are completed by means of the figures mentioned.

20

In the last figure a syllogism is possible whether both or only one of the premisses is problematic. When the premisses are problematic the conclusion will be problematic; and also when one premiss is problematic, the other assertoric. But when the other premiss 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 premisses 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 premisses should be negative no necessary consequence will follow from them as they are stated, but if the premisses 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 premisses 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 premiss 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 premisses should be negative−the one universal and the other particular−although no syllogistic conclusion will follow from the premisses as they are put, it will follow if they are converted, as above. But when both premisses 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.

21

If one premiss 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 premisses 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 premisses 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 premiss is problematic in that figure the conclusion also will be problematic. But if the minor premiss BC is negative, or if both premisses are negative, no syllogistic conclusion can be drawn from the premisses as they stand, but if they are converted a syllogism is obtained as before.

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

22

If one of the premisses is necessary, the other problematic, when the premisses 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 premisses 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 premiss is problematic−it is clear that the conclusion will be problematic: for when the premisses stand thus in the first figure, the conclusion (as we found) is problematic. But if the negative premiss 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 premiss is necessary. But when the premisses 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 premiss is negative, if it is problematic we shall have a syllogism by altering the premiss 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 premisses are affirmative, the conclusion will be problematic, not pure; and also when one premiss is negative, the other affirmative, the latter being necessary. But when the negative premiss 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 premiss 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 premisses 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.

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 premiss 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 premisses taken. Nor when C belongs to something else, and that to something else and so on, no connexion 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 premisses, and a syllogism referring to this out of premisses with the same reference, and a syllogism relating this to that proceeds through premisses which relate this to that. But it is impossible to take a premiss in reference to B, if we neither affirm nor deny anything of it; or again to take a premiss 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 reductiones ad 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.

24

Further in every syllogism one of the premisses must be affirmative, and universality must be present: unless one of the premisses 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 premiss 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 centre. 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 premiss, and that a universal statement is proved only when all the premisses are universal, while a particular statement is proved both from two universal premisses and from one only: consequently if the conclusion is universal, the premisses also must be universal, but if the premisses 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 premisses 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.

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 premisses 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 premisses. 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 premisses and not from more than two. For the three terms make two premisses, unless a new premiss is assumed, as was said at the beginning, to perfect the syllogisms. It is clear therefore that in whatever syllogistic argument the premisses through which the main conclusion follows (for some of the preceding conclusions must be premisses) 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 premisses, every syllogism will consist of an even number of premisses and an odd number of terms (for the terms exceed the premisses by one), and the conclusions will be half the number of the premisses. 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 premisses 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 premisses will be equal in number to the relations of predication. The premisses however will not always be even, the terms odd; but they will alternate−when the premisses are even, the terms must be odd; when the terms are even, the premisses must be odd: for along with one term one premiss is added, if a term is added from any quarter. Consequently since the premisses 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 premisses. 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 premisses.

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 premisses through which it proceeds, the relation of the premisses 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.

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 premisses 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 premisses. If the statement is indefinite, it is uncertain whether the premiss 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 premisses 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 premisses. The reason why this is so will be clear in the sequel.

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 premisses, 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 premisses 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 premiss negative. If attributes which cannot belong to either term are identical, e.g. C and H, both premisses 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 premisses 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.

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 premiss 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 remisses are laid down in accordance with the truth, in the reductio ad impossibile one of the premisses 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 premisses and find the middle term. Consequently a syllogism cannot be formed by means of other terms.

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 premisses in which the arrangement of the terms is in accordance with truth, while if we look for dialectical syllogisms we must start from probable premisses. 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 premisses: we have discussed the matter accurately in the treatise concerning dialectic.

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.

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 premisses 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 premisses have not been stated, we must ourselves assume the one which is missing. For sometimes men put forward the universal premiss, but do not posit the premiss which is contained in it, either in writing or in discussion: or men put forward the premisses 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 premisses: 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 premisses 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 premisses 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 premisses, then divide them into their terms. We must take that term as middle which is stated in both the remisses: for it is necessary that the middle should be found in both premisses 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 premisses 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.

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 premiss 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'.

34

Men will frequently fall into fallacies through not setting out the terms of the premiss 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 diseae 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 premisses what possesses the condition ought always to be substituted for the condition and taken as the term.

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.

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 premisses 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 premisses 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 premiss 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 premisses 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 premiss.

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.

38

A term which is repeated in the premisses 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.

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.

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.

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 a 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 premisses of the syllogism.

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 analyse 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 premisses should be sought.

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.

44

Further we must not try to reduce hypothetical syllogisms; for with the given premisses 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 analysed either; but the reduction to what is impossible can be analysed 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.

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 premisses will be particular.

It is clear that in order to resolve the figures into one another the premiss which concerns the minor extreme must be converted in both the figures: for when this premiss 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 premisses 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.

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 ter 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.

Book II

1

WE have already explained the number of the figures, the character and number of the premisses, when and how a syllogism is formed; further what we must look for when a refuting and establishing propositions, and how we should investigate a given problem in any branch of inquiry, also by what means we shall obtain principles appropriate to each subject. Since some syllogisms are universal, others particular, all the universal syllogisms give more than one result, and of particular syllogisms the affirmative yield more than one, the negative yield only the stated conclusion. For all propositions are convertible save only the particular negative: and the conclusion states one definite thing about another definite thing. Consequently all syllogisms save the particular negative yield more than one conclusion, e.g. if A has been proved to to all or to some B, then B must belong to some A: and if A has been proved to belong to no B, then B belongs to no A. This is a different conclusion from the former. But if A does not belong to some B, it is not necessary that B should not belong to some A: for it may possibly belong to all A.

This then is the reason common to all syllogisms whether universal or particular. But it is possible to give another reason concerning those which are universal. For all the things that are subordinate to the middle term or to the conclusion may be proved by the same syllogism, if the former are placed in the middle, the latter in the conclusion; e.g. if the conclusion AB is proved through C, whatever is subordinate to B or C must accept the predicate A: for if D is included in B as in a whole, and B is included in A, then D will be included in A. Again if E is included in C as in a whole, and C is included in A, then E will be included in A. Similarly if the syllogism is negative. In the second figure it will be possible to infer only that which is subordinate to the conclusion, e.g. if A belongs to no B and to all C; we conclude that B belongs to no C. If then D is subordinate to C, clearly B does not belong to it. But that B does not belong to what is subordinate to A is not clear by means of the syllogism. And yet B does not belong to E, if E is subordinate to A. But while it has been proved through the syllogism that B belongs to no C, it has been assumed without proof that B does not belong to A, consequently it does not result through the syllogism that B does not belong to E.

But in particular syllogisms there will be no necessity of inferring what is subordinate to the conclusion (for a syllogism does not result when this premiss is particular), but whatever is subordinate to the middle term may be inferred, not however through the syllogism, e.g. if A belongs to all B and B to some C. Nothing can be inferred about that which is subordinate to C; something can be inferred about that which is subordinate to B, but not through the preceding syllogism. Similarly in the other figures. That which is subordinate to the conclusion

cannot be proved; the other subordinate can be proved, only not through the syllogism, just as in the universal syllogisms what is subordinate to the middle term is proved (as we saw) from a premiss which is not demonstrated: consequently either a conclusion is not possible in the case of universal syllogisms or else it is possible also in the case of particular syllogisms.

2

It is possible for the premisses of the syllogism to be true, or to be false, or to be the one true, the other false. The conclusion is either true or false necessarily. From true premisses it is not possible to draw a false conclusion, but a true conclusion may be drawn from false premisses, true however only in respect to the fact, not to the reason. The reason cannot be established from false premisses: why this is so will be explained in the sequel.

First then that it is not possible to draw a false conclusion from true premisses, is made clear by this consideration. If it is necessary that B should be when A is, it is necessary that A should not be when B is not. If then A is true, B must be true: otherwise it will turn out that the same thing both is and is not at the same time. But this is impossible. Let it not, because A is laid down as a single term, be supposed that it is possible, when a single fact is given, that something should necessarily result. For that is not possible. For what results necessarily is the conclusion, and the means by which this comes about are at the least three terms, and two relations of subject and predicate or premisses. If then it is true that A belongs to all that to which B belongs, and that B belongs to all that to which C belongs, it is necessary that A should belong to all that to which C belongs, and this cannot be false: for then the same thing will belong and not belong at the same time. So A is posited as one thing, being two premisses taken together. The same holds good of negative syllogisms: it is not possible to prove a false conclusion from true premisses.

But from what is false a true conclusion may be drawn, whether both the premisses are false or only one, provided that this is not either of the premisses indifferently, if it is taken as wholly false: but if the premiss is not taken as wholly false, it does not matter which of the two is false. (1) Let A belong to the whole of C, but to none of the Bs, neither let B belong to C. This is possible, e.g. animal belongs to no stone, nor stone to any man. If then A is taken to belong to all B and B to all C, A will belong to all C; consequently though both the premisses are false the conclusion is true: for every man is an animal. Similarly with the negative. For it is possible that neither A nor B should belong to any C, although A belongs to all B, e.g. if the same terms are taken and man is put as middle: for neither animal nor man belongs to any stone, but animal belongs to every man. Consequently if one term is taken to belong to none of that to which it does belong, and the other term is taken to belong to all of that to which it does not belong, though both the premisses are false the conclusion will be true. (2) A similar proof may be given if each premiss is partially false.

(3) But if one only of the premisses is false, when the first premiss is wholly false, e.g. AB, the conclusion will not be true, but if the premiss BC is wholly false, a true conclusion will be possible. I mean by 'wholly false' the contrary of the truth, e.g. if what belongs to none is assumed to belong to all, or if what belongs to all is assumed to belong to none. Let A belong to no B, and B to all C. If then the premiss BC which I take is true, and the premiss AB is wholly false, viz. that A belongs to all B, it is impossible that the conclusion should be true: for A belonged to none of the Cs, since A belonged to nothing to which B belonged, and B belonged to all C. Similarly there cannot be a true conclusion if A belongs to all B, and B to all C, but while the true premiss BC is assumed, the wholly false premiss AB is also assumed, viz. that A belongs to nothing to which B belongs: here the conclusion must be false. For A will belong to all C, since A belongs to everything to which B belongs, and B to all C. It is clear then that when the first premiss is wholly false, whether affirmative or negative, and the other premiss is true, the conclusion cannot be true.

(4) But if the premiss is not wholly false, a true conclusion is possible. For if A belongs to all C and to some B, and if B belongs to all C, e.g. animal to every swan and to some white thing, and white to every swan, then if we

take as premisses that A belongs to all B, and B to all C, A will belong to all C truly: for every swan is an animal. Similarly if the statement AB is negative. For it is possible that A should belong to some B and to no C, and that B should belong to all C, e.g. animal to some white thing, but to no snow, and white to all snow. If then one should assume that A belongs to no B, and B to all C, then will belong to no C.

(5) But if the premiss AB, which is assumed, is wholly true, and the premiss BC is wholly false, a true syllogism will be possible: for nothing prevents A belonging to all B and to all C, though B belongs to no C, e.g. these being species of the same genus which are not subordinate one to the other: for animal belongs both to horse and to man, but horse to no man. If then it is assumed that A belongs to all B and B to all C, the conclusion will be true, although the premiss BC is wholly false. Similarly if the premiss AB is negative. For it is possible that A should belong neither to any B nor to any C, and that B should not belong to any C, e.g. a genus to species of another genus: for animal belongs neither to music nor to the art of healing, nor does music belong to the art of healing. If then it is assumed that A belongs to no B, and B to all C, the conclusion will be true.

(6) And if the premiss BC is not wholly false but in part only, even so the conclusion may be true. For nothing prevents A belonging to the whole of B and of C, while B belongs to some C, e.g. a genus to its species and difference: for animal belongs to every man and to every footed thing, and man to some footed things though not to all. If then it is assumed that A belongs to all B, and B to all C, A will belong to all C: and this ex hypothesi is true. Similarly if the premiss AB is negative. For it is possible that A should neither belong to any B nor to any C, though B belongs to some C, e.g. a genus to the species of another genus and its difference: for animal neither belongs to any wisdom nor to any instance of 'speculative', but wisdom belongs to some instance of 'speculative'. If then it should be assumed that A belongs to no B, and B to all C, will belong to no C: and this ex hypothesi is true.

In particular syllogisms it is possible when the first premiss is wholly false, and the other true, that the conclusion should be true; also when the first premiss is false in part, and the other true; and when the first is true, and the particular is false; and when both are false. (7) For nothing prevents A belonging to no B, but to some C, and B to some C, e.g. animal belongs to no snow, but to some white thing, and snow to some white thing. If then snow is taken as middle, and animal as first term, and it is assumed that A belongs to the whole of B, and B to some C, then the premiss BC is wholly false, the premiss BC true, and the conclusion true. Similarly if the premiss AB is negative: for it is possible that A should belong to the whole of B, but not to some C, although B belongs to some C, e.g. animal belongs to every man, but does not follow some white, but man belongs to some white; consequently if man be taken as middle term and it is assumed that A belongs to no B but B belongs to some C, the conclusion will be true although the premiss AB is wholly false. (If the premiss AB is false in part, the conclusion may be true. For nothing prevents A belonging both to B and to some C, and B belonging to some C, e.g. animal to something beautiful and to something great, and beautiful belonging to something great. If then A is assumed to belong to all B, and B to some C, the a premiss AB will be partially false, the premiss BC will be true, and the conclusion true. Similarly if the premiss AB is negative. For the same terms will serve, and in the same positions, to prove the point.

(9) Again if the premiss AB is true, and the premiss BC is false, the conclusion may be true. For nothing prevents A belonging to the whole of B and to some C, while B belongs to no C, e.g. animal to every swan and to some black things, though swan belongs to no black thing. Consequently if it should be assumed that A belongs to all B, and B to some C, the conclusion will be true, although the statement BC is false. Similarly if the premiss AB is negative. For it is possible that A should belong to no B, and not to some C, while B belongs to no C, e.g. a genus to the species of another genus and to the accident of its own species: for animal belongs to no number and not to some white things, and number belongs to nothing white. If then number is taken as middle, and it is assumed that A belongs to no B, and B to some C, then A will not belong to some C, which ex hypothesi is true. And the premiss AB is true, the premiss BC false.

(10) Also if the premiss AB is partially false, and the premiss BC is false too, the conclusion may be true. For nothing prevents A belonging to some B and to some C, though B belongs to no C, e.g. if B is the contrary of C, and both are accidents of the same genus: for animal belongs to some white things and to some black things, but white belongs to no black thing. If then it is assumed that A belongs to all B, and B to some C, the conclusion will be true. Similarly if the premiss AB is negative: for the same terms arranged in the same way will serve for the proof.

(11) Also though both premisses are false the conclusion may be true. For it is possible that A may belong to no B and to some C, while B belongs to no C, e.g. a genus in relation to the species of another genus, and to the accident of its own species: for animal belongs to no number, but to some white things, and number to nothing white. If then it is assumed that A belongs to all B and B to some C, the conclusion will be true, though both premisses are false. Similarly also if the premiss AB is negative. For nothing prevents A belonging to the whole of B, and not to some C, while B belongs to no C, e.g. animal belongs to every swan, and not to some black things, and swan belongs to nothing black. Consequently if it is assumed that A belongs to no B, and B to some C, then A does not belong to some C. The conclusion then is true, but the premisses arc false.

3

In the middle figure it is possible in every way to reach a true conclusion through false premisses, whether the syllogisms are universal or particular, viz. when both premisses are wholly false; when each is partially false; when one is true, the other wholly false (it does not matter which of the two premisses is false); if both premisses are partially false; if one is quite true, the other partially false; if one is wholly false, the other partially true. For (1) if A belongs to no B and to all C, e.g. animal to no stone and to every horse, then if the premisses are stated contrariwise and it is assumed that A belongs to all B and to no C, though the premisses are wholly false they will yield a true conclusion. Similarly if A belongs to all B and to no C: for we shall have the same syllogism.

(2) Again if one premiss is wholly false, the other wholly true: for nothing prevents A belonging to all B and to all C, though B belongs to no C, e.g. a genus to its co−ordinate species. For animal belongs to every horse and man, and no man is a horse. If then it is assumed that animal belongs to all of the one, and none of the other, the one premiss will be wholly false, the other wholly true, and the conclusion will be true whichever term the negative statement concerns.

(3) Also if one premiss is partially false, the other wholly true. For it is possible that A should belong to some B and to all C, though B belongs to no C, e.g. animal to some white things and to every raven, though white belongs to no raven. If then it is assumed that A belongs to no B, but to the whole of C, the premiss AB is partially false, the premiss AC wholly true, and the conclusion true. Similarly if the negative statement is transposed: the proof can be made by means of the same terms. Also if the affirmative premiss is partially false, the negative wholly true, a true conclusion is possible. For nothing prevents A belonging to some B, but not to C as a whole, while B belongs to no C, e.g. animal belongs to some white things, but to no pitch, and white belongs to no pitch. Consequently if it is assumed that A belongs to the whole of B, but to no C, the premiss AB is partially false, the premiss AC is wholly true, and the conclusion is true.

(4) And if both the premisses are partially false, the conclusion may be true. For it is possible that A should belong to some B and to some C, and B to no C, e.g. animal to some white things and to some black things, though white belongs to nothing black. If then it is assumed that A belongs to all B and to no C, both premisses are partially false, but the conclusion is true. Similarly, if the negative premiss is transposed, the proof can be made by means of the same terms.

It is clear also that our thesis holds in particular syllogisms. For (5) nothing prevents A belonging to all B and to some C, though B does not belong to some C, e.g. animal to every man and to some white things, though man will

not belong to some white things. If then it is stated that A belongs to no B and to some C, the universal premiss is wholly false, the particular premiss is true, and the conclusion is true. Similarly if the premiss AB is affirmative: for it is possible that A should belong to no B, and not to some C, though B does not belong to some C, e.g. animal belongs to nothing lifeless, and does not belong to some white things, and lifeless will not belong to some white things. If then it is stated that A belongs to all B and not to some C, the premiss AB which is universal is wholly false, the premiss AC is true, and the conclusion is true. Also a true conclusion is possible when the universal premiss is true, and the particular is false. For nothing prevents A following neither B nor C at all, while B does not belong to some C, e.g. animal belongs to no number nor to anything lifeless, and number does not follow some lifeless things. If then it is stated that A belongs to no B and to some C, the conclusion will be true, and the universal premiss true, but the particular false. Similarly if the premiss which is stated universally is affirmative. For it is possible that should A belong both to B and to C as wholes, though B does not follow some C, e.g. a genus in relation to its species and difference: for animal follows every man and footed things as a whole, but man does not follow every footed thing. Consequently if it is assumed that A belongs to the whole of B, but does not belong to some C, the universal premiss is true, the particular false, and the conclusion true.

(6) It is clear too that though both premisses are false they may yield a true conclusion, since it is possible that A should belong both to B and to C as wholes, though B does not follow some C. For if it is assumed that A belongs to no B and to some C, the premisses are both false, but the conclusion is true. Similarly if the universal premiss is affirmative and the particular negative. For it is possible that A should follow no B and all C, though B does not belong to some C, e.g. animal follows no science but every man, though science does not follow every man. If then A is assumed to belong to the whole of B, and not to follow some C, the premisses are false but the conclusion is true.

4

In the last figure a true conclusion may come through what is false, alike when both premisses are wholly false, when each is partly false, when one premiss is wholly true, the other false, when one premiss is partly false, the other wholly true, and vice versa, and in every other way in which it is possible to alter the premisses. For (1) nothing prevents neither A nor B from belonging to any C, while A belongs to some B, e.g. neither man nor footed follows anything lifeless, though man belongs to some footed things. If then it is assumed that A and B belong to all C, the premisses will be wholly false, but the conclusion true. Similarly if one premiss is negative, the other affirmative. For it is possible that B should belong to no C, but A to all C, and that should not belong to some B, e.g. black belongs to no swan, animal to every swan, and animal not to everything black. Consequently if it is assumed that B belongs to all C, and A to no C, A will not belong to some B: and the conclusion is true, though the premisses are false.

(2) Also if each premiss is partly false, the conclusion may be true. For nothing prevents both A and B from belonging to some C while A belongs to some B, e.g. white and beautiful belong to some animals, and white to some beautiful things. If then it is stated that A and B belong to all C, the premisses are partially false, but the conclusion is true. Similarly if the premiss AC is stated as negative. For nothing prevents A from not belonging, and B from belonging, to some C, while A does not belong to all B, e.g. white does not belong to some animals, beautiful belongs to some animals, and white does not belong to everything beautiful. Consequently if it is assumed that A belongs to no C, and B to all C, both premisses are partly false, but the conclusion is true.

(3) Similarly if one of the premisses assumed is wholly false, the other wholly true. For it is possible that both A and B should follow all C, though A does not belong to some B, e.g. animal and white follow every swan, though animal does not belong to everything white. Taking these then as terms, if one assumes that B belongs to the whole of C, but A does not belong to C at all, the premiss BC will be wholly true, the premiss AC wholly false, and the conclusion true. Similarly if the statement BC is false, the statement AC true, the conclusion may be true. The same terms will serve for the proof. Also if both the premisses assumed are affirmative, the conclusion may

be true. For nothing prevents B from following all C, and A from not belonging to C at all, though A belongs to some B, e.g. animal belongs to every swan, black to no swan, and black to some animals. Consequently if it is assumed that A and B belong to every C, the premiss BC is wholly true, the premiss AC is wholly false, and the conclusion is true. Similarly if the premiss AC which is assumed is true: the proof can be made through the same terms.

(4) Again if one premiss is wholly true, the other partly false, the conclusion may be true. For it is possible that B should belong to all C, and A to some C, while A belongs to some B, e.g. biped belongs to every man, beautiful not to every man, and beautiful to some bipeds. If then it is assumed that both A and B belong to the whole of C, the premiss BC is wholly true, the premiss AC partly false, the conclusion true. Similarly if of the premisses assumed AC is true and BC partly false, a true conclusion is possible: this can be proved, if the same terms as before are transposed. Also the conclusion may be true if one premiss is negative, the other affirmative. For since it is possible that B should belong to the whole of C, and A to some C, and, when they are so, that A should not belong to all B, therefore it is assumed that B belongs to the whole of C, and A to no C, the negative premiss is partly false, the other premiss wholly true, and the conclusion is true. Again since it has been proved that if A belongs to no C and B to some C, it is possible that A should not belong to some C, it is clear that if the premiss AC is wholly true, and the premiss BC partly false, it is possible that the conclusion should be true. For if it is assumed that A belongs to no C, and B to all C, the premiss AC is wholly true, and the premiss BC is partly false.

(5) It is clear also in the case of particular syllogisms that a true conclusion may come through what is false, in every possible way. For the same terms must be taken as have been taken when the premisses are universal, positive terms in positive syllogisms, negative terms in negative. For it makes no difference to the setting out of the terms, whether one assumes that what belongs to none belongs to all or that what belongs to some belongs to all. The same applies to negative statements.

It is clear then that if the conclusion is false, the premisses of the argument must be false, either all or some of them; but when the conclusion is true, it is not necessary that the premisses should be true, either one or all, yet it is possible, though no part of the syllogism is true, that the conclusion may none the less be true; but it is not necessitated. The reason is that when two things are so related to one another, that if the one is, the other necessarily is, then if the latter is not, the former will not be either, but if the latter is, it is not necessary that the former should be. But it is impossible that the same thing should be necessitated by the being and by the not−being of the same thing. I mean, for example, that it is impossible that B should necessarily be great since A is white and that B should necessarily be great since A is not white. For whenever since this, A, is white it is necessary that that, B, should be great, and since B is great that C should not be white, then it is necessary if is white that C should not be white. And whenever it is necessary, since one of two things is, that the other should be, it is necessary, if the latter is not, that the former (viz. A) should not be. If then B is not great A cannot be white. But if, when A is not white, it is necessary that B should be great, it necessarily results that if B is not great, B itself is great. (But this is impossible.) For if B is not great, A will necessarily not be white. If then when this is not white B must be great, it results that if B is not great, it is great, just as if it were proved through three terms.

5

Circular and reciprocal proof means proof by means of the conclusion, i.e. by converting one of the premisses simply and inferring the premiss which was assumed in the original syllogism: e.g. suppose it has been necessary to prove that A belongs to all C, and it has been proved through B; suppose that A should now be proved to belong to B by assuming that A belongs to C, and C to B−so A belongs to B: but in the first syllogism the converse was assumed, viz. that B belongs to C. Or suppose it is necessary to prove that B belongs to C, and A is assumed to belong to C, which was the conclusion of the first syllogism, and B to belong to A but the converse was assumed in the earlier syllogism, viz. that A belongs to B. In no other way is reciprocal proof possible. If another term is taken as middle, the proof is not circular: for neither of the propositions assumed is the same as

before: if one of the accepted terms is taken as middle, only one of the premisses of the first syllogism can be assumed in the second: for if both of them are taken the same conclusion as before will result: but it must be different. If the terms are not convertible, one of the premisses from which the syllogism results must be undemonstrated: for it is not possible to demonstrate through these terms that the third belongs to the middle or the middle to the first. If the terms are convertible, it is possible to demonstrate everything reciprocally, e.g. if A and B and C are convertible with one another. Suppose the proposition AC has been demonstrated through B as middle term, and again the proposition AB through the conclusion and the premiss BC converted, and similarly the proposition BC through the conclusion and the premiss AB converted. But it is necessary to prove both the premiss CB, and the premiss BA: for we have used these alone without demonstrating them. If then it is assumed that B belongs to all C, and C to all A, we shall have a syllogism relating B to A. Again if it is assumed that C belongs to all A, and A to all B, C must belong to all B. In both these syllogisms the premiss CA has been assumed without being demonstrated: the other premisses had ex hypothesi been proved. Consequently if we succeed in demonstrating this premiss, all the premisses will have been proved reciprocally. If then it is assumed that C belongs to all B, and B to all A, both the premisses assumed have been proved, and C must belong to A. It is clear then that only if the terms are convertible is circular and reciprocal demonstration possible (if the terms are not convertible, the matter stands as we said above). But it turns out in these also that we use for the demonstration the very thing that is being proved: for C is proved of B, and B of by assuming that C is said of and C is proved of A through these premisses, so that we use the conclusion for the demonstration.

In negative syllogisms reciprocal proof is as follows. Let B belong to all C, and A to none of the Bs: we conclude that A belongs to none of the Cs. If again it is necessary to prove that A belongs to none of the Bs (which was previously assumed) A must belong to no C, and C to all B: thus the previous premiss is reversed. If it is necessary to prove that B belongs to C, the proposition AB must no longer be converted as before: for the premiss 'B belongs to no A' is identical with the premiss 'A belongs to no B'. But we must assume that B belongs to all of that to none of which longs. Let A belong to none of the Cs (which was the previous conclusion) and assume that B belongs to all of that to none of which A belongs. It is necessary then that B should belong to all C. Consequently each of the three propositions has been made a conclusion, and this is circular demonstration, to assume the conclusion and the converse of one of the premisses, and deduce the remaining premiss.

In particular syllogisms it is not possible to demonstrate the universal premiss through the other propositions, but the particular premiss can be demonstrated. Clearly it is impossible to demonstrate the universal premiss: for what is universal is proved through propositions which are universal, but the conclusion is not universal, and the proof must start from the conclusion and the other premiss. Further a syllogism cannot be made at all if the other premiss is converted: for the result is that both premisses are particular. But the particular premiss may be proved. Suppose that A has been proved of some C through B. If then it is assumed that B belongs to all A and the conclusion is retained, B will belong to some C: for we obtain the first figure and A is middle. But if the syllogism is negative, it is not possible to prove the universal premiss, for the reason given above. But it is possible to prove the particular premiss, if the proposition AB is converted as in the universal syllogism, i.e 'B belongs to some of that to some of which A does not belong': otherwise no syllogism results because the particular premiss is negative.

6

In the second figure it is not possible to prove an affirmative proposition in this way, but a negative proposition may be proved. An affirmative proposition is not proved because both premisses of the new syllogism are not affirmative (for the conclusion is negative) but an affirmative proposition is (as we saw) proved from premisses which are both affirmative. The negative is proved as follows. Let A belong to all B, and to no C: we conclude that B belongs to no C. If then it is assumed that B belongs to all A, it is necessary that A should belong to no C: for we get the second figure, with B as middle. But if the premiss AB was negative, and the other affirmative, we shall have the first figure. For C belongs to all A and B to no C, consequently B belongs to no A: neither then

does A belong to B. Through the conclusion, therefore, and one premiss, we get no syllogism, but if another premiss is assumed in addition, a syllogism will be possible. But if the syllogism not universal, the universal premiss cannot be proved, for the same reason as we gave above, but the particular premiss can be proved whenever the universal statement is affirmative. Let A belong to all B, and not to all C: the conclusion is BC. If then it is assumed that B belongs to all A, but not to all C, A will not belong to some C, B being middle. But if the universal premiss is negative, the premiss AC will not be demonstrated by the conversion of AB: for it turns out that either both or one of the premisses is negative; consequently a syllogism will not be possible. But the proof will proceed as in the universal syllogisms, if it is assumed that A belongs to some of that to some of which B does not belong.

7

In the third figure, when both premisses are taken universally, it is not possible to prove them reciprocally: for that which is universal is proved through statements which are universal, but the conclusion in this figure is always particular, so that it is clear that it is not possible at all to prove through this figure the universal premiss. But if one premiss is universal, the other particular, proof of the latter will sometimes be possible, sometimes not. When both the premisses assumed are affirmative, and the universal concerns the minor extreme, proof will be possible, but when it concerns the other extreme, impossible. Let A belong to all C and B to some C: the conclusion is the statement AB. If then it is assumed that C belongs to all A, it has been proved that C belongs to some B, but that B belongs to some C has not been proved. And yet it is necessary, if C belongs to some B, that B should belong to some C. But it is not the same that this should belong to that, and that to this: but we must assume besides that if this belongs to some of that, that belongs to some of this. But if this is assumed the syllogism no longer results from the conclusion and the other premiss. But if B belongs to all C, and A to some C, it will be possible to prove the proposition AC, when it is assumed that C belongs to all B, and A to some B. For if C belongs to all B and A to some B, it is necessary that A should belong to some C, B being middle. And whenever one premiss is affirmative the other negative, and the affirmative is universal, the other premiss can be proved. Let B belong to all C, and A not to some C: the conclusion is that A does not belong to some B. If then it is assumed further that C belongs to all B, it is necessary that A should not belong to some C, B being middle. But when the negative premiss is universal, the other premiss is not except as before, viz. if it is assumed that that belongs to some of that, to some of which this does not belong, e.g. if A belongs to no C, and B to some C: the conclusion is that A does not belong to some B. If then it is assumed that C belongs to some of that to some of which does not belong, it is necessary that C should belong to some of the Bs. In no other way is it possible by converting the universal premiss to prove the other: for in no other way can a syllogism be formed.

It is clear then that in the first figure reciprocal proof is made both through the third and through the first figure−if the conclusion is affirmative through the first; if the conclusion is negative through the last. For it is assumed that that belongs to all of that to none of which this belongs. In the middle figure, when the syllogism is universal, proof is possible through the second figure and through the first, but when particular through the second and the last. In the third figure all proofs are made through itself. It is clear also that in the third figure and in the middle figure those syllogisms which are not made through those figures themselves either are not of the nature of circular proof or are imperfect.

8

To convert a syllogism means to alter the conclusion and make another syllogism to prove that either the extreme cannot belong to the middle or the middle to the last term. For it is necessary, if the conclusion has been changed into its opposite and one of the premisses stands, that the other premiss should be destroyed. For if it should stand, the conclusion also must stand. It makes a difference whether the conclusion is converted into its contradictory or into its contrary. For the same syllogism does not result whichever form the conversion takes. This will be made clear by the sequel. By contradictory opposition I mean the opposition of 'to all' to 'not to all', and of 'to some' to

'to none'; by contrary opposition I mean the opposition of 'to all' to 'to none', and of 'to some' to 'not to some'. Suppose that A been proved of C, through B as middle term. If then it should be assumed that A belongs to no C, but to all B, B will belong to no C. And if A belongs to no C, and B to all C, A will belong, not to no B at all, but not to all B. For (as we saw) the universal is not proved through the last figure. In a word it is not possible to refute universally by conversion the premiss which concerns the major extreme: for the refutation always proceeds through the third since it is necessary to take both premisses in reference to the minor extreme. Similarly if the syllogism is negative. Suppose it has been proved that A belongs to no C through B. Then if it is assumed that A belongs to all C, and to no B, B will belong to none of the Cs. And if A and B belong to all C, A will belong to some B: but in the original premiss it belonged to no B.

If the conclusion is converted into its contradictory, the syllogisms will be contradictory and not universal. For one premiss is particular, so that the conclusion also will be particular. Let the syllogism be affirmative, and let it be converted as stated. Then if A belongs not to all C, but to all B, B will belong not to all C. And if A belongs not to all C, but B belongs to all C, A will belong not to all B. Similarly if the syllogism is negative. For if A belongs to some C, and to no B, B will belong, not to no C at all, but−not to some C. And if A belongs to some C, and B to all C, as was originally assumed, A will belong to some B.

In particular syllogisms when the conclusion is converted into its contradictory, both premisses may be refuted, but when it is converted into its contrary, neither. For the result is no longer, as in the universal syllogisms, refutation in which the conclusion reached by O, conversion lacks universality, but no refutation at all. Suppose that A has been proved of some C. If then it is assumed that A belongs to no C, and B to some C, A will not belong to some B: and if A belongs to no C, but to all B, B will belong to no C. Thus both premisses are refuted. But neither can be refuted if the conclusion is converted into its contrary. For if A does not belong to some C, but to all B, then B will not belong to some C. But the original premiss is not yet refuted: for it is possible that B should belong to some C, and should not belong to some C. The universal premiss AB cannot be affected by a syllogism at all: for if A does not belong to some of the Cs, but B belongs to some of the Cs, neither of the premisses is universal. Similarly if the syllogism is negative: for if it should be assumed that A belongs to all C, both premisses are refuted: but if the assumption is that A belongs to some C, neither premiss is refuted. The proof is the same as before.

9

In the second figure it is not possible to refute the premiss which concerns the major extreme by establishing something contrary to it, whichever form the conversion of the conclusion may take. For the conclusion of the refutation will always be in the third figure, and in this figure (as we saw) there is no universal syllogism. The other premiss can be refuted in a manner similar to the conversion: I mean, if the conclusion of the first syllogism is converted into its contrary, the conclusion of the refutation will be the contrary of the minor premiss of the first, if into its contradictory, the contradictory. Let A belong to all B and to no C: conclusion BC. If then it is assumed that B belongs to all C, and the proposition AB stands, A will belong to all C, since the first figure is produced. If B belongs to all C, and A to no C, then A belongs not to all B: the figure is the last. But if the conclusion BC is converted into its contradictory, the premiss AB will be refuted as before, the premiss, AC by its contradictory. For if B belongs to some C, and A to no C, then A will not belong to some B. Again if B belongs to some C, and A to all B, A will belong to some C, so that the syllogism results in the contradictory of the minor premiss. A similar proof can be given if the premisses are transposed in respect of their quality.

If the syllogism is particular, when the conclusion is converted into its contrary neither premiss can be refuted, as also happened in the first figure,' if the conclusion is converted into its contradictory, both premisses can be refuted. Suppose that A belongs to no B, and to some C: the conclusion is BC. If then it is assumed that B belongs to some C, and the statement AB stands, the conclusion will be that A does not belong to some C. But the original statement has not been refuted: for it is possible that A should belong to some C and also not to some C. Again if

B belongs to some C and A to some C, no syllogism will be possible: for neither of the premisses taken is universal. Consequently the proposition AB is not refuted. But if the conclusion is converted into its contradictory, both premisses can be refuted. For if B belongs to all C, and A to no B, A will belong to no C: but it was assumed to belong to some C. Again if B belongs to all C and A to some C, A will belong to some B. The same proof can be given if the universal statement is affirmative.

10

In the third figure when the conclusion is converted into its contrary, neither of the premisses can be refuted in any of the syllogisms, but when the conclusion is converted into its contradictory, both premisses may be refuted and in all the moods. Suppose it has been proved that A belongs to some B, C being taken as middle, and the premisses being universal. If then it is assumed that A does not belong to some B, but B belongs to all C, no syllogism is formed about A and C. Nor if A does not belong to some B, but belongs to all C, will a syllogism be possible about B and C. A similar proof can be given if the premisses are not universal. For either both premisses arrived at by the conversion must be particular, or the universal premiss must refer to the minor extreme. But we found that no syllogism is possible thus either in the first or in the middle figure. But if the conclusion is converted into its contradictory, both the premisses can be refuted. For if A belongs to no B, and B to all C, then A belongs to no C: again if A belongs to no B, and to all C, B belongs to no C. And similarly if one of the premisses is not universal. For if A belongs to no B, and B to some C, A will not belong to some C: if A belongs to no B, and to C, B will belong to no C.

Similarly if the original syllogism is negative. Suppose it has been proved that A does not belong to some B, BC being affirmative, AC being negative: for it was thus that, as we saw, a syllogism could be made. Whenever then the contrary of the conclusion is assumed a syllogism will not be possible. For if A belongs to some B, and B to all C, no syllogism is possible (as we saw) about A and C. Nor, if A belongs to some B, and to no C, was a syllogism possible concerning B and C. Therefore the premisses are not refuted. But when the contradictory of the conclusion is assumed, they are refuted. For if A belongs to all B, and B to C, A belongs to all C: but A was supposed originally to belong to no C. Again if A belongs to all B, and to no C, then B belongs to no C: but it was supposed to belong to all C. A similar proof is possible if the premisses are not universal. For AC becomes universal and negative, the other premiss particular and affirmative. If then A belongs to all B, and B to some C, it results that A belongs to some C: but it was supposed to belong to no C. Again if A belongs to all B, and to no C, then B belongs to no C: but it was assumed to belong to some C. If A belongs to some B and B to some C, no syllogism results: nor yet if A belongs to some B, and to no C. Thus in one way the premisses are refuted, in the other way they are not.

From what has been said it is clear how a syllogism results in each figure when the conclusion is converted; when a result contrary to the premiss, and when a result contradictory to the premiss, is obtained. It is clear that in the first figure the syllogisms are formed through the middle and the last figures, and the premiss which concerns the minor extreme is alway refuted through the middle figure, the premiss which concerns the major through the last figure. In the second figure syllogisms proceed through the first and the last figures, and the premiss which concerns the minor extreme is always refuted through the first figure, the premiss which concerns the major extreme through the last. In the third figure the refutation proceeds through the first and the middle figures; the premiss which concerns the major is always refuted through the first figure, the premiss which concerns the minor through the middle figure.

11

It is clear then what conversion is, how it is effected in each figure, and what syllogism results. The syllogism per impossibile is proved when the contradictory of the conclusion stated and another premiss is assumed; it can be made in all the figures. For it resembles conversion, differing only in this: conversion takes place after a syllogism

has been formed and both the premisses have been taken, but a reduction to the impossible takes place not because the contradictory has been agreed to already, but because it is clear that it is true. The terms are alike in both, and the premisses of both are taken in the same way. For example if A belongs to all B, C being middle, then if it is supposed that A does not belong to all B or belongs to no B, but to all C (which was admitted to be true), it follows that C belongs to no B or not to all B. But this is impossible: consequently the supposition is false: its contradictory then is true. Similarly in the other figures: for whatever moods admit of conversion admit also of the reduction per impossibile.

All the problems can be proved per impossibile in all the figures, excepting the universal affirmative, which is proved in the middle and third figures, but not in the first. Suppose that A belongs not to all B, or to no B, and take besides another premiss concerning either of the terms, viz. that C belongs to all A, or that B belongs to all D; thus we get the first figure. If then it is supposed that A does not belong to all B, no syllogism results whichever term the assumed premiss concerns; but if it is supposed that A belongs to no B, when the premiss BD is assumed as well we shall prove syllogistically what is false, but not the problem proposed. For if A belongs to no B, and B belongs to all D, A belongs to no D. Let this be impossible: it is false then A belongs to no B. But the universal affirmative is not necessarily true if the universal negative is false. But if the premiss CA is assumed as well, no syllogism results, nor does it do so when it is supposed that A does not belong to all B. Consequently it is clear that the universal affirmative cannot be proved in the first figure per impossibile.

But the particular affirmative and the universal and particular negatives can all be proved. Suppose that A belongs to no B, and let it have been assumed that B belongs to all or to some C. Then it is necessary that A should belong to no C or not to all C. But this is impossible (for let it be true and clear that A belongs to all C): consequently if this is false, it is necessary that A should belong to some B. But if the other premiss assumed relates to A, no syllogism will be possible. Nor can a conclusion be drawn when the contrary of the conclusion is supposed, e.g. that A does not belong to some B. Clearly then we must suppose the contradictory.

Again suppose that A belongs to some B, and let it have been assumed that C belongs to all A. It is necessary then that C should belong to some B. But let this be impossible, so that the supposition is false: in that case it is true that A belongs to no B. We may proceed in the same way if the proposition CA has been taken as negative. But if the premiss assumed concerns B, no syllogism will be possible. If the contrary is supposed, we shall have a syllogism and an impossible conclusion, but the problem in hand is not proved. Suppose that A belongs to all B, and let it have been assumed that C belongs to all A. It is necessary then that C should belong to all B. But this is impossible, so that it is false that A belongs to all B. But we have not yet shown it to be necessary that A belongs to no B, if it does not belong to all B. Similarly if the other premiss taken concerns B; we shall have a syllogism and a conclusion which is impossible, but the hypothesis is not refuted. Therefore it is the contradictory that we must suppose.

To prove that A does not belong to all B, we must suppose that it belongs to all B: for if A belongs to all B, and C to all A, then C belongs to all B; so that if this is impossible, the hypothesis is false. Similarly if the other premiss assumed concerns B. The same results if the original proposition CA was negative: for thus also we get a syllogism. But if the negative proposition concerns B, nothing is proved. If the hypothesis is that A belongs not to all but to some B, it is not proved that A belongs not to all B, but that it belongs to no B. For if A belongs to some B, and C to all A, then C will belong to some B. If then this is impossible, it is false that A belongs to some B; consequently it is true that A belongs to no B. But if this is proved, the truth is refuted as well; for the original conclusion was that A belongs to some B, and does not belong to some B. Further the impossible does not result from the hypothesis: for then the hypothesis would be false, since it is impossible to draw a false conclusion from true premisses: but in fact it is true: for A belongs to some B. Consequently we must not suppose that A belongs to some B, but that it belongs to all B. Similarly if we should be proving that A does not belong to some B: for if 'not to belong to some' and 'to belong not to all' have the same meaning, the demonstration of both will be identical.

It is clear then that not the contrary but the contradictory ought to be supposed in all the syllogisms. For thus we shall have necessity of inference, and the claim we make is one that will be generally accepted. For if of everything one or other of two contradictory statements holds good, then if it is proved that the negation does not hold, the affirmation must be true. Again if it is not admitted that the affirmation is true, the claim that the negation is true will be generally accepted. But in neither way does it suit to maintain the contrary: for it is not necessary that if the universal negative is false, the universal affirmative should be true, nor is it generally accepted that if the one is false the other is true.

12

It is clear then that in the first figure all problems except the universal affirmative are proved per impossibile. But in the middle and the last figures this also is proved. Suppose that A does not belong to all B, and let it have been assumed that A belongs to all C. If then A belongs not to all B, but to all C, C will not belong to all B. But this is impossible (for suppose it to be clear that C belongs to all B): consequently the hypothesis is false. It is true then that A belongs to all B. But if the contrary is supposed, we shall have a syllogism and a result which is impossible: but the problem in hand is not proved. For if A belongs to no B, and to all C, C will belong to no B. This is impossible; so that it is false that A belongs to no B. But though this is false, it does not follow that it is true that A belongs to all B.

When A belongs to some B, suppose that A belongs to no B, and let A belong to all C. It is necessary then that C should belong to no B. Consequently, if this is impossible, A must belong to some B. But if it is supposed that A does not belong to some B, we shall have the same results as in the first figure.

Again suppose that A belongs to some B, and let A belong to no C. It is necessary then that C should not belong to some B. But originally it belonged to all B, consequently the hypothesis is false: A then will belong to no B.

When A does not belong to an B, suppose it does belong to all B, and to no C. It is necessary then that C should belong to no B. But this is impossible: so that it is true that A does not belong to all B. It is clear then that all the syllogisms can be formed in the middle figure.

13

Similarly they can all be formed in the last figure. Suppose that A does not belong to some B, but C belongs to all B: then A does not belong to some C. If then this is impossible, it is false that A does not belong to some B; so that it is true that A belongs to all B. But if it is supposed that A belongs to no B, we shall have a syllogism and a conclusion which is impossible: but the problem in hand is not proved: for if the contrary is supposed, we shall have the same results as before.

But to prove that A belongs to some B, this hypothesis must be made. If A belongs to no B, and C to some B, A will belong not to all C. If then this is false, it is true that A belongs to some B.

When A belongs to no B, suppose A belongs to some B, and let it have been assumed that C belongs to all B. Then it is necessary that A should belong to some C. But ex hypothesi it belongs to no C, so that it is false that A belongs to some B. But if it is supposed that A belongs to all B, the problem is not proved.

But this hypothesis must be made if we are prove that A belongs not to all B. For if A belongs to all B and C to some B, then A belongs to some C. But this we assumed not to be so, so it is false that A belongs to all B. But in that case it is true that A belongs not to all B. If however it is assumed that A belongs to some B, we shall have the same result as before.

It is clear then that in all the syllogisms which proceed per impossibile the contradictory must be assumed. And it is plain that in the middle figure an affirmative conclusion, and in the last figure a universal conclusion, are proved in a way.

14

Demonstration per impossibile differs from ostensive proof in that it posits what it wishes to refute by reduction to a statement admitted to be false; whereas ostensive proof starts from admitted positions. Both, indeed, take two premisses that are admitted, but the latter takes the premisses from which the syllogism starts, the former takes one of these, along with the contradictory of the original conclusion. Also in the ostensive proof it is not necessary that the conclusion should be known, nor that one should suppose beforehand that it is true or not: in the other it is necessary to suppose beforehand that it is not true. It makes no difference whether the conclusion is affirmative or negative; the method is the same in both cases. Everything which is concluded ostensively can be proved per impossibile, and that which is proved per impossibile can be proved ostensively, through the same terms. Whenever the syllogism is formed in the first figure, the truth will be found in the middle or the last figure, if negative in the middle, if affirmative in the last. Whenever the syllogism is formed in the middle figure, the truth will be found in the first, whatever the problem may be. Whenever the syllogism is formed in the last figure, the truth will be found in the first and middle figures, if affirmative in first, if negative in the middle. Suppose that A has been proved to belong to no B, or not to all B, through the first figure. Then the hypothesis must have been that A belongs to some B, and the original premisses that C belongs to all A and to no B. For thus the syllogism was made and the impossible conclusion reached. But this is the middle figure, if C belongs to all A and to no B. And it is clear from these premisses that A belongs to no B. Similarly if has been proved not to belong to all B. For the hypothesis is that A belongs to all B; and the original premisses are that C belongs to all A but not to all B. Similarly too, if the premiss CA should be negative: for thus also we have the middle figure. Again suppose it has been proved that A belongs to some B. The hypothesis here is that is that A belongs to no B; and the original premisses that B belongs to all C, and A either to all or to some C: for in this way we shall get what is impossible. But if A and B belong to all C, we have the last figure. And it is clear from these premisses that A must belong to some B. Similarly if B or A should be assumed to belong to some C.

Again suppose it has been proved in the middle figure that A belongs to all B. Then the hypothesis must have been that A belongs not to all B, and the original premisses that A belongs to all C, and C to all B: for thus we shall get what is impossible. But if A belongs to all C, and C to all B, we have the first figure. Similarly if it has been proved that A belongs to some B: for the hypothesis then must have been that A belongs to no B, and the original premisses that A belongs to all C, and C to some B. If the syllogism is negative, the hypothesis must have been that A belongs to some B, and the original premisses that A belongs to no C, and C to all B, so that the first figure results. If the syllogism is not universal, but proof has been given that A does not belong to some B, we may infer in the same way. The hypothesis is that A belongs to all B, the original premisses that A belongs to no C, and C belongs to some B: for thus we get the first figure.

Again suppose it has been proved in the third figure that A belongs to all B. Then the hypothesis must have been that A belongs not to all B, and the original premisses that C belongs to all B, and A belongs to all C; for thus we shall get what is impossible. And the original premisses form the first figure. Similarly if the demonstration establishes a particular proposition: the hypothesis then must have been that A belongs to no B, and the original premisses that C belongs to some B, and A to all C. If the syllogism is negative, the hypothesis must have been that A belongs to some B, and the original premisses that C belongs to no A and to all B, and this is the middle figure. Similarly if the demonstration is not universal. The hypothesis will then be that A belongs to all B, the premisses that C belongs to no A and to some B: and this is the middle figure.

It is clear then that it is possible through the same terms to prove each of the problems ostensively as well. Similarly it will be possible if the syllogisms are ostensive to reduce them ad impossibile in the terms which have

been taken, whenever the contradictory of the conclusion of the ostensive syllogism is taken as a premiss. For the syllogisms become identical with those which are obtained by means of conversion, so that we obtain immediately the figures through which each problem will be solved. It is clear then that every thesis can be proved in both ways, i.e. per impossibile and ostensively, and it is not possible to separate one method from the other.

15

In what figure it is possible to draw a conclusion from premisses which are opposed, and in what figure this is not possible, will be made clear in this way. Verbally four kinds of opposition are possible, viz. universal affirmative to universal negative, universal affirmative to particular negative, particular affirmative to universal negative, and particular affirmative to particular negative: but really there are only three: for the particular affirmative is only verbally opposed to the particular negative. Of the genuine opposites I call those which are universal contraries, the universal affirmative and the universal negative, e.g. 'every science is good', 'no science is good'; the others I call contradictories.

In the first figure no syllogism whether affirmative or negative can be made out of opposed premisses: no affirmative syllogism is possible because both premisses must be affirmative, but opposites are, the one affirmative, the other negative: no negative syllogism is possible because opposites affirm and deny the same predicate of the same subject, and the middle term in the first figure is not predicated of both extremes, but one thing is denied of it, and it is affirmed of something else: but such premisses are not opposed.

In the middle figure a syllogism can be made both oLcontradictories and of contraries. Let A stand for good, let B and C stand for science. If then one assumes that every science is good, and no science is good, A belongs to all B and to no C, so that B belongs to no C: no science then is a science. Similarly if after taking 'every science is good' one took 'the science of medicine is not good'; for A belongs to all B but to no C, so that a particular science will not be a science. Again, a particular science will not be a science if A belongs to all C but to no B, and B is science, C medicine, and A supposition: for after taking 'no science is supposition', one has assumed that a particular science is supposition. This syllogism differs from the preceding because the relations between the terms are reversed: before, the affirmative statement concerned B, now it concerns C. Similarly if one premiss is not universal: for the middle term is always that which is stated negatively of one extreme, and affirmatively of the other. Consequently it is possible that contradictories may lead to a conclusion, though not always or in every mood, but only if the terms subordinate to the middle are such that they are either identical or related as whole to part. Otherwise it is impossible: for the premisses cannot anyhow be either contraries or contradictories.

In the third figure an affirmative syllogism can never be made out of opposite premisses, for the reason given in reference to the first figure; but a negative syllogism is possible whether the terms are universal or not. Let B and C stand for science, A for medicine. If then one should assume that all medicine is science and that no medicine is science, he has assumed that B belongs to all A and C to no A, so that a particular science will not be a science. Similarly if the premiss BA is not assumed universally. For if some medicine is science and again no medicine is science, it results that some science is not science, The premisses are contrary if the terms are taken universally; if one is particular, they are contradictory.

We must recognize that it is possible to take opposites in the way we said, viz. 'all science is good' and 'no science is good' or 'some science is not good'. This does not usually escape notice. But it is possible to establish one part of a contradiction through other premisses, or to assume it in the way suggested in the Topics. Since there are three oppositions to affirmative statements, it follows that opposite statements may be assumed as premisses in six ways; we may have either universal affirmative and negative, or universal affirmative and particular negative, or particular affirmative and universal negative, and the relations between the terms may be reversed; e.g. A may belong to all B and to no C, or to all C and to no B, or to all of the one, not to all of the other; here too the relation

between the terms may be reversed. Similarly in the third figure. So it is clear in how many ways and in what figures a syllogism can be made by means of premisses which are opposed.

It is clear too that from false premisses it is possible to draw a true conclusion, as has been said before, but it is not possible if the premisses are opposed. For the syllogism is always contrary to the fact, e.g. if a thing is good, it is proved that it is not good, if an animal, that it is not an animal because the syllogism springs out of a contradiction and the terms presupposed are either identical or related as whole and part. It is evident also that in fallacious reasonings nothing prevents a contradiction to the hypothesis from resulting, e.g. if something is odd, it is not odd. For the syllogism owed its contrariety to its contradictory premisses; if we assume such premisses we shall get a result that contradicts our hypothesis. But we must recognize that contraries cannot be inferred from a single syllogism in such a way that we conclude that what is not good is good, or anything of that sort unless a self−contradictory premiss is at once assumed, e.g. 'every animal is white and not white', and we proceed 'man is an animal'. Either we must introduce the contradiction by an additional assumption, assuming, e.g., that every science is supposition, and then assuming 'Medicine is a science, but none of it is supposition' (which is the mode in which refutations are made), or we must argue from two syllogisms. In no other way than this, as was said before, is it possible that the premisses should be really contrary.

16

To beg and assume the original question is a species of failure to demonstrate the problem proposed; but this happens in many ways. A man may not reason syllogistically at all, or he may argue from premisses which are less known or equally unknown, or he may establish the antecedent by means of its consequents; for demonstration proceeds from what is more certain and is prior. Now begging the question is none of these: but since we get to know some things naturally through themselves, and other things by means of something else (the first principles through themselves, what is subordinate to them through something else), whenever a man tries to prove what is not self−evident by means of itself, then he begs the original question. This may be done by assuming what is in question at once; it is also possible to make a transition to other things which would naturally be proved through the thesis proposed, and demonstrate it through them, e.g. if A should be proved through B, and B through C, though it was natural that C should be proved through A: for it turns out that those who reason thus are proving A by means of itself. This is what those persons do who suppose that they are constructing parallel straight lines: for they fail to see that they are assuming facts which it is impossible to demonstrate unless the parallels exist. So it turns out that those who reason thus merely say a particular thing is, if it is: in this way everything will be self−evident. But that is impossible.

If then it is uncertain whether A belongs to C, and also whether A belongs to B, and if one should assume that A does belong to B, it is not yet clear whether he begs the original question, but it is evident that he is not demonstrating: for what is as uncertain as the question to be answered cannot be a principle of a demonstration. If however B is so related to C that they are identical, or if they are plainly convertible, or the one belongs to the other, the original question is begged. For one might equally well prove that A belongs to B through those terms if they are convertible. But if they are not convertible, it is the fact that they are not that prevents such a demonstration, not the method of demonstrating. But if one were to make the conversion, then he would be doing what we have described and effecting a reciprocal proof with three propositions.

Similarly if he should assume that B belongs to C, this being as uncertain as the question whether A belongs to C, the question is not yet begged, but no demonstration is made. If however A and B are identical either because they are convertible or because A follows B, then the question is begged for the same reason as before. For we have explained the meaning of begging the question, viz. proving that which is not self−evident by means of itself.

If then begging the question is proving what is not self−evident by means of itself, in other words failing to prove when the failure is due to the thesis to be proved and the premiss through which it is proved being equally

uncertain, either because predicates which are identical belong to the same subject, or because the same predicate belongs to subjects which are identical, the question may be begged in the middle and third figures in both ways, though, if the syllogism is affirmative, only in the third and first figures. If the syllogism is negative, the question is begged when identical predicates are denied of the same subject; and both premisses do not beg the question indifferently (in a similar way the question may be begged in the middle figure), because the terms in negative syllogisms are not convertible. In scientific demonstrations the question is begged when the terms are really related in the manner described, in dialectical arguments when they are according to common opinion so related.

17

The objection that 'this is not the reason why the result is false', which we frequently make in argument, is made primarily in the case of a reductio ad impossibile, to rebut the proposition which was being proved by the reduction. For unless a man has contradicted this proposition he will not say, 'False cause', but urge that something false has been assumed in the earlier parts of the argument; nor will he use the formula in the case of an ostensive proof; for here what one denies is not assumed as a premiss. Further when anything is refuted ostensively by the terms ABC, it cannot be objected that the syllogism does not depend on the assumption laid down. For we use the expression 'false cause', when the syllogism is concluded in spite of the refutation of this position; but that is not possible in ostensive proofs: since if an assumption is refuted, a syllogism can no longer be drawn in reference to it. It is clear then that the expression 'false cause' can only be used in the case of a reductio ad impossibile, and when the original hypothesis is so related to the impossible conclusion, that the conclusion results indifferently whether the hypothesis is made or not. The most obvious case of the irrelevance of an assumption to a conclusion which is false is when a syllogism drawn from middle terms to an impossible conclusion is independent of the hypothesis, as we have explained in the Topics. For to put that which is not the cause as the cause, is just this: e.g. if a man, wishing to prove that the diagonal of the square is incommensurate with the side, should try to prove Zeno's theorem that motion is impossible, and so establish a reductio ad impossibile: for Zeno's false theorem has no connexion at all with the original assumption. Another case is where the impossible conclusion is connected with the hypothesis, but does not result from it. This may happen whether one traces the connexion upwards or downwards, e.g. if it is laid down that A belongs to B, B to C, and C to D, and it should be false that B belongs to D: for if we eliminated A and assumed all the same that B belongs to C and C to D, the false conclusion would not depend on the original hypothesis. Or again trace the connexion upwards; e.g. suppose that A belongs to B, E to A and F to E, it being false that F belongs to A. In this way too the impossible conclusion would result, though the original hypothesis were eliminated. But the impossible conclusion ought to be connected with the original terms: in this way it will depend on the hypothesis, e.g. when one traces the connexion downwards, the impossible conclusion must be connected with that term which is predicate in the hypothesis: for if it is impossible that A should belong to D, the false conclusion will no longer result after A has been eliminated. If one traces the connexion upwards, the impossible conclusion must be connected with that term which is subject in the hypothesis: for if it is impossible that F should belong to B, the impossible conclusion will disappear if B is eliminated. Similarly when the syllogisms are negative.

It is clear then that when the impossibility is not related to the original terms, the false conclusion does not result on account of the assumption. Or perhaps even so it may sometimes be independent. For if it were laid down that A belongs not to B but to K, and that K belongs to C and C to D, the impossible conclusion would still stand. Similarly if one takes the terms in an ascending series. Consequently since the impossibility results whether the first assumption is suppressed or not, it would appear to be independent of that assumption. Or perhaps we ought not to understand the statement that the false conclusion results independently of the assumption, in the sense that if something else were supposed the impossibility would result; but rather we mean that when the first assumption is eliminated, the same impossibility results through the remaining premisses; since it is not perhaps absurd that the same false result should follow from several hypotheses, e.g. that parallels meet, both on the assumption that the interior angle is greater than the exterior and on the assumption that a triangle contains more than two right angles.

18

A false argument depends on the first false statement in it. Every syllogism is made out of two or more premisses. If then the false conclusion is drawn from two premisses, one or both of them must be false: for (as we proved) a false syllogism cannot be drawn from two premisses. But if the premisses are more than two, e.g. if C is established through A and B, and these through D, E, F, and G, one of these higher propositions must be false, and on this the argument depends: for A and B are inferred by means of D, E, F, and G. Therefore the conclusion and the error results from one of them.

19

In order to avoid having a syllogism drawn against us we must take care, whenever an opponent asks us to admit the reason without the conclusions, not to grant him the same term twice over in his premisses, since we know that a syllogism cannot be drawn without a middle term, and that term which is stated more than once is the middle. How we ought to watch the middle in reference to each conclusion, is evident from our knowing what kind of thesis is proved in each figure. This will not escape us since we know how we are maintaining the argument.

That which we urge men to beware of in their admissions, they ought in attack to try to conceal. This will be possible first, if, instead of drawing the conclusions of preliminary syllogisms, they take the necessary premisses and leave the conclusions in the dark; secondly if instead of inviting assent to propositions which are closely connected they take as far as possible those that are not connected by middle terms. For example suppose that A is to be inferred to be true of F, B, C, D, and E being middle terms. One ought then to ask whether A belongs to B, and next whether D belongs to E, instead of asking whether B belongs to C; after that he may ask whether B belongs to C, and so on. If the syllogism is drawn through one middle term, he ought to begin with that: in this way he will most likely deceive his opponent.

20

Since we know when a syllogism can be formed and how its terms must be related, it is clear when refutation will be possible and when impossible. A refutation is possible whether everything is conceded, or the answers alternate (one, I mean, being affirmative, the other negative). For as has been shown a se error results from one of them.

It sometimes happens that just as we are deceived in the arrangement of the terms, so error may arise in our thought about them, e.g. if it is possible that the same predicate should belong to more than one subject immediately, but although knowing the one, a man may forget the other and think the opposite true. Suppose that A belongs to B and to C in virtue of their nature, and that B and C belong to all D in the same way. If then a man thinks that A belongs to all B, and B to D, but A to no C, and C to all D, he will both know and not know the same thing in respect of the same thing. Again if a man were to make a mistake about the members of a single series; e.g. suppose A belongs to B, B to C, and C to D, but some one thinks that A belongs to all B, but to no C: he will both know that A belongs to D, and think that it does not. Does he then maintain after this simply that what he knows, he does not think? For he knows in a way that A belongs to C through B, since the part is included in the whole; so that what he knows in a way, this he maintains he does not think at all: but that is impossible.

In the former case, where the middle term does not belong to the same series, it is not possible to think both the premisses with reference to each of the two middle terms: e.g. that A belongs to all B, but to no C, and both B and C belong to all D. For it turns out that the first premiss of the one syllogism is either wholly or partially contrary to the first premiss of the other. For if he thinks that A belongs to everything to which B belongs, and he knows

that B belongs to D, then he knows that A belongs to D. Consequently if again he thinks that A belongs to nothing to which C belongs, he thinks that A does not belong to some of that to which B belongs; but if he thinks that A belongs to everything to which B belongs, and again thinks that A does not belong to some of that to which B belongs, these beliefs are wholly or partially contrary. In this way then it is not possible to think; but nothing prevents a man thinking one premiss of each syllogism of both premisses of one of the two syllogisms: e.g. A belongs to all B, and B to D, and again A belongs to no C. An error of this kind is similar to the error into which we fall concerning particulars: e.g. if A belongs to all B, and B to all C, A will belong to all C. If then a man knows that A belongs to everything to which B belongs, he knows that A belongs to C. But nothing prevents his being ignorant that C exists; e.g. let A stand for two right angles, B for triangle, C for a particular diagram of a triangle. A man might think that C did not exist, though he knew that every triangle contains two right angles; consequently he will know and not know the same thing at the same time. For the expression 'to know that every triangle has its angles equal to two right angles' is ambiguous, meaning to have the knowledge either of the universal or of the particulars. Thus then he knows that C contains two right angles with a knowledge of the universal, but not with a knowledge of the particulars; consequently his knowledge will not be contrary to his ignorance. The argument in the Meno that learning is recollection may be criticized in a similar way. For it never happens that a man starts with a foreknowledge of the particular, but along with the process of being led to see the general principle he receives a knowledge of the particulars, by an act (as it were) of recognition. For we know some things directly; e.g. that the angles are equal to two right angles, if we know that the figure is a triangle. Similarly in all other cases.

By a knowledge of the universal then we see the particulars, but we do not know them by the kind of knowledge which is proper to them; consequently it is possible that we may make mistakes about them, but not that we should have the knowledge and error that are contrary to one another: rather we have the knowledge of the universal but make a mistake in apprehending the particular. Similarly in the cases stated above. The error in respect of the middle term is not contrary to the knowledge obtained through the syllogism, nor is the thought in respect of one middle term contrary to that in respect of the other. Nothing prevents a man who knows both that A belongs to the whole of B, and that B again belongs to C, thinking that A does not belong to C, e.g. knowing that every mule is sterile and that this is a mule, and thinking that this animal is with foal: for he does not know that A belongs to C, unless he considers the two propositions together. So it is evident that if he knows the one and does not know the other, he will fall into error. And this is the relation of knowledge of the universal to knowledge of the particular. For we know no sensible thing, once it has passed beyond the range of our senses, even if we happen to have perceived it, except by means of the universal and the possession of the knowledge which is proper to the particular, but without the actual exercise of that knowledge. For to know is used in three senses: it may mean either to have knowledge of the universal or to have knowledge proper to the matter in hand or to exercise such knowledge: consequently three kinds of error also are possible. Nothing then prevents a man both knowing and being mistaken about the same thing, provided that his knowledge and his error are not contrary. And this happens also to the man whose knowledge is limited to each of the premisses and who has not previously considered the particular question. For when he thinks that the mule is with foal he has not the knowledge in the sense of its actual exercise, nor on the other hand has his thought caused an error contrary to his knowledge: for the error contrary to the knowledge of the universal would be a syllogism.

But he who thinks the essence of good is the essence of bad will think the same thing to be the essence of good and the essence of bad. Let A stand for the essence of good and B for the essence of bad, and again C for the essence of good. Since then he thinks B and C identical, he will think that C is B, and similarly that B is A, consequently that C is A. For just as we saw that if B is true of all of which C is true, and A is true of all of which B is true, A is true of C, similarly with the word 'think'. Similarly also with the word 'is'; for we saw that if C is the same as B, and B as A, C is the same as A. Similarly therefore with 'opine'. Perhaps then this is necessary if a man will grant the first point. But presumably that is false, that any one could suppose the essence of good to be the essence of bad, save incidentally. For it is possible to think this in many different ways. But we must consider this matter better.

22

Whenever the extremes are convertible it is necessary that the middle should be convertible with both. For if A belongs to C through B, then if A and C are convertible and C belongs everything to which A belongs, B is convertible with A, and B belongs to everything to which A belongs, through C as middle, and C is convertible with B through A as middle. Similarly if the conclusion is negative, e.g. if B belongs to C, but A does not belong to B, neither will A belong to C. If then B is convertible with A, C will be convertible with A. Suppose B does not belong to A; neither then will C: for ex hypothesi B belonged to all C. And if C is convertible with B, B is convertible also with A, for C is said of that of all of which B is said. And if C is convertible in relation to A and to B, B also is convertible in relation to A. For C belongs to that to which B belongs: but C does not belong to that to which A belongs. And this alone starts from the conclusion; the preceding moods do not do so as in the affirmative syllogism. Again if A and B are convertible, and similarly C and D, and if A or C must belong to anything whatever, then B and D will be such that one or other belongs to anything whatever. For since B belongs to that to which A belongs, and D belongs to that to which C belongs, and since A or C belongs to everything, but not together, it is clear that B or D belongs to everything, but not together. For example if that which is uncreated is incorruptible and that which is incorruptible is uncreated, it is necessary that what is created should be corruptible and what is corruptible should have been created. For two syllogisms have been put together. Again if A or B belongs to everything and if C or D belongs to everything, but they cannot belong together, then when A and C are convertible B and D are convertible. For if B does not belong to something to which D belongs, it is clear that A belongs to it. But if A then C: for they are convertible. Therefore C and D belong together. But this is impossible. When A belongs to the whole of B and to C and is affirmed of nothing else, and B also belongs to all C, it is necessary that A and B should be convertible: for since A is said of B and C only, and B is affirmed both of itself and of C, it is clear that B will be said of everything of which A is said, except A itself. Again when A and B belong to the whole of C, and C is convertible with B, it is necessary that A should belong to all B: for since A belongs to all C, and C to B by conversion, A will belong to all B.

When, of two opposites A and B, A is preferable to B, and similarly D is preferable to C, then if A and C together are preferable to B and D together, A must be preferable to D. For A is an object of desire to the same extent as B is an object of aversion, since they are opposites: and C is similarly related to D, since they also are opposites. If then A is an object of desire to the same extent as D, B is an object of aversion to the same extent as C (since each is to the same extent as each−the one an object of aversion, the other an object of desire). Therefore both A and C together, and B and D together, will be equally objects of desire or aversion. But since A and C are preferable to B and D, A cannot be equally desirable with D; for then B along with D would be equally desirable with A along with C. But if D is preferable to A, then B must be less an object of aversion than C: for the less is opposed to the less. But the greater good and lesser evil are preferable to the lesser good and greater evil: the whole BD then is preferable to the whole AC. But ex hypothesi this is not so. A then is preferable to D, and C consequently is less an object of aversion than B. If then every lover in virtue of his love would prefer A, viz. that the beloved should be such as to grant a favour, and yet should not grant it (for which C stands), to the beloved's granting the favour (represented by D) without being such as to grant it (represented by B), it is clear that A (being of such a nature) is preferable to granting the favour. To receive affection then is preferable in love to sexual intercourse. Love then is more dependent on friendship than on intercourse. And if it is most dependent on receiving affection, then this is its end. Intercourse then either is not an end at all or is an end relative to the further end, the receiving of affection. And indeed the same is true of the other desires and arts.

23

It is clear then how the terms are related in conversion, and in respect of being in a higher degree objects of aversion or of desire. We must now state that not only dialectical and demonstrative syllogisms are formed by means of the aforesaid figures, but also rhetorical syllogisms and in general any form of persuasion, however it may be presented. For every belief comes either through syllogism or from induction.

Now induction, or rather the syllogism which springs out of induction, consists in establishing syllogistically a relation between one extreme and the middle by means of the other extreme, e.g. if B is the middle term between A and C, it consists in proving through C that A belongs to B. For this is the manner in which we make inductions. For example let A stand for long−lived, B for bileless, and C for the particular long−lived animals, e.g. man, horse, mule. A then belongs to the whole of C: for whatever is bileless is long−lived. But B also ('not possessing bile') belongs to all C. If then C is convertible with B, and the middle term is not wider in extension, it is necessary that A should belong to B. For it has already been proved that if two things belong to the same thing, and the extreme is convertible with one of them, then the other predicate will belong to the predicate that is converted. But we must apprehend C as made up of all the particulars. For induction proceeds through an enumeration of all the cases.

Such is the syllogism which establishes the first and immediate premiss: for where there is a middle term the syllogism proceeds through the middle term; when there is no middle term, through induction. And in a way induction is opposed to syllogism: for the latter proves the major term to belong to the third term by means of the middle, the former proves the major to belong to the middle by means of the third. In the order of nature, syllogism through the middle term is prior and better known, but syllogism through induction is clearer to us.

24

We have an 'example' when the major term is proved to belong to the middle by means of a term which resembles the third. It ought to be known both that the middle belongs to the third term, and that the first belongs to that which resembles the third. For example let A be evil, B making war against neighbours, C Athenians against Thebans, D Thebans against Phocians. If then we wish to prove that to fight with the Thebans is an evil, we must assume that to fight against neighbours is an evil. Evidence of this is obtained from similar cases, e.g. that the war against the Phocians was an evil to the Thebans. Since then to fight against neighbours is an evil, and to fight against the Thebans is to fight against neighbours, it is clear that to fight against the Thebans is an evil. Now it is clear that B belongs to C and to D (for both are cases of making war upon one's neighbours) and that A belongs to D (for the war against the Phocians did not turn out well for the Thebans): but that A belongs to B will be proved through D. Similarly if the belief in the relation of the middle term to the extreme should be produced by several similar cases. Clearly then to argue by example is neither like reasoning from part to whole, nor like reasoning from whole to part, but rather reasoning from part to part, when both particulars are subordinate to the same term, and one of them is known. It differs from induction, because induction starting from all the particular cases proves (as we saw) that the major term belongs to the middle, and does not apply the syllogistic conclusion to the minor term, whereas argument by example does make this application and does not draw its proof from all the particular cases.

25

By reduction we mean an argument in which the first term clearly belongs to the middle, but the relation of the middle to the last term is uncertain though equally or more probable than the conclusion; or again an argument in which the terms intermediate between the last term and the middle are few. For in any of these cases it turns out that we approach more nearly to knowledge. For example let A stand for what can be taught, B for knowledge, C for justice. Now it is clear that knowledge can be taught: but it is uncertain whether virtue is knowledge. If now the statement BC is equally or more probable than AC, we have a reduction: for we are nearer to knowledge, since we have taken a new term, being so far without knowledge that A belongs to C. Or again suppose that the terms intermediate between B and C are few: for thus too we are nearer knowledge. For example let D stand for squaring, E for rectilinear figure, F for circle. If there were only one term intermediate between E and F (viz. that the circle is made equal to a rectilinear figure by the help of lunules), we should be near to knowledge. But when BC is not more probable than AC, and the intermediate terms are not few, I do not call this reduction: nor again when the statement BC is immediate: for such a statement is knowledge.

26

An objection is a premiss contrary to a premiss. It differs from a premiss, because it may be particular, but a premiss either cannot be particular at all or not in universal syllogisms. An objection is brought in two ways and through two figures; in two ways because every objection is either universal or particular, by two figures because objections are brought in opposition to the premiss, and opposites can be proved only in the first and third figures. If a man maintains a universal affirmative, we reply with a universal or a particular negative; the former is proved from the first figure, the latter from the third. For example let stand for there being a single science, B for contraries. If a man premises that contraries are subjects of a single science, the objection may be either that opposites are never subjects of a single science, and contraries are opposites, so that we get the first figure, or that the knowable and the unknowable are not subjects of a single science: this proof is in the third figure: for it is true of C (the knowable and the unknowable) that they are contraries, and it is false that they are the subjects of a single science.

Similarly if the premiss objected to is negative. For if a man maintains that contraries are not subjects of a single science, we reply either that all opposites or that certain contraries, e.g. what is healthy and what is sickly, are subjects of the same science: the former argument issues from the first, the latter from the third figure.

In general if a man urges a universal objection he must frame his contradiction with reference to the universal of the terms taken by his opponent, e.g. if a man maintains that contraries are not subjects of the same science, his opponent must reply that there is a single science of all opposites. Thus we must have the first figure: for the term which embraces the original subject becomes the middle term.

If the objection is particular, the objector must frame his contradiction with reference to a term relatively to which the subject of his opponent's premiss is universal, e.g. he will point out that the knowable and the unknowable are not subjects of the same science: 'contraries' is universal relatively to these. And we have the third figure: for the particular term assumed is middle, e.g. the knowable and the unknowable. Premisses from which it is possible to draw the contrary conclusion are what we start from when we try to make objections. Consequently we bring objections in these figures only: for in them only are opposite syllogisms possible, since the second figure cannot produce an affirmative conclusion.

Besides, an objection in the middle figure would require a fuller argument, e.g. if it should not be granted that A belongs to B, because C does not follow B. This can be made clear only by other premisses. But an objection ought not to turn off into other things, but have its new premiss quite clear immediately. For this reason also this is the only figure from which proof by signs cannot be obtained.

We must consider later the other kinds of objection, namely the objection from contraries, from similars, and from common opinion, and inquire whether a particular objection cannot be elicited from the first figure or a negative objection from the second.

27

A probability and a sign are not identical, but a probability is a generally approved proposition: what men know to happen or not to happen, to be or not to be, for the most part thus and thus, is a probability, e.g. 'the envious hate', 'the beloved show affection'. A sign means a demonstrative proposition necessary or generally approved: for anything such that when it is another thing is, or when it has come into being the other has come into being before or after, is a sign of the other's being or having come into being. Now an enthymeme is a syllogism starting from probabilities or signs, and a sign may be taken in three ways, corresponding to the position of the middle term in the figures. For it may be taken as in the first figure or the second or the third. For example the proof that a woman is with child because she has milk is in the first figure: for to have milk is the middle term. Let A

represent to be with child, B to have milk, C woman. The proof that wise men are good, since Pittacus is good, comes through the last figure. Let A stand for good, B for wise men, C for Pittacus. It is true then to affirm both A and B of C: only men do not say the latter, because they know it, though they state the former. The proof that a woman is with child because she is pale is meant to come through the middle figure: for since paleness follows women with child and is a concomitant of this woman, people suppose it has been proved that she is with child. Let A stand for paleness, B for being with child, C for woman. Now if the one proposition is stated, we have only a sign, but if the other is stated as well, a syllogism, e.g. 'Pittacus is generous, since ambitious men are generous and Pittacus is ambitious.' Or again 'Wise men are good, since Pittacus is not only good but wise.' In this way then syllogisms are formed, only that which proceeds through the first figure is irrefutable if it is true (for it is universal), that which proceeds through the last figure is refutable even if the conclusion is true, since the syllogism is not universal nor correlative to the matter in question: for though Pittacus is good, it is not therefore necessary that all other wise men should be good. But the syllogism which proceeds through the middle figure is always refutable in any case: for a syllogism can never be formed when the terms are related in this way: for though a woman with child is pale, and this woman also is pale, it is not necessary that she should be with child. Truth then may be found in signs whatever their kind, but they have the differences we have stated.

We must either divide signs in the way stated, and among them designate the middle term as the index (for people call that the index which makes us know, and the middle term above all has this character), or else we must call the arguments derived from the extremes signs, that derived from the middle term the index: for that which is proved through the first figure is most generally accepted and most true.

It is possible to infer character from features, if it is granted that the body and the soul are changed together by the natural affections: I say 'natural', for though perhaps by learning music a man has made some change in his soul, this is not one of those affections which are natural to us; rather I refer to passions and desires when I speak of natural emotions. If then this were granted and also that for each change there is a corresponding sign, and we could state the affection and sign proper to each kind of animal, we shall be able to infer character from features. For if there is an affection which belongs properly to an individual kind, e.g. courage to lions, it is necessary that there should be a sign of it: for ex hypothesi body and soul are affected together. Suppose this sign is the possession of large extremities: this may belong to other kinds also though not universally. For the sign is proper in the sense stated, because the affection is proper to the whole kind, though not proper to it alone, according to our usual manner of speaking. The same thing then will be found in another kind, and man may be brave, and some other kinds of animal as well. They will then have the sign: for ex hypothesi there is one sign corresponding to each affection. If then this is so, and we can collect signs of this sort in these animals which have only one affection proper to them−but each affection has its sign, since it is necessary that it should have a single sign−we shall then be able to infer character from features. But if the kind as a whole has two properties, e.g. if the lion is both brave and generous, how shall we know which of the signs which are its proper concomitants is the sign of a particular affection? Perhaps if both belong to some other kind though not to the whole of it, and if, in those kinds in which each is found though not in the whole of their members, some members possess one of the affections and not the other: e.g. if a man is brave but not generous, but possesses, of the two signs, large extremities, it is clear that this is the sign of courage in the lion also. To judge character from features, then, is possible in the first figure if the middle term is convertible with the first extreme, but is wider than the third term and not convertible with it: e.g. let A stand for courage, B for large extremities, and C for lion. B then belongs to everything to which C belongs, but also to others. But A belongs to everything to which B belongs, and to nothing besides, but is convertible with B: otherwise, there would not be a single sign correlative with each affection.

−THE END−