

## Logic Reading 2.03 Reducing Syllogisms to the First Figure

He was in logic a great critic;  
profoundly skill' d in Analytic;  
He could distinguish and divide  
A hair 'twixt south and south-west side.

-Samuel Butler

\_\_\_\_\_ **Introduction.** In earlier readings, we discussed the four figures of the syllogism. The figure of a syllogism, remember, is the disposition or location of the terms in the premises. Syllogisms can be divided into four figures, according to where the middle term appears in each premise.

Of the four different figures, the First Figure is the most straightforward and the one in which the validity is the easiest to recognize. For this reason, logicians have found ways to transform syllogisms in the other three figures into syllogisms of the First Figure.

The study of how to reduce other kinds of syllogisms to the First Figure is also helpful in understanding the mechanics of the traditional syllogism. Once you are able to reduce Second, Third, and Fourth (Indirect First) Figure syllogisms to the First Figure, you will understand syllogisms much better

\_\_\_\_\_ **Two Methods of Reduction.** There are two ways this can be done:

- ✓ Direct Reduction
- ✓ Indirect Reduction

We will study the first kind of reduction, **Direct Reduction**, in this chapter But first, let's consider the different operations we will use to reduce syllogisms of the Second, Third, and Fourth Figure to the First Figure.

\_\_\_\_\_ **The Nineteen Valid Moods.** You will remember that out of the 64 different kinds of syllogisms (we know there are 64 because there are 16 different moods and 4 different figures) there are only 19 that are valid. Let us review them so that we can demonstrate how to reduce syllogisms.

As we have seen, each valid syllogism has been given a name as follows:

**BARBARA, CELARENT, DARII, FERIOque prioris;**  
**CESARE, CAMESTRES, FESTINO, BAROCO secundae;**  
**Tertia; DARAPTI, DISAMIS, DATISI, FELAPTON, BOCARDO, FERISON**  
**habet;**  
**quarta insuper addit; BRAMANTIP, CAMENES, DIMARIS, FESAPO,**  
**FRESISON.**

Remember that the vowels in each of these words indicate the mood of the syllogism. For example, BARBARA indicates an AA syllogism with a conclusion that is also an A statement.

\_\_\_\_\_ **What the Consonants Mean.** We know what the vowels in the words above mean, since we studied them in the last chapter, but what do the consonants in these words mean? The first consonant indicates the mood in the First Figure to which each valid syllogism in the Second, Third, and Fourth Figure can be reduced. In other words, it tells you which kind of syllogism in the First Figure you should end up with after it has been reduced.

For example, notice that CESARE, a Second Figure syllogism, has the same first letter as CELARENT, a valid mood of the First Figure-both begin with **C**. That means that when a CESARE syllogism is reduced, it becomes a CELARENT syllogism. If, after you have done the reduction on a CESARE, it is NOT a CELARENT, then you know you have done something wrong. All syllogisms in figures other than the First that begin with C will reduce to a CELARENT if the reduction is done properly.

FESTINO, on the other hand, or any other syllogism in figures other than the First, whose names begins with **F**, must reduce to FERIO. Likewise, any syllogism whose name begins with **B** reduces to BARBARA. And any syllogism beginning with **D** reduces to DARII.

That takes care of what each non-First Figure syllogism must look like after it has been reduced to the First Figure. But how do you do a reduction?

\_\_\_\_\_ **The Four Operations for Reduction.** A reduction of a non-First Figure syllogism to a First Figure syllogism can be done in one of four ways. But how do you know which way to use? Once again, we

look to the name of the argument to tell us. Which method you should use to reduce a syllogism to the First Figure is dictated by other consonants in the name of the syllogism. The letters **S**, **P**, **M**, and **C**, when they appear in the body (i.e. not as the initial consonant) of the syllogism name indicate which type of reduction procedure to use.

These operations are indicated as follows:

**S: Simple conversion** of the proposition signified by the preceding vowel;  
**P: Per accidens**, or **partial** conversion of the proposition signified by the preceding vowel;  
**M: Mutatio**, or **transposition of the premises**; make the minor premise the major and the major the minor.  
**C: Reduction by contradiction**. This is the indirect method of reduction through (rather than to) BARBARA. It is signified by a noninitial **c** and is applied only to BAROCO and BOCARDO.

This sounds complicated, but let's explain it by giving some examples. Let's take the following syllogism.

No fish<sup>P</sup> is a mammal<sup>M</sup>  
All whales<sup>S</sup> are mammals<sup>M</sup>  
Therefore, No whale<sup>S</sup> is a fish<sup>P</sup>

First, we look to see what figure the syllogism is in. We see that the middle term, **mammal** is in the predicate in both the major and minor premise-it is **prae-prae**, a Second Figure syllogism.

Second, we look to see what mood the syllogism is in. We see that it is EA. What is the name for an EA syllogism in the Second Figure? It is CESARE. The first letter in the word CESARE-**C**-tells us that we will be converting this syllogism to CELARENT, its First Figure equivalent.

Third, we look to see which of the letters above which indicate the appropriate operations (S, P, M, or C) appear in the name CESARE. We notice that there is an S: CESARE. We then look back at our chart on the previous page to see what S indicates we should do. It says, '**Simple Conversion** of the proposition signified by the preceding vowel.' We know therefore that we must convert the proposition signified by the vowel preceding the **S** in CESARE. Since **E** is the vowel that precedes the **S** in CESARE, and since the **E** is the first vowel in CESARE, we know that we must do a conversion of the major premise, which is an E statement.

In order to do this, we must remember what conversion is. We discussed this in **Reading 05** in which we covered the three ways of converting propositions to other equivalent propositions. Let us review it for a moment.

\_\_\_\_\_ **Review of Conversion.** We said in the Reading 05 that there are three ways to convert statements to their logical equivalents: Obversion, Conversion and Contraposition. The present case, in which we are trying to find out how to reduce CESARE, the **S** indicates we are to perform a Simple Conversion. This just means Conversion, as opposed to Obversion or Contraposition, the other two methods. In Conversion we simply interchange (or switch) the subject and the predicate—we place the predicate where the subject is and the subject where the predicate is.

\_\_\_\_\_ **Reduction Involving Conversion.** So let's interchange the subject and the predicate of our CESARE syllogism. We start with:

No fish <sup>P</sup> is a mammal <sup>M</sup>	CE
All whales <sup>S</sup> are mammals <sup>M</sup>	SA
Therefore, No whale <sup>S</sup> is a fish <sup>P</sup>	RE

After we convert the major premise, we end up with:

No mammal <sup>M</sup> is a fish <sup>P</sup>	CEL
All whales <sup>S</sup> are mammals <sup>M</sup>	AR
Therefore, No whale <sup>S</sup> is a fish <sup>P</sup>	ENT

We see that whereas before we had a Second Figure syllogism (*prae-prae*), we now have a First Figure syllogism (*sub-prae*). Furthermore, they are logically the same syllogism, since in conversion we are changing one statement to another logically equivalent statement.

Let's try another one:

All men <sup>M</sup> are mortal <sup>P</sup>	DAR
All men <sup>M</sup> are bipeds <sup>S</sup>	AP
Therefore, some bipeds <sup>S</sup> are mortal <sup>P</sup>	TI

This syllogism a Third Figure syllogism--*sub-sub*. Its mood is AA. Now we know, by looking at the lines we gave above, that an AA syllogism

in the third figure is DARAPTI. We see that this name has in it the letter **P**, which is one of the four letters (S, P, M, and C) that indicate which operation we must perform in order to make the syllogism a First Figure syllogism. In the case of P, the operation is partial conversion of the proposition signified by the preceding vowel.

\_\_\_\_\_ **Review of Partial Conversion.** What is Partial Conversion?

Partial Conversion is a kind of Conversion (again, as opposed to Obversion and Contraposition) in which an A statement can be partially converted into an I statement. A Partial Conversion is accomplished by interchanging the subject and predicate (just as in ordinary Conversion) and changing the quantity (i.e. changing it from a universal to a particular statement). If, for example, I say **All dogs are animals**, I can partially convert it by interchanging **dogs** and **animals** and making it particular. If I do this, I get **Some animals are dogs**.

\_\_\_\_\_ **Reduction Using Partial Conversion.** The proposition indicated by the vowel preceding P in DARAPTI is the minor premise, which we know to be an A statement:

We start with:

All men <sup>M</sup> are mortal <sup>P</sup>	DAR
All men <sup>M</sup> are bipeds <sup>S</sup>	AP
Therefore, some bipeds <sup>S</sup> are mortal <sup>P</sup>	TI

And by partially converting the minor premise, we get:

All men <sup>M</sup> are mortal <sup>P</sup>	DAR
Some bipeds <sup>S</sup> are men <sup>M</sup>	I
Therefore, some bipeds <sup>S</sup> are mortal <sup>P</sup>	I

Again, we see that we have an equivalent syllogism, even though it is a different mood in a different figure. And note that it is a First Figure DARII.

\_\_\_\_\_ **Reduction Involving Multiple Steps.** In order to reduce some syllogisms to the First Figure, more than one step must be taken. This is indicated if the consonants **S**, **P**, **M**, or **C** appear more than once in the name of the syllogism you are trying to reduce. Let's take a look at this one:

Some crows <sup>M</sup> are carnivorous <sup>P</sup>	DIS
All crows <sup>M</sup> are birds <sup>S</sup>	AM
Therefore, Some birds <sup>S</sup> are carnivorous <sup>P</sup>	IS

This is the Third Figure syllogism DISAMIS. It reduces to DARII, since it begins with D. But there are three operations you have to go through to accomplish this. Look at the word **DISAMIS**. It has three consonants that correspond to operations in the list we looked at above: DISAMIS. Does this indicate that we have to do three different things to this syllogism in order to reduce it to the First Figure? Yes, it does. The first S indicates Simple Conversion of the major premise, which is an I statement, since the S follows the I. The M indicates that we need to make the major premise the minor and the minor premise the major. The second S indicates that we do a Simple Conversion on the conclusion.

In what order is this done? It is done in the order in which the consonants appear. In other words, you do a simple conversion on the major premise first, then transpose (i.e. switch) the major and minor premises, and then do a simple conversion on the conclusion--in that order. It is very important that you observe this order because, if you do not, you will not end up with the correct First Figure syllogism.

Step one, then, would be to convert the major premise, **Some crows are carnivorous**. In doing so, we get **Some carnivorous things are crows**. Step Two involves transposing the major and minor premises, yielding the following:

All crows <sup>M</sup> are birds <sup>S</sup>
Some carnivorous things <sup>M</sup> are crows <sup>P</sup>
Therefore, some birds <sup>S</sup> are carnivorous <sup>P</sup>

We have one step left, which is to do a simple conversion on the conclusion, going from **Some birds are carnivorous** to **Some carnivorous things are birds**. Once this is done, we see, once again, that we now have a First Figure (*sub-prae*) syllogism--a DARII.

All crows <sup>M</sup> are birds <sup>P</sup>	DA
Some carnivorous things <sup>S</sup> are crows <sup>M</sup>	RI
Therefore, some carnivorous things <sup>S</sup> are birds <sup>P</sup>	I

We have covered S, P and M, but have not covered C, which involves

Indirect Reduction. Since it involves a very different procedure, we will leave its explanation to the next reading.

\_\_\_\_\_ **Summary.** In this chapter, we discuss ways to reduce syllogisms of the Second, Third and Fourth Figures to First Figure syllogisms. We said that there are two kinds of reduction. The first is called **Direct** Reduction and the second is called **Indirect** Reduction. In this chapter we discuss Direct Reduction.

In addition to the vowels in the syllogisms names, some of the consonants also have a purpose. The consonants, S, P, M and C, when they appear in the body of a syllogism name, indicate four different methods by which a syllogism may be reduced to the First Figure. The method indicated by each of these letters is as follows:

**S: Simple conversion** of the proposition signified by the preceding vowel;

**P: Per accidens, or partial,** conversion of the proposition signified by the preceding vowel;

**M: Mutatio, or transposition of the premises;** make the minor premise the major and the major the minor.

**C: Reduction by contradiction.** This is the indirect method of reduction through (rather than to) BARBARA. It is signified by a noninitial c and is applied only to BAROCO and BOCARDO.

When one of these consonants appears in the body of a syllogism name, it indicates that the operation it stands for must be performed on the proposition indicated by the preceding vowel.

Some non-First Figure syllogisms must be reduced to the First Figure by the use of multiple steps. We must use more than one step in any syllogism in which the letters S, P, M and C appear more than once. When more than one of these consonants appears, the operations they indicate must be performed in the order in which the consonants appear.