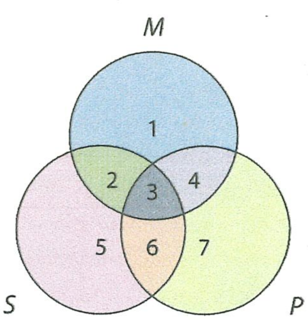
8. In a standard-form syllogism having Figure 2, the two occurrences of the middle term are on the right.
9. The unconditionally valid syllogistic forms are valid from both the Boolean and the Aristotelian standpoints.
10. The conditionally valid syllogistic forms are invalid if the requisite condition is not fulfilled.

5.2 Venn Diagrams

Venn diagrams provide the most intuitively evident and, in the long run, easiest to remember technique for testing the validity of categorical syllogisms. The technique is basically an extension of the one developed in Chapter 4 to represent the informational content of categorical propositions. Because syllogisms contain three terms, whereas propositions contain only two, the application of Venn diagrams to syllogisms requires three overlapping circles.

These circles should be drawn so that seven areas are clearly distinguishable within the diagram. The second step is to label the circles, one for each term. The precise order of the labeling is not critical, but we will adopt the convention of always assigning the lower-left circle to the subject of the conclusion, the lower-right circle to the predicate of the conclusion, and the top circle to the middle term. This convention is easy to remember because it conforms to the arrangement of the terms in a standard-form syllogism: The subject of the conclusion is on the lower left, the predicate of the conclusion is on the lower right, and the middle term is in the premises, above the conclusion.



Anything in the area marked "1" is an *M* but neither an *S* nor a *P*, anything in the area marked "2" is both an *S* and an *M* but not a *P*, anything in the area marked "3" is a member of all three classes, and so on.

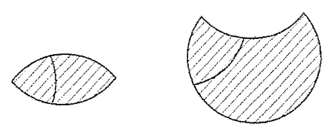
SKIP 252

The test procedure consists of transferring the information content of the premises to the diagram and then inspecting the diagram to see whether it necessarily implies the truth of the conclusion. If the information in the diagram does do this, the argument is valid; otherwise it is invalid.

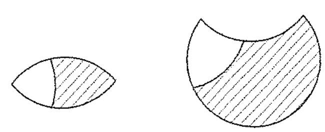
The use of Venn diagrams to evaluate syllogisms usually requires a little practice at first. Perhaps the best way of learning the technique is through illustrative examples, but a few pointers are needed first:

1. Marks (shading or placing an X) are entered only for the premises. No marks are made for the conclusion.
2. If the argument contains one universal premise, this premise should be entered first in the diagram. If there are two universal premises, either one can be done first.
3. When entering the information contained in a premise, one should concentrate on the circles corresponding to the two terms in the statement. While the third circle cannot be ignored altogether, it should be given only minimal attention.
4. When inspecting a completed diagram to see whether it supports a particular conclusion, one should remember that particular statements assert two things. "Some *S* are *P*" means "At least one *S* exists *and* that *S* is a *P*"; "Some *S* are not *P*" means "At least one *S* exists *and* that *S* is not a *P*."
5. When shading an area, one must be careful to shade *all* of the area in question. Examples:

Right:

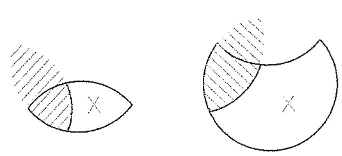


Wrong:

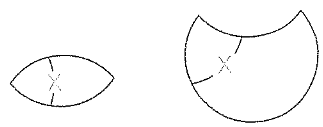


6. The area where an X goes is always initially divided into two parts. If one of these parts has already been shaded, the X goes in the unshaded part. Examples:

Right:

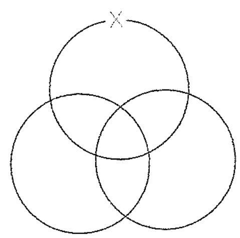


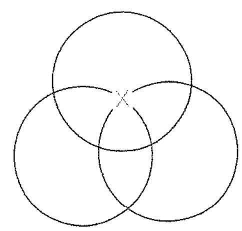
If one of the two parts is not shaded, the X goes on the line separating the two parts. Examples:

Right: 

This means that the X may be in either (or both) of the two areas—but it is not known which one.

7. An X should never be placed in such a way that it dangles outside of the diagram, and it should never be placed on the intersection of two lines.

Wrong: 

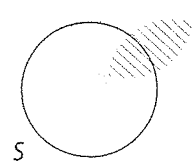
Wrong: 

Boolean Standpoint

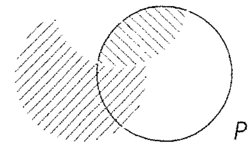
Because the Boolean standpoint does not recognize universal premises as having existential import, its approach to testing syllogisms is simpler and more general than that of the Aristotelian standpoint. Hence, we will begin by testing syllogisms from that standpoint and later proceed to the Aristotelian standpoint. Here is an example:

1. No *P* are *M*. **EAE-2**
   All *S* are *M*.
   No *S* are *P*.

Since both premises are universal, it makes no difference which premise we enter first in the diagram. To enter the major premise, we concentrate our attention on the *M* and *P* circles, which are highlighted with color:



We now complete the diagram by entering the minor premise. In doing so, we concentrate our attention on the *S* and *M* circles, which are highlighted with color:



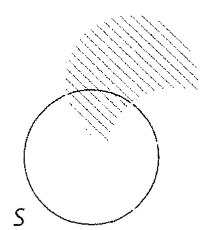
The conclusion states that the area where the *S* and *P* circles overlap is shaded. Inspection of the diagram reveals that this area is indeed shaded, so the syllogistic form is valid. Because the form is valid from the Boolean standpoint, it is *unconditionally valid.* In other words, it is valid regardless of whether its premises are recognized as having existential import.

Here is another example:

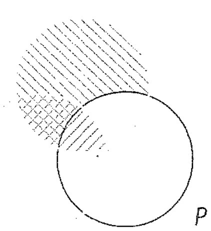
2. All *M* are *P.* **AEE-1**
   No *S* are *M.*

   No *S* are *P.*

Again, both premises are universal, so it makes no difference which premise we enter first in the diagram. To enter the major premise, we concentrate our attention on the *M* and *P* circles:



To enter the minor premise, we concentrate our attention on the *M* and *S* circles:

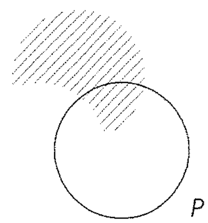


Again, the conclusion states that the area where the *S* and *P* circles overlap is shaded. Inspection of the diagram reveals that only part of this area is shaded, so the syllogistic form is invalid.

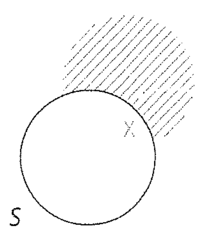
Another example:

3. Some *P* are *M*. **IAI**-4
   All *M* are *S*.
   Some *S* are *P*.

We enter the universal premise first. To do so, we concentrate our attention on the *M* and *S* circles:



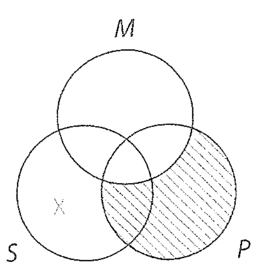
To enter the particular premise, we concentrate our attention on the *M* and *P* circles. This premise tells us to place an X in the area where the *M* and *P* circles overlap. Because part of this area is shaded, we place the X in the remaining area:



The conclusion states that there is an X in the area where the *S* and *P* circles overlap. Inspection of the diagram reveals that there is indeed an X in this area, so the syllogistic form is valid.

The examples that follow are done in a single step.

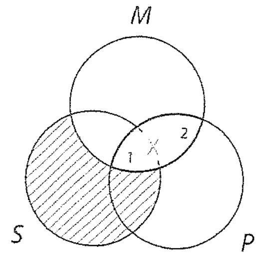
4. All *P* are *M*. **AOO**-2
   Some *S* are not *M*.
   Some *S* are not *P*.



The universal premise is entered first. The particular premise tells us to place an X in the part of the *S* circle that lies outside the *M* circle. Because part of this area is shaded, we place the X in the remaining area. The conclusion states that there is an X that is inside the *S* circle but outside the *P* circle. Inspection of the diagram reveals that there is indeed an X in this area, so the syllogistic form is valid.

5. Some *M* are *P*.
All *S* are *M*.
Some *S* are *P*.

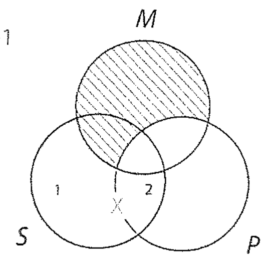
IAI-1



As usual, we enter the universal premise first. In entering the particular premise, we concentrate on the area where the *M* and *P* circles overlap. (For emphasis, this area is colored in the diagram.) Because this overlap area is divided into two parts (the areas marked "1" and "2"), we place the X on the line (arc of the *S* circle) that separates the two parts. The conclusion states that there is an X in the area where the *S* and *P* circles overlap. Inspection of the diagram reveals that the single X is dangling outside of this overlap area. We do not know if it is in or out. Thus, the syllogistic form is invalid.

6. All *M* are *P*.
Some *S* are not *M*.
Some *S* are not *P*.

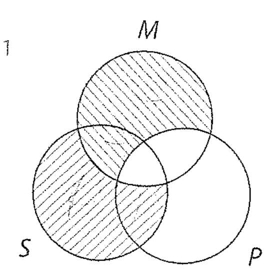
AOO-1



In entering the particular premise, we concentrate our attention on the part of the *S* circle that lies outside the *M* circle (colored area). Because this area is divided into two parts (the areas marked "1" and "2"), we place the X on the line (arc of the *P* circle) separating the two areas. The conclusion states that there is an X that is inside the *S* circle but outside the *P* circle. There *is* an X in the *S* circle, but we do not know whether it is inside or outside the *P* circle. Hence, the argument is invalid.

7. All *M* are *P*.
All *S* are *M*.
All *S* are *P*.

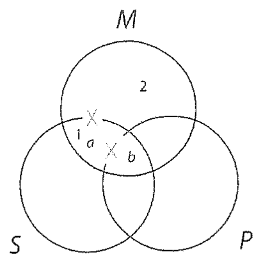
AAA-1



This is the "Barbara" syllogism. The conclusion states that the part of the *S* circle that is outside the *P* circle is empty. Inspection of the diagram reveals that this area is indeed empty. Thus, the syllogistic form is valid.

8. Some *M* are not *P*.
Some *S* are *M*.
Some *S* are not *P*.

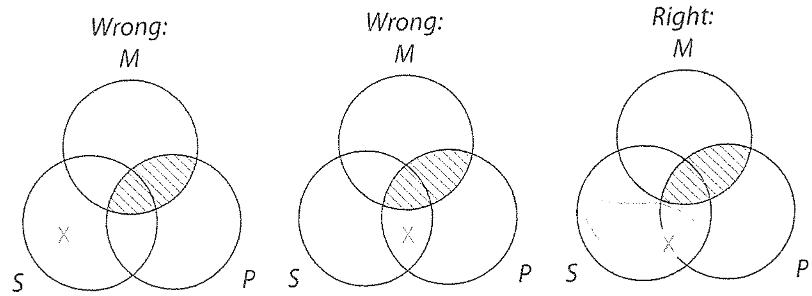
OIO-1



In this diagram no areas have been shaded, so there are two possible areas for each of the two X's. The X from the first premise goes on the line (arc of the *S* circle) separating areas 1 and 2, and the X from the second premise goes on the line (arc of the *P* circle) separating areas *a* and *b*. The conclusion states that there is an X that is inside the *S* circle but outside the *P* circle. We have no certainty that the X from the first premise is inside the *S* circle, and while the X from the second premise is inside the *S* circle, we have no certainty that it is outside the *P* circle. Hence, the syllogistic form is invalid.

We have yet to explain the rationale for placing the X on the boundary separating two areas when neither of the areas is shaded. Consider this argument:

No *P* are *M*.
Some *S* are not *M*.
Some *S* are *P*.



In each of the three diagrams the content of the first premise is represented correctly. The problem concerns placing the X from the second premise. In the first diagram the X is placed inside the *S* circle but outside both the *M* circle and the *P* circle. This diagram asserts: "At least one *S* is not an *M* and it is also not a *P*." Clearly the diagram says more than the premise does, and so it is incorrect. In the second diagram the X is placed inside the *S* circle, outside the *M* circle, and inside the *P* circle. This diagram asserts: "At least one *S* is not an *M*, but it is a *P*." Again, the diagram says more than the premise says, and so it is incorrect. In the third diagram, which is done correctly, the X is placed on the boundary between the two areas. This diagram asserts: "At least one *S* is not an *M*, and it may or may not be a *P*." In other words, nothing at all is said about *P*, and so the diagram represents exactly the content of the second premise. STOP

Aristotelian Standpoint

The syllogistic forms we have tested thus far are valid or invalid from the Boolean standpoint, which does not recognize universal premises as having existential import. We now shift to the Aristotelian standpoint, where existential import can make a difference to validity. To test a syllogism from the Aristotelian standpoint, we follow basically the same procedure we followed in Section 4.6 to test immediate inferences:

1. Reduce the syllogism to its form and test it from the Boolean standpoint. If the form is valid, proceed no further. The syllogism is valid from both standpoints.
2. If the syllogistic form is invalid from the Boolean standpoint and has a particular conclusion, then adopt the Aristotelian standpoint and look to see if there is a Venn circle that is completely shaded except for one area.