CHAPTER 3

Logic



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3.8

Arguments and Euler Diagrams

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Objective

1. Use Euler diagrams to determine validity.

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Euler Diagrams

Technique for determining the validity of arguments whose premises contain the words *all*, *some*, and *no*.



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Euler Diagrams and Arguments

- 1. Make an Euler diagram for the first premise.
- 2. Make an Euler diagram for the second premise on top of the one for the first premise.
- 3. The argument is valid if and only if every possible diagram illustrates the conclusion of the argument. If there is even *one* possible diagram that contradicts the conclusion, this indicates that the conclusion is not true in every case, so the argument is invalid.

Example: Arguments and Euler Diagrams

Use Euler diagrams to determine whether the following argument is valid or invalid:

All people who arrive late cannot perform.

<u>All people who cannot perform are ineligible for</u> <u>scholarships.</u>

Therefore, all people who arrive late are ineligible for scholarships.

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Solution:

Step 1: Make an Euler diagram for the first premise.

Step 2: Make an Euler diagram for the second premise.

Step 3: Since there is only one possible diagram, and it illustrates the argument's conclusion The argument is valid.



Ineligible for scholarships Cannot perform Arrive late

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Example: Arguments and Euler Diagrams

Use Euler diagrams to determine whether the following argument is valid or invalid:

All poets appreciate language.

All writers appreciate language.

Therefore, all poets are writers.

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Example: Arguments and Euler Diagrams

Step 1: Make an Euler diagram for the first premise.

Step 2: Make an Euler diagram for the second premise on top of the one for the first premise.



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Adding "All writers appreciate language" can be done in four ways:



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Step 3: Not all diagrams illustrate the argument's conclusion that

'All poets are writers.'

The first two diagrams certainly do not. The argument is invalid!

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Example: Euler Diagrams and the Quantifier SOME

All people are mortal

Some mortals are students.

Therefore, some people are students. Step 1: Make an Euler diagram for the first premise.

All people are mortal.

Step 2: Make an Euler diagram for the second premise on top of the one for the first premise. Some mortals are students.





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The dot in the region of intersection shows that at least one mortal is a student. The diagram does not show the "people" and "students" circle intersecting with a dot in the region of intersection.



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Step 3: The argument is valid if and only if every possible diagram illustrates the conclusion of the argument. The argument's conclusion is:

Some people are students.

The diagram does not show the "people" circle and the "students" circle intersecting with a dot in the region of intersection. The conclusion does not follow from the premises. The argument is invalid.