MATH 150 Logic Section 3.5 Analyzing Arguments with Euler Diagrams

Logical arguments are based on *premises* (given statements assumed to be true).

Premises are linked together using the logical connective "and" to produce *conclusions*.

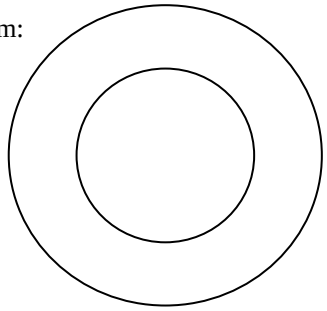
A *valid* argument occurs when premises force the conclusion to be reached. If an argument is not valid, we say it is *invalid* (or a fallacy).

There are several *forms of valid arguments.* If you recognize these forms, then valid arguments will be easier to recognize

1. Example of a *valid* argument:

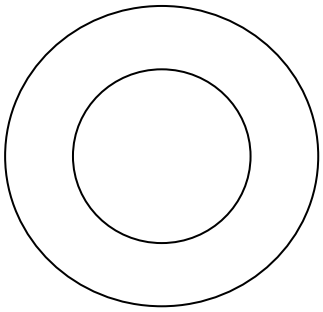
If it is a vegetable, then it is healthy for you. (Premise 1)
It is a vegetable. (Premise 2)
(Valid Conclusion)

Using a Euler Diagram:



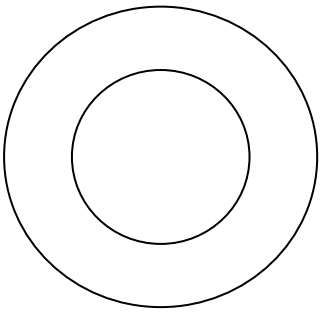
2. Example of a *valid* argument:

If it is a vegetable, then it is healthy for you.
It is not healthy for you.



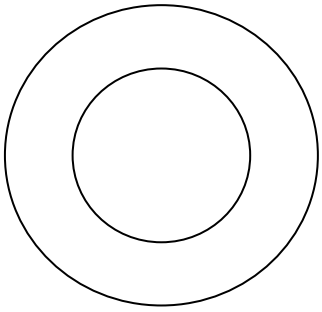
3. Example of an *invalid* argument:

If it is a vegetable, then it is healthy for you.
It is not a vegetable



4. Example of an *invalid* argument:

If I ride my motorcycle, then I wear a helmet.
I am wearing my helmet



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Often, premises make use of universal quantifiers or existential quantifiers.

Examples:

5. All men are mortal
Socrates is a man.
Socrates is mortal.

6. All snoops are snorks.
Tom is a snork.
Tom is a snoop.

7. All atlases contain maps.
Some books contain maps.
All atlases are books.

8. All cats drink milk.
Felix drinks milk.
Felix is a cat.

9. All Natural numbers are positive.
$X > 0$
X is a Natural number.

10. All dogs like biscuits.
Dr. P. likes biscuits.
Dr. P. is a dog.

11. Some dogs have fleas.
Some dogs have 3 legs.
Some dogs with fleas have 3 legs.

12. All pillows are soft.
All marshmallows are soft.
All pillows are marshmallows.