Introduction to Logical Reasoning
Statements

David Emmanuel Gray

Northwestern University in Qatar
Carnegie Mellon University in Qatar

What is Statement?

Statements are the building blocks of an argument.

Statement: An assertion that something is or is not the case; a statement is always either true or false.

Keep in mind that this does not imply that you or I correctly *know* whether a statement is true or false.

For this class, I will use "statement" (Vaughn) and "proposition" (Copi and Cohen) interchangeably.

Types of Statements

Simple Statement: A statement that involves *only one* individual claim or assertion.

Compound Statement: A statement that involves *more than one* claim or assertion.

Simple Statements

Affirmative (Positive) Statement: A simple statement asserting that some claim is *true*.

Logic is a fun class.

Negative Statement: A simple statement asserting that some claim is *false*.

Logic is **not** an easy class.

Compound Statements

Conjunctive statement: A compound statement asserting the truth of *all* its simple statements.

Logic is fun **and** logic is hard.

Such a statement is false if *any one* of its simple statements is false.

Compound Statements

Notice there are a lot of other ways to express the exact same conjunctive statement:

Logic is fun **and** hard.

Logic is **both** fun **and** hard.

Logic is fun, **also** it is hard.

Logic is fun **but** hard.

Logic is fun, **yet** it is hard.

Logic is fun, **though** it is hard.

These certainly have different *connotations*, but they all have the same *logical* content.

Compound Statements

Disjunctive Statement: A compound statement asserting the truth of *at least one* of its simple statements.

Logic is fun **or** logic is hard.

Such a statement is false only when *every one* of its simple statements is false.

Compound Statements

Notice there are a lot of other ways to express the exact same disjunctive statement:

Logic is fun **or** hard.

Logic is **either** fun **or** hard.

Logic is fun **unless** it is hard.

As before, these certainly may have different connotations, but they all are all logically identical.

Compound Statements

Hypothetical Statement: A compound statement of the form "if … then …."

If you take an aspirin, **then** your headache will go away.

If you arrive after I have called your name, **then** you will be marked as tardy.

How would you show that a hypothetical statement, like one of the above, is false?

Compound Statements

A hypothetical statement asserts that there is a special relationship between the *if* statement (called the **antecedent**) and the *then* statement (called the **consequent**). It claims that whenever the antecedent holds, then the consequent *must* hold as well.

So the truth or falsity of a hypothetical is just the truth or falsity of this relationship, and it is *only* false when the antecedent (the "if" part) is true while the consequent (the "then" part) is false.

Analyzing Statements

Now we can start looking at statements to break down their logical form concerning the assertions and claims they are expressing.

Analyzing Statements

However, we can dig even deeper in our analysis of statements. For instance, consider the following:

> If I stay home and I study logic, then I will either get a good grade in class or be grumpy.

There is a lot going on here! Overall it is a compound hypothetical ("if … then …"), but the antecedent is a compound conjunctive ("and") while the consequent is a compound disjunctive ("either … or …").

Next Class…

We will do our first in-class workshop, practicing this form of statement analysis. Please do look over the problem set, so you can start practicing before then.

Ideally, you should come to the workshop prepared to ask either your classmates, Sara, Narcis, or myself for help.