Philosophy 101
(2/15/11)

- **You should be reading well into Chapter 3 now**…

- **Solutions to HW #1 posted** (study them carefully)

- **Quiz #1 to be returned today** (end of class)

- **Solutions to Quiz #1 posted** (except #4, which is on HW 2)

- **HW #2 due Thursday** (on Ch. 2 & early Ch. 3).

- Today: Chapter 3
  - **Well-Formed Arguments**
    - **Validity and the logical form of arguments**
    - **Sentential Logic & Predicate Logic**

- **Validity**
- Informally, if the conclusion of an argument *follows from* its premises, then we say the argument is **valid**.

- Here is a more precise *definition* of *validity*:

- **D3.1**: An argument is **valid** if and only if it is (logically!) *impossible* for both of the following to hold (simultaneously):
  1. all the premises of the argument are true, but
  2. the conclusion of the argument is false.

- Another (*equivalent*) way of putting this is as follows:
  - **D3.2**: An argument is **valid** if and only if the following conditional claim is (logically!) *necessarily true*:
    - *If* all of the premises of the argument *were* true, *then* the conclusion of the argument would *also* have to be true.

- **Validity**
- The *validity* of an argument has nothing to do with whether the premises (or conclusion) are *actually* true.

- In this sense, determining whether an argument is valid is really a *hypothetical* (or "*imaginative*") exercise. Three steps:

  1. First, *imagine* a situation/world in which all of the premises of the argument are true (this need not be the actual world!).

  2. Second, ask yourself this question: "*Could* the conclusion of the argument be *false* — *in such a situation/world?*".
     - where the "could" involves **logical** possibility/necessity.

  3. If the answer to this question is "No", then the argument is *valid*. If the answer is "Yes" then the argument is *in*valid.

- **Validity — Eight Examples**

1)	All wines are beverages. Chardonnay is a wine. Therefore, chardonnay is a beverage.	**5)**	All wines are beverages. Chardonnay is a beverage. Therefore, chardonnay is a wine.
2)	All wines are whiskeys. Chardonnay is a wine. Therefore, chardonnay is a whiskey.	**6)**	All wines are beverages. Ginger ale is a beverage. Therefore, ginger ale is a wine.
3)	All wines are soft drinks. Ginger ale is a wine. Therefore, ginger ale is a soft drink.	**7)**	All wines are whiskeys. Chardonnay is a whiskey. Therefore, chardonnay is a wine.
4)	All wines are whiskeys. Ginger ale is a wine. Therefore, ginger ale is a whiskey.	**8)**	All wines are whiskeys. Ginger ale is a whiskey. Therefore, ginger ale is a wine.

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• Validity — Eight Examples (Revealed)

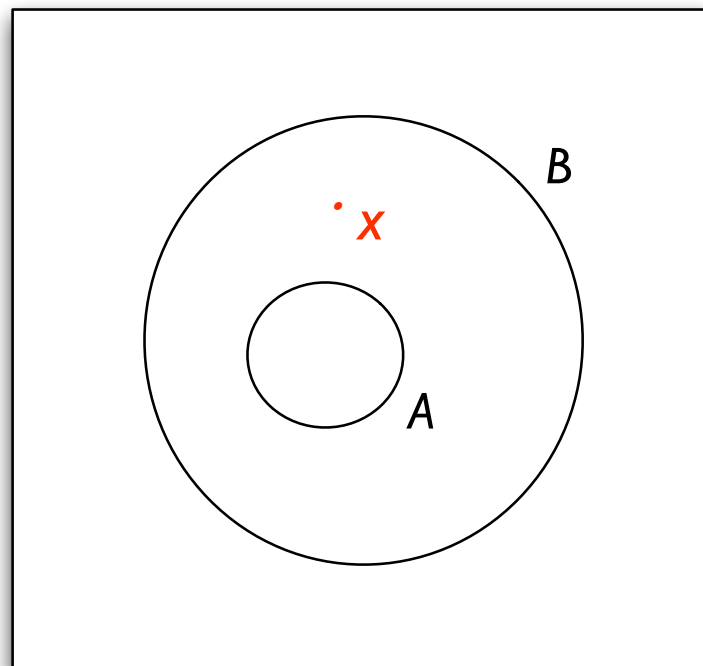|	Valid	Invalid
True premises True conclusion	All wines are beverages. Chardonnay is a wine. Therefore, chardonnay is a beverage. [sound]	All wines are beverages. Chardonnay is a beverage. Therefore, chardonnay is a wine. [unsound]
True premises False conclusion	**Impossible** None exist	All wines are beverages. Ginger ale is a beverage. Therefore, ginger ale is a wine. [unsound]
False premises True conclusion	All wines are soft drinks. Ginger ale is a wine. Therefore, ginger ale is a soft drink. [unsound]	All wines are whiskeys. Chardonnay is a whiskey. Therefore, chardonnay is a wine. [unsound]
False premises False conclusion	All wines are whiskeys. Ginger ale is a wine. Therefore, ginger ale is a whiskey. [unsound]	All wines are whiskeys. Ginger ale is a whiskey. Therefore, ginger ale is a wine. [unsound]

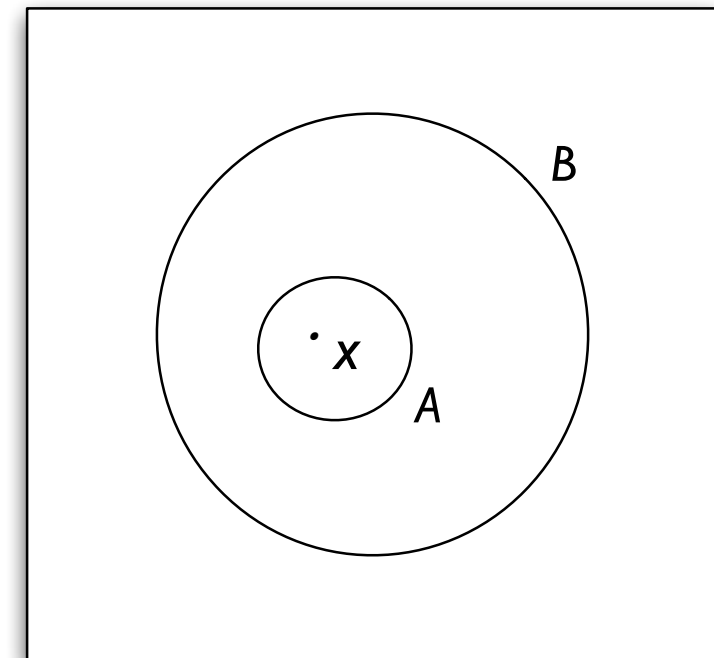## Chapter 3: Well-Formed Arguments XX

• Validity — Eight Examples (Revealed)
• All the arguments in column one of the previous tables are valid — and this is because the all have the same *logical form*:

> • All *A*s are *B*s.
>   *x* is an *A*.
> --------------------
>   *x* is a *B*.

You can "see" why this argument form is valid, using a Venn Diagram:

Chapter 3: Well-Formed Arguments XXI

• Validity — Eight Examples (Revealed)
• All the arguments in column two of the previous tables are *in*valid — and this is because the all have the same *logical form*:

> • All *A*s are *B*s.
>   *x* is a *B*.
> --------------------
>   *x* is an *A*.

You can "see" why this argument form is *in*valid, using a Venn Diagram:

Chapter 3: Well-Formed Arguments XXII

• Validity — Sentential Logic
• Before discussing the logical forms of *Predicate Logic*, we will examine a more basic notion of logical form: *Sentential Form*.

• In **Sentential Logic**, we use capital letters (*P, Q, R*) to denote *complete sentences*. This reveals **sentential form**.

•Example:

Example 3.4

Biz E. wants to make a phone a call, so he picks up the phone but he hears that someone else is already making a call from one of the other phones on the same line. He quickly hangs up, without identifying the voice he heard. He then wonders who is using the phone. He knows that it must be either his wife or his son, since there is no one else at home. He then looks out the window and sees that his son is out in the backyard mowing the lawn, so he concludes that his wife is the one on the phone.

• **Validity — Sentential Logic**

1. Either my son is on the phone or my wife is on the phone.
2. It is not the case that my son is on the phone.
----
3. (Therefore,) My wife is on the phone.

• Now, let's we use the following *abbreviations* for the (two) complete (*atomic*) sentences that occur within the argument:
  P : my son is on the phone.
  Q : my wife is on the phone.

Resulting
Sentential Form:

1. Either P or Q.
2. $\sim P$ (it is not the case that P).
----
3. Q

• **Validity — Sentential Logic (connectives)**

• In *sentential* (or *propositional*) logic, we use capital letters to denote *atomic sentences*, and we have 5 *sentential connectives*:

Sentential Connectives	
Conjunction	A and B
Disjunction	A or B
Negation	$\sim A$
Conditional	If A then B
Biconditional	A if and only if B
	(If A then B, and if B then A)

• **Validity — Sentential Logic (some valid forms)**

• Some sentential forms are *valid*, and others are *in*valid.
• Let's discuss some *valid* forms first…

A. Argument by elimination
1. Either P or Q.
2. $\sim P$.
3. Q.

1. Either the American League will win or the National League will win.
2. The American League won't win.
3. The National League will win.

B. Simplification
1. P and Q.
2. P.

1. Sarah knows logic and Sam does not know logic.
2. Sarah knows logic.

C. Affirming the antecedent (*Modus ponens*)
1. If P then Q.
2. P.
3. Q.

1. If the president is in the White House, then president is in Washington, D.C.
2. The president is in the White House.
3. The president is in Washington, D.C.

• **Validity — Sentential Logic (more valid forms)**

D. Denying the consequent (*Modus tollens*)
1. If P then Q.
2. $\sim Q$.
3. $\sim P$.

1. If the president is in the White House, then the president is in Washington, D.C.
2. The president is not in Washington, D.C.
3. The president is not in the White House.

E. Hypothetical syllogism
1. If P then Q.
2. If Q then R.
3. If P then R.

1. If Jones passes the test, then Jones passes the course.
2. If Jones passes the course, then Jones graduates.
3. If Jones passes the test, then Jones graduates

F. Contraposition
1. If P then Q.
2. If $\sim Q$ then $\sim P$.

1. If the president is in the White House, then the president is in Washington, D.C.
2. If the president is not in Washington, D.C., then the president is not in the White House.

- **Validity — Sentential Logic (two *in*valid forms)**

A. Denying the antecedent
1. If *P* then *Q*.
2. ~*P*.
3. ~*Q*.

1. If the president is in the White House, then the President is in Washington, D.C.
2. The president is not in the White House.
3. The president is not in Washington, D.C.

B. Affirming the consequent
1. If *P* then *Q*.
2. *Q*.
3. *P*.

1. If the president is in the White House, then the president is in Washington, D.C.
2. The president is in Washington, D.C.
3. The president is in the White House.

- **Validity — Predicate Logic**
- In predicate logic, capital letters are used to denote *predicates*, and lower case letters are used to denote *objects*.

- There are two main kinds of claims in predicate logic:

- **Singular** claims are about *particular* objects.
  - *E.g.*, Socrates is a man.

- **General** claims (or **generalizations**) are about a group (or a population) of objects.
  - *E.g.*, All men are mortal.

- We will encounter three types of generalizations, involving the three quantifiers "All", "Some", and "Most".

- **Validity — Predicate Logic (some valid forms)**

1. All *A*s are *B*s.
2. *x* is an *A*.
3. *x* is a *B*.

1. All men are mortal.
2. Socrates is a man.
3. Socrates is mortal.

1. All *A*s are *B*s.
2. *x* is not a *B*.
3. *x* is not an *A*.

1. All desserts are sweet.
2. This lima bean is not sweet.
3. This lima bean is not a dessert.

1. All *A*s are *B*s.
2. All *B*s are *C*s.
3. All *A*s are *C*s.

1. All fork-tailed flycatchers are birds.
2. All birds have wings.
3. All fork-tailed flycatchers have wings.

1. No *A*s are *B*s.
2. *x* is an *A*.
3. *x* is not a *B*.

1. No men are mothers.
2. Tom Cruise is a man.
3. Tom Cruise is not a mother.

- **Validity — Predicate Logic (some *in*valid forms)**

1. All *A*s are *B*s.
2. *x* is not an *A*.
3. *x* is not a *B*.

1. All men are mortal.
2. Fido is not a man.
3. Fido is not mortal.

1. All *A*s are *B*s.
2. *x* is a *B*.
3. *x* is an *A*.

1. All men are mortal.
2. Fido is mortal.
3. Fido is a man.

Another important Example:

Most As are Bs.
x is an A.
----
x is a B.

- **Validity — A Clarification of the Definition**
  - Our initial definition of validity was a bit unclear. You can see this unclarity in certain more subtle examples, such as:

Argument 3.12

1. Jones is a mother.

2. Jones is female.

- Is this argument valid? One might *think* it is, because it might *seem* that it would be a *logical* contradiction for the premise of this argument to be true *while* its conclusion is false.
- But, *strictly speaking*, we will *not* classify this argument as *valid*.
  - ➡This is because we have *no logical theory* (sentential or predicate) according to which this argument has a valid *form*.
- This leads to an important *clarification* of our definition.

- **Validity — A Clarification of the Definition**
  - Here is a clarified defintion of validity:
    - **D3.1b:** An argument is valid iff the argument has a *logical form* such that it is impossible for any argument with that logical form to have true premises and a false conclusion.
- That is, *all valid arguments must have **valid logical forms**.*

- The following two ("equivalent") arguments ***are*** valid:
  1. Jones is a female and Jones is a parent.
  ----
  2. Jones is a parent.

  1. Jones is a mother.
  2. All mothers are females.
  ----
  3. Jones is a female.