Critical Thinking skills and Logical Arguments

- *Critical think* is a branch of informal logic
- Critical thinking includes a variety of deliberative processes that assist in evaluating arguments and claims
- Claims also called *statements or assertions*
- *Logical argument* is form of reasoning
Logical Arguments

an *argument* can be defined as a:

*form of reasoning that attempts to establish the truth of one claim (called a conclusion) based on the assumed truth of the evidence in other claims (called premises) provided to support the conclusion.*
Arguments continued

An argument has three important characteristics or features in that it:

- (i) Is a "form of reasoning."
- (ii) Is comprised of claims (sometimes also called statements or assertions).
- (iii) Aims at establishing a conclusion (i.e., one claim) based on evidence provided (by other claims)
Structure of an Argument

Premise 1

. optional

. optional

Premise N optional

Conclusion
The role of an argument in a dispute involving cybertechnology

Consider a hypothetical dispute whether a controversial and powerful new computer chip-code-named Chip X-is being developed in Japan. This new chip alleged to so powerful in speed and performance that it will eclipse any computer chips manufactures in the United States, such as Intel or AMD, will be capable of producing during the next serval years. Chip X will also enable the manufacturer to monitor certain activities of those users whose computers contain the chip in ways that pose serious threats to personal privacy.
Premise 1. When I recently visited the Computer Science Department at the University of Hiroshima I noticed that graduate students and professors there were field testing a new computer chip, whose code name is Chip X.

Premise 2. I have a copy of the design specifications for Chip X, which shows that it will be several times faster than any chip currently available in the US.

Premise 3. Lee Smith, a mutual colleague of ours who was recently an exchange student in the computer science program at the University of Hiroshima and who participated in the field testing of Chip X, will corroborate my account.

Conclusion. Chip X is currently being developed in Japan.
The role of an argument in a dispute involving cybertechnology

- The claim in the conclusion is independent of the evidence provided in the argument’s premises.
- The conclusion contains a *descriptive statement*.
Examples on logical arguments

Suppose I want to convince you that people should be able to include information on their web sites about how to build a bomb. Further my reason for holding this view is based on the principle that people are allowed to write books on how to build bombs and authors of the web sites should have the same rights and freedoms as authors of books. And suppose I base my reasoning for this claim on the right of authors to express themselves as guaranteed in the First Amendment of the United States Constitution.
Sample Arguments continued

Premise 1. An author's freedom to write a book on how to build a bomb is one that is protected by the First Amendment.

Premise 2. Authoring a book is similar to constructing a Web Site.

Conclusion. Constructing a Web site on how to build a bomb ought to be protected by the First Amendment.
Sample Arguments continued

- **Premise**: The Internet is in public space.

- **Conclusion**: Therefore, those who use the Internet should not expect to retain any personal privacy.
We must build a national missile defense system NMD because without such a system we are vulnerable to nuclear attacks from rogue nations that might arise in the future. Engineers and computer scientists have testified that they can design a computer-guided missile defense system that is effective, safe, and reliable. It is our obligation as Americans to take whatever measures we can to protect the safety of our citizens.
Constructing an Argument

Premise 1: Without the new NMD, the United States is vulnerable to nuclear attacks in the future from rogue nations.

Premise 2: Computer scientists and engineers have testified before congress that they can design a computer-guided missile defense system that is both safe and reliable.

Premise 3: The United States must do whatever is necessary to preserve the military defense of the nation and the safety of its citizens.

Conclusion: The United States should build the new NMD.
Valid Arguments

- Claims are either True or False, arguments will be either Valid or Invalid
- We can use an informal system developed by John Nolt (2002) to determine the validity or invalidity of an argument
- The system stated that:

Is the relationship between the premises and the conclusion such that if all of the premises in the argument are assumed true, it would be impossible for the conclusion to be false
Invalid Arguments: The Counterexample Strategy

- To show that an argument is invalid, all we need to do is to produce one counterexample to the argument.

A logically possible case in which the argument’s conclusion could be imagined to be false while the argument premises are assumed to be true.
The assumed truth of the premises is sufficient to guarantee the conclusion.

Premises (even when true) do not guarantee the conclusion.
Reconstructing an Arguments to be Valid

Premise 1: Without the new NMD, the United States is vulnerable to nuclear attacks in the future from rogue nations

Premise 2: Computer scientists and engineers have testified before congress that they can design a computer-guided missile defense system that is both safe and reliable

Premise 3: The United States must do whatever is necessary to preserve the military defense of the nation and the safety of its citizens.

Premise 4: The new NMD system is necessary to preserve the defense and the safety of the United States and its citizens

Conclusion. The united States should build the new NMD
Examples on Valid Argument

Premise 1: people who own iMac computers are smarter than those who own PC’s

Premise 2: My roommate own an iMac computer

Premise 3: I own a PC.

Conclusion: My roommate is smarter than me
Premise 1: CEO of major corporations are high school graduates

Premise 2: Bill Gate was the CEO of a major computer corporation

Conclusion: Bill Gate is a high-school graduate
Invalid Arguments

Premise 1: All CEOs of major United States computer corporations have been United States citizens
Premise 2: Bill Gate is a United State citizen

Conclusion: Bill Gate has been a CEO of a major computer corporations in the United States
Invalid Arguments

Premise 1: Most CEOs of major computer corporations are college graduates.
Premise 2: Steve Ballmer is the CEO of a major computer cooperation.

Conclusion: Steve Ballmer is a college graduate.
Inductive Arguments

Premises 1: Seventy-five percent of people who own IPods also own iMac computers

Premise 2: My roommate currently own an Ipod

Conclusion: My roommate also own an iMac computer
Premise 1: The Internet is in public space

Conclusion: Those who use the Internet should not expect to retain personal privacy
The term "fallacy" does not mean false statement.

It means *faulty reasoning*.

So it is possible for an argument to contain all true statements and still be fallacious.
Informal Logical Fallacies

- Many fallacies appear in everyday reasoning.
- Logicians have categorized them in ways that are convenient for us to recognize.
- We refer to these kinds of fallacious arguments as informal logical fallacies.
Valid Arguments

Sound

All the premises are true.

Unsound

At least one premise is false.
Figure 3-3

Invalid Arguments

Inductive

Conclusion likely follows from assuming the truth of the premises.

Fallacious

Conclusion does not likely follow from assuming the truth of the premises.
Figure 3-4 Comprehensive View of Arguments

Arguments

- Valid
  - Unsound
    - Weak Arguments
  - Sound
    - Strong Arguments
- Invalid
  - Inductive
  - Fallacious
    - Weak Arguments
Seven-step Strategy for Evaluating Arguments: I

(Part 1: Steps 1-4)

**Step 1.** Convert the argument into standard form. (List the premises first, followed by the conclusion.)

**Step 2.** Test the argument for its reasoning strength to see whether it is valid or invalid. (Assume the premises to be true, and ask yourself whether the conclusion must also be true when those premises are assumed true. Is a counterexample to the argument possible?)

**Step 3.** Is the argument valid?

   If yes, go to Step 4.
   
   If no, go to Step 5.

**Step 4.** Is the (valid) argument also sound? That is, are the premises true in the actual world?

   **4a.** If the argument is valid and if all of the premises are true in the actual world, then the argument is also sound. (To determine truth-values for statements, see Appendix E.)
   
   **4b.** If the argument is valid, but one or more premises can be shown to be either false or not capable of being verified in the actual world, then argument is unsound.
Seven-Step Strategy For Evaluating Arguments: II

(Part II: See Steps 1-4 on previous slide)

Step 5. Is the (invalid) argument inductive or fallacious? (How likely will the conclusion be true when the premises are assumed true?)
   5a. If the conclusion would likely be true because the premises are assumed true, the argument is inductive.
   5b. If the conclusion would not likely be true even when the premises are assumed true, the argument is fallacious. (Keep in mind that a fallacious argument can be made up of Individual claims that are themselves true in the actual world.)

Step 6. Determine whether the premises in your argument are either true or false.

Step 7: Make an overall assessment of the argument. That is, describe the argument's strength of reasoning in conjunction with the truth conditions of the argument's premises. For example, is the argument inductive with all true premises? Is it inductive with some false premises? Is it fallacious with a mixture of true and false premises, and so forth? Remember that an inductive argument with premises that are all true is stronger than a valid argument with one or more false premises.)