logic and sometimes twisting or abandoning them. For example, Rips (2001, p. 133) concluded that "arguments have different roles and purposes, and people assess them differently depending on which purpose they have in mind."

The word **pragmatic** refers to anything that is practical. In real life, people have a *reason for reasoning*, and sometimes the laws of logic are at odds with the setting, consequences, and commonly agreed on reasons and rules for deriving conclusions. As Henle's participants showed in the previous example, in real life, we add our own beliefs and knowledge to the facts we are given when we determine if a conclusion is supported by the premises. In most everyday settings, this is a pragmatic or practical approach to reasoning problems.

Inductive and Deductive Reasoning

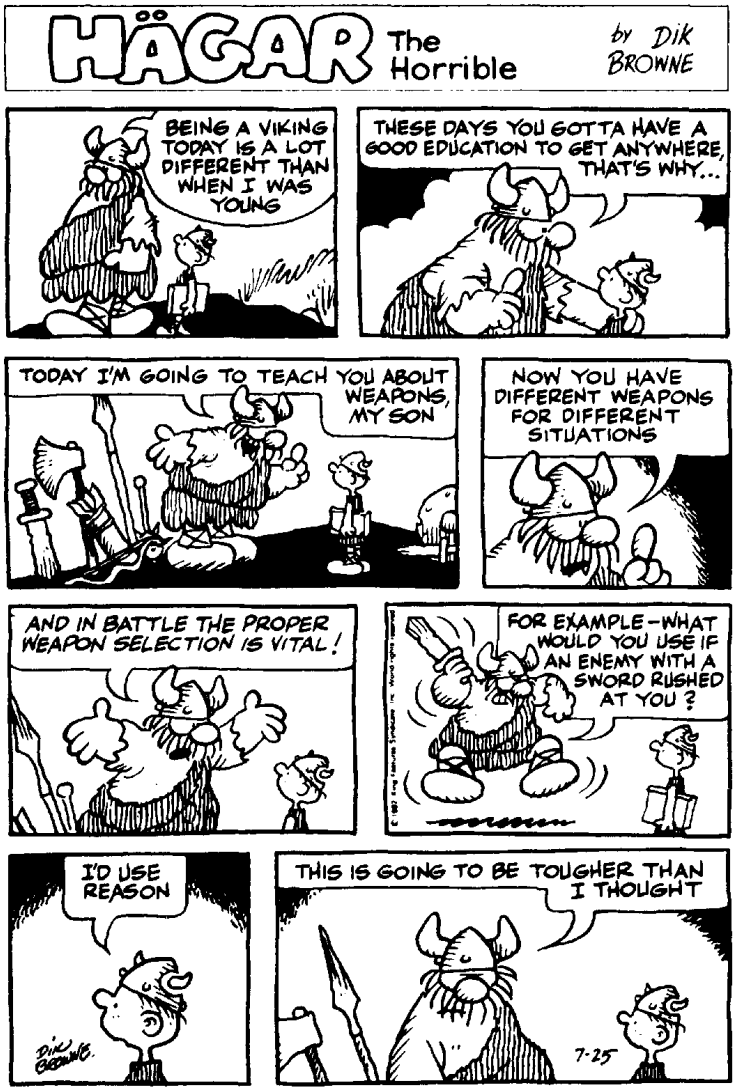
Actual thinking has its own logic; it is orderly, reasonable, reflective.

—Dewey (1933, p. 75)

A distinction is often made between inductive and deductive reasoning. (See Chapter 6, "Thinking as Hypothesis Testing" for a related discussion of this topic.) In **inductive reasoning** observations are collected that support or suggest a conclusion. It is a way of projecting information from known examples to the unknown (Heit, 2000). For example, if every person you have ever seen has only one head, you would use this evidence to support the conclusion (or suggest the hypothesis) that everyone in the world has only one head. Of course, you can't be absolutely certain of this fact. It's always possible that someone you've never met has two heads. If you met just one person with two heads, your conclusion must be wrong. Thus, with inductive reasoning you can never *prove* that your conclusion or hypothesis is correct, but you can disprove it.

When we reason inductively, we collect facts and use them to provide support or disconfirmation for conclusions or hypotheses. It's how we discover what the world is like. Lopes (1982) described induction this way: "Scientists do it; lay people do it; even birds and beasts do it. But the process is mysterious and full of paradox . . . induction cannot be justified on logical grounds" (p. 626). We reason inductively both informally in the course of everyday living, and formally in experimental research. For this reason, hypothesis testing is sometimes described as the process of inductive reasoning. When we reason inductively, we generalize from our experiences to create beliefs or expectations. Sometimes inductive reasoning is described as reasoning "up" from particular instances or experiences in the world to a belief about the nature of the world.

In **deductive reasoning**, we begin with statements known or believed to be true, like "everyone has only one head," and then conclude or infer that Karen, a woman you've never met, will have only one head. This conclusion follows logically from the earlier statement. If we know that it is true that everyone has only one head, then it must also be true that any specific person will have only one head. This conclusion necessarily follows from the belief; if the belief is true, the conclusion *must* be true. Deductive reasoning is sometimes described as reasoning "down" from beliefs about the nature of the world to particular instances. Rips (1988) argues that deduction is a general-purpose mechanism for cognitive tasks. According to Rips, deduction "enables us to answer questions from information stored in memory, to plan actions according to goals, and to solve certain kinds of puzzles" (p. 117). The notion of "reasoning up" from observations and "reasoning down" from hypotheses is schematically shown in Fig. 4.1.



Although it is common to make a distinction between inductive and deductive reasoning, the distinction may not be a particularly useful description of how people reason in real life. In everyday contexts, we switch from inductive to deductive reasoning in the course of thinking. Our hypotheses and beliefs guide the observations we make, and our observations, in turn, modify our hypotheses and beliefs. Often, this process will involve a continuous interplay of inductive and deductive reasoning. Thinking in real-world contexts almost always involves the use of multiple thinking skills.

LINEAR ORDERING

Reasoning is simply a matter of getting your facts straight.

—B. F. Anderson (1980, p. 62)

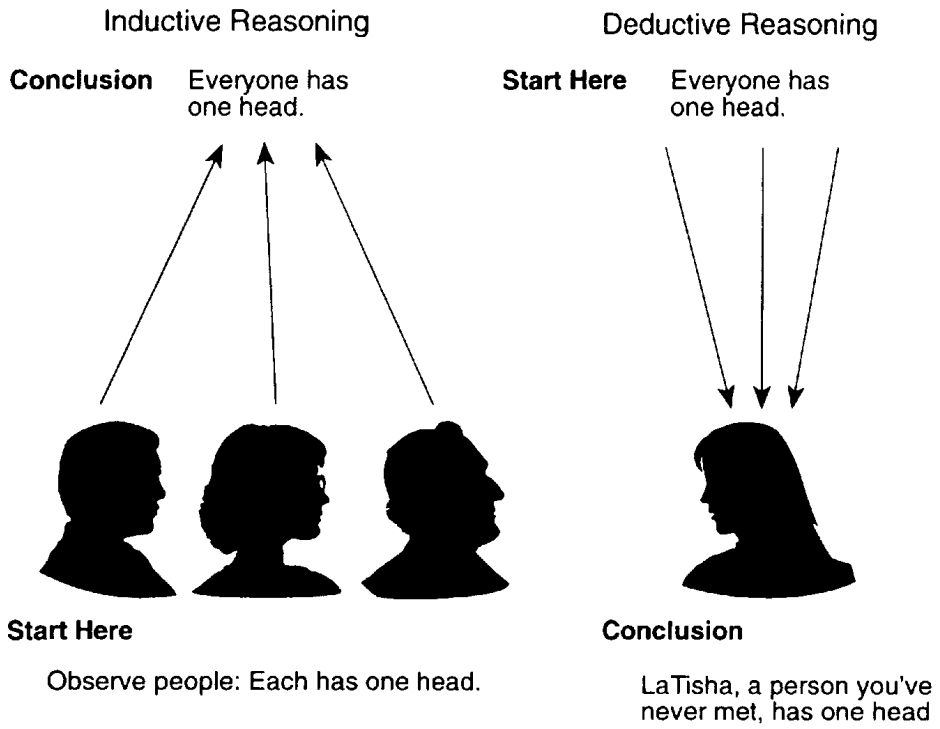


FIG. 4.1. A pictorial distinction between deductive (reasoning "down" from premises) and inductive reasoning (reasoning "up" from examples). In most real-world settings, we use both types of reasoning recursively.

Joel is stronger than Bill, but not as strong as Richard. Richard is stronger than Joel, but not as strong as Donald. Who is strongest and who is second strongest?

Although I'm sure that you've never met Joel, Donald, Richard, and Bill, I'm also sure you could answer this question. The premises or statements in this problem give information about the orderly relationship among the terms; hence, it is called a **linear ordering** or **linear syllogism**. Like all deductive reasoning problems, the premises are used to derive valid conclusions—conclusions that must be true if the premises are true. In linear ordering problems, we're concerned with orderly relationships in which the relationships among the terms can be arranged in a straight-line array.

Linear Diagrams

How did you solve the problem about Joel, Donald, Richard, and Bill? Most people work line by line, ordering the people as specified in each line:

"Joel is stronger than Bill, but not as strong as Richard" becomes: