Science is a way of gaining knowledge
How do we know things?
   Instinct?
   Revealed Knowledge?
   Authority?
   Reasoning
      Inductive reasoning
      Deductive reasoning

Deductive reasoning
   Begin with generalities (postulates) that everyone agrees are true. Combine two or more generalities with “if” and “then” to make inferences about specific cases.

Examples:
   Euclidean geometry

Deductive Reasoning

Strengths:
If your postulates are true and you have not made a logical error in combining them then your result is necessarily true (i.e. you can prove things).

Weaknesses:
It is extremely difficult to find postulates that everyone agrees are true.
Postulates are derived from imagination not from nature.
Complex deductive systems may be self contradictory.

Inductive reasoning

Observe specific cases based on patterns observed derive general rules.

Examples:
   When I asked Kelly for a date, Kelly said no.
   When I asked Pat for a date, Pat said no.
   When I asked Casey for a date, Casey said no.
   Therefore I conclude that no one will go on a date with me.
Inductive Reasoning

Strengths:
Basic information is derived from observation and must be consistent with the real world.
It is easy to get people to agree on specific cases/events

Weaknesses:
Hasty generalizations
Biased Sampling
Can not prove general rules.

Scientific reasoning
(hypothetico - deductive model)

Step 1: Observation
Step 2: Develop a tentative explanation (theory) about how the universe works. (note this explanation may be based on observation, logic, common sense or the creativity of the scientist)

Step 3: Use deductive logic to create a hypothesis based on the tentative explanation. (The hypothesis is a statement that must be true if the explanation is correct)

Step 4: Collect data to test the hypothesis.

Scientific reasoning
(hypothetico - deductive reasoning)

Step 5: Reject or accept hypothesis
Step 6: re-evaluate explanation and other explanations
Step 7: Communicate your results