Chapter One

Section One

The purpose of studying Mathematics is *solving problems*. You can collect the similar problems' solutions to get a *conjecture* (conclusion). (That is, look at *patterns* and *make rules*.) Then use the conjecture to solve another problem. To get the conjecture is ***inductive reasoning***. However, the ***conjecture*** may or ***may not be true***.

Example 1: (Look at ***patterns*** and *make rules*.)

What is the next number of this list, 1, 8, 15, 22, 29?

Hint: Look at the ***difference*** between two neighbors.

Example 2: (The conjecture *may not be true*.)

What is the next number of this list, 1, 8, 15, 22, 29?

If we treat them as ***dates*** of Mondays in July, the last example's solution won't be true.

July, 2002						
S	M	Tu	W	Th	F	S
	1	2	3	4	5	6
7	**8**	9	10	11	12	13
14	**15**	16	17	18	19	20
21	**22**	23	24	25	26	27
28	**29**	30	31			

August, 2002						
S	M	Tu	W	Th	F	S
				1	2	3
4	**5**	6	7	8	9	10
11	**12**	13	14	15	16	17
18	**19**	20	21	22	23	24
25	**26**	27	28	29	30	31

After we use logical thinking or ***mathematical induction*** (See any standard college algebra text) to prove the conjecture, the conjecture can be true forever. Otherwise, as long as we find a **counterexample** for a particular conjecture, we can say that this conjecture is not always true.

Example 3: (Counterexample)

For all real numbers, its square can be divided by itself. ($x^2 \div x = x$, for all real numbers x)

It is not true since $0^2 \div 0 \neq 0$. We say that $0^2 \div 0 \neq 0$ is a counterexample for the statement, for all real numbers, its square can be divided by itself.

Definitions: (See page 2 of textbook)

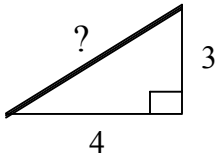
1. **Inductive Reasoning**:
   Inductive reasoning is characterized by drawing a general conclusion (making a conjecture) from repeated observations of specific examples. (The reasoning goes from *specific examples* to a *general statement*.)

2. **Deductive Reasoning**:
   Deductive reasoning is characterized by applying *general principles* to *specific examples*.

Example 4: (Deductive Reasoning)

Pythagorean Theorem: In any right triangle, the sum of the squares of the legs (shorter sides) is equal to the square of the hypotenuse (longest side).

Can you find the length of the hypotenuse?



Example 5: (Inductive or Deductive Reasoning?) (See page 4)

Determine whether the reasoning is an example of deductive or inductive reasoning.

(a) Our house is made of redwood. Both of my next-door neighbors have redwood houses. Therefore, all houses in our neighborhood are made of redwood.

(It is an example of Inductive Reasoning, why?)

(b) All word processors will type the symbol @. I have a word processor. I can type the symbol @.

(It is an example of Deductive Reasoning, why?)

(c) Today is Friday. Tomorrow will be Saturday.

(It is an example of Deductive Reasoning, why?)

Exercises: (Page 8 of textbook)

Determine whether the reasoning is an example of deductive or inductive reasoning.

1. If the mechanic says that it will take two days to repair your car, then it will actually take four days. The mechanic says, "I figure it'll take a couple of days to fix it, ma'am." Then you can expect it to be ready four days from now.	deductive
3. It has rained every day for the past five days, and it is raining today as well. So it will also rain tomorrow.	inductive
5. Josh had 95 Pokémon trading cards. Margaret gave him 20 more for his birthday. Therefore, he now has 115 of them.	deductive
7. If you build it, they will come. You build it. So, they will come.	deductive
8. All men are mortal. Socrates is a man. Therefore, Socrates is mortal.	deductive
9. It is a fact that every student who ever attended Brainchild University was accepted into medical school. Since I am attending Brainchild, I can expect to be accepted to medical school, too.	inductive
11. In the sequence 5, 10, 15, 20, . . . , the most probable next number is 25.	inductive