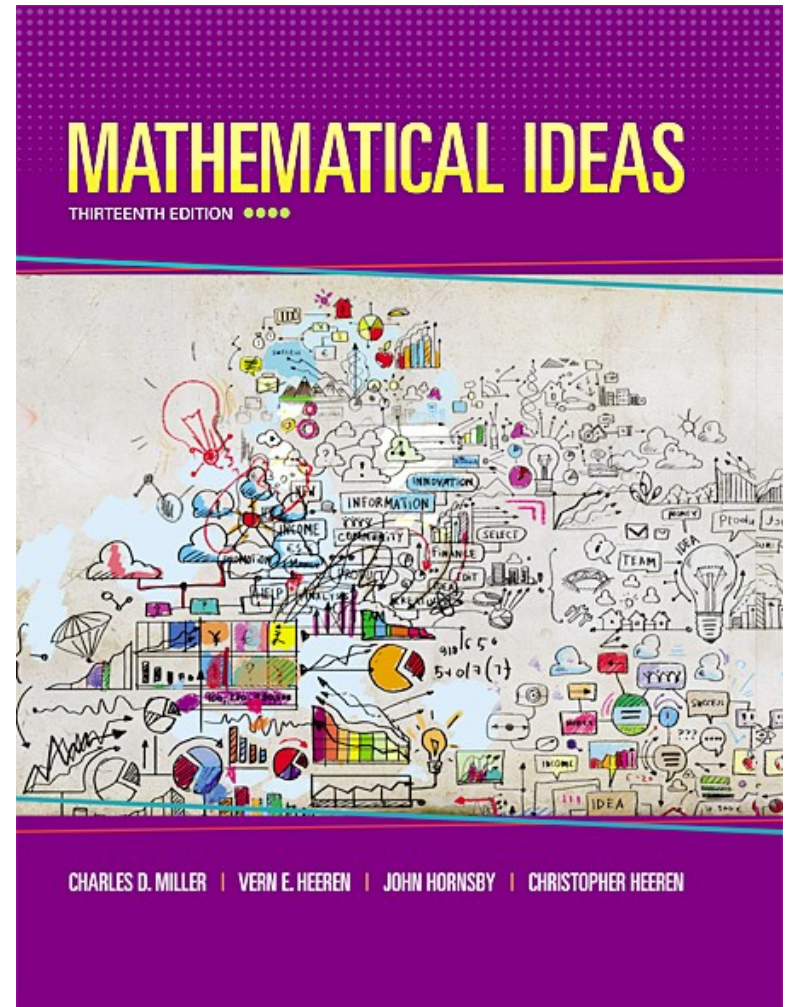


Chapter 1

The Art of Problem Solving



Chapter 1: The Art of Problem Solving

- 1.1 Solving Problems by Inductive Reasoning
- 1.2 An Application of Inductive Reasoning: Number Patterns
- 1.3 Strategies for Problem Solving
- 1.4 Numeracy in Today's World

Section 1-1

Solving Problems by Inductive Reasoning

Solving Problems by Inductive Reasoning

- Be able to distinguish between inductive and deductive reasoning.
- Understand that, in some cases, inductive reasoning may not lead to valid conclusions.

Characteristics of Inductive and Deductive Reasoning

Inductive Reasoning

Draw a general conclusion (a *conjecture*) from repeated observations of specific examples. There is no assurance that the observed conjecture is always true.

Deductive Reasoning

Apply general principles to specific examples.

Definitions



A **premise** can be an assumption, law, rule, widely held idea, or observation. Then, reason inductively or deductively from the premises to obtain a **conclusion**. The premises and conclusion make up a **logical argument**.

Example: Identifying the Premise and Conclusion

Identify each premise and the conclusion in the following argument. Then tell whether the argument is an example of inductive or deductive reasoning.

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

Solution (next slide)

Example: Identifying the Premise and Conclusion

Solution

The premises are “Our house is made of brick” and “Both of my next-door neighbors have brick houses.” The conclusion is “Therefore, all houses in our neighborhood are made of brick.” Because the reasoning goes from specific examples to a general statement, the argument is an example of inductive reasoning (although it may very well be faulty).

Example: Predicting the next number in a sequence

Use inductive reasoning to determine the *probable* next number in the list below.

5, 9, 13, 17, 21, 25, 29

Solution

Each number in the list is obtained by adding 4 to the previous number.

The probable next number is $29 + 4 = 33$.

Example: Predicting the product of two numbers

Use the list of equations and inductive reasoning to predict the next multiplication fact in the list:

$$37 \times 3 = 111$$

$$37 \times 6 = 222$$

$$37 \times 9 = 333$$

$$37 \times 12 = 444$$

Solution

$$37 \times 15 = 555$$

Pitfalls of Inductive Reasoning

One can not be sure about a conjecture until a general relationship has been proven.

One counterexample is sufficient to make the conjecture false.