### Signature Content in the second seco

#### INDUCTIVE REASONING

**Inductive reasoning** is the process of arriving at a general conclusion based on observations of specific examples.

### Example 1

Identify a pattern then use it to predict what happens next:

1, 1, 2, 3, 5, 8, 13...







Content adapted from Blitzer, Thinking Mathematically, Prentice Hall

What is the rule for generating the next row? What is the next row?

### You Try



### O Deductive Reasoning: General ⇒ Specific

### DEDUCTIVE REASONING

**Deductive reasoning** is the process of proving a specific conclusion from one or more general statements. A conclusion that is proved true by deductive reasoning is called a **theorem**.

Example 3

It can be shown that

$$1 + 2 + 3 + \cdots + n = \frac{n(n+1)}{2}.$$

I can use this formula to conclude that the sum of the first one hundred counting numbers,  $1 + 2 + 3 + \cdots + 100$ , is ...

# Example 4

Identify the reasoning process as inductive or deductive:

All books by Stephen King have made the best-seller list. *Carrie* is a novel by Stephen King. Therefore, *Carrie* was on the best-seller list.

All books by Stephen King have made the best-seller list. Therefore, it is highly probable that the novel King is currently working on will make the best-seller list.

ou Try
Step 1: Find a friend.
<b>Step 2:</b> You and your friend each pick a number. You must pick a different number than your friend. Write your number down:
Step 3: Working on your own, multiply your number by 4:
Step 4: Add 8 to the result of the last step:
Step 5: Divide the result of the last step by 2:
Step 6: Subtract 4 from the result of the last step:
<b>Step 7:</b> Compare your results with your friend and make a general conjecture about these instructions
When you used the general instructions to do the calculations for your chosen number, what kind of reasoning were you using? When you made your conjecture in step 7 using the results from the specific number you tried what kind of reasoning were you using?
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4 of 4

Content adapted from Blitzer, *Thinking Mathematically*, Prentice Hall



**b.** to the nearest million

You Try



## Example 2

Obtain an estimate by rounding numbers:

7.92 + 3.06 + 24.36

42% of 291, 506

Traveling at an average rate of between 40 and 50 miles per hour for 3 to 4 hours, select the best estimate for the distance traveled.

a. 120 miles

**c.** 195 miles

**b.** 160 miles **d.** 210 miles

## Example 4



The circle graph (pie chart) shows the percentage of 221, 730, 462 American adults who drink caffeinated beverages on a daily basis and the number of cups consumed per day. Use this information to estimate the number of American adults who drink from three to four cups of caffeinated beverages per day.

# You Try



All content adapted from Blitzer, Thinking Mathematically, Prentice Hall

### Mathematical Models

### Example 5



#### Four Step Process

### POLYA'S FOUR STEPS IN PROBLEM SOLVING

**Step 1. Understand the problem.** Read the problem several times. The first reading can serve as an overview. In the second reading, write down what information is given and determine exactly what it is that the problem requires you to find.

**Step 2.** Devise a plan. The plan for solving the problem might involve one or more of these suggested problem-solving strategies:

- Use inductive reasoning to look for a pattern.
- Make a systematic list or a table.
- Use estimation to make an educated guess at the solution. Check the guess against the problem's conditions and work backward to eventually determine the solution.
- Try expressing the problem more simply and solve a similar simpler problem.
- Use trial and error.
- List the given information in a chart or table.
- Try making a sketch or a diagram to illustrate the problem.
- Relate the problem to a similar problem that you have seen before. Try applying the procedures used to solve the similar problem to the new one.
- Look for a "catch" if the answer seems too obvious. Perhaps the problem involves some sort of trick question deliberately intended to lead the problem solver in the wrong direction.
- Use the given information to eliminate possibilities.
- Use common sense.

#### Step 3. Carry out the plan and solve the problem.

**Step 4.** Look back and check the answer. The answer should satisfy the conditions of the problem. The answer should make sense and be reasonable. If this is not the case, recheck the method and any calculations. Perhaps there is an alternate way to arrive at a correct solution.

### Example 1

It takes you four minutes to read a page in a book. How many words per minute can you read?

What piece of information is missing to solve this problem?

You have \$250 to spend and you need to purchase four new tires. If each tire weighs 21 pounds and cost \$42 plus \$2.50 tax, how much money will you have left after buying the tires?

What piece of information is unnecessary to solve the problem?

## You Try

Determine whether too much or not enough information is given.Identify the missing/unneccessary piece of information.a) If a steak seels for \$8.15, what is the cost per pound?b) A sales person recieves a weekly salry of \$350. In addition \$15 is paid for every item sold in excess of 200 items. How much extra is received from the sale of 212 items?

### Example 3

Which is the better value: a 12-ounce jar of honey for \$2.25 or an 18-ounce jar of honey for \$3.24?

The supermarket displays the unit price for the 12-ounce jar in terms of cost per ounce, but displays the unit price for the 18-ounce in terms of cost per quart. Assuming 32 ounces in a quart, what are the unit prices, to the nearest cent, given by the supermarket?

Does the better value always have the lower displayed unit price?

## You Try

Pens are bought at  $95\phi$  per dozen and sold in groups of four for \$2.25. Find the profit on 15 dozen pens.



There are five people in a room. Each person shakes the hand of every other person exactly once. How many handshakes are exchanged?

# You Try

All the rows, columns, and the two diagonals of a magic square have the same sum. Use the properties of a magic square to fill in the missing numbers.

5	А	18
в	15	С
D	E	25

