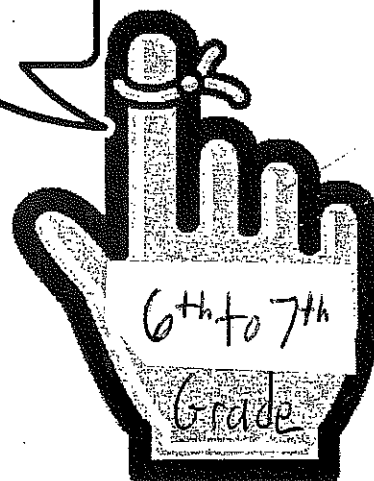


One problem  
per week!!

Summer 2013 Math Packet  
for rising 7th grade



Name \_\_\_\_\_

Due \_\_\_\_\_

## Summer 2013 Math Packet for Rising 7th grade students

- ° This packet contains examples and problems which show how to use ten problem solving strategies.
- ° You will use these strategies all year long.
- ° The packet is due the first week of school and counts as your first quiz grade.
- ° Doing one problem each week will be most efficient.

### The Problem Solving Strategies (PSS) are:

1. Draw a diagram
2. Make a model (No sample provided)
3. Make an organized list
4. Make a table or graph
5. Look for a pattern
6. Predict and test
7. Use logical thinking
8. Work backward
9. Solve a simpler problem
10. Write a formula or an equation



Look at the completed sample problem for each strategy.

Part I: Strategies for Solving Problems

**1**

# Draw a Diagram

Sometimes organizing information in a diagram helps you solve a problem. You can use the strategy *draw a diagram*.

## Example

Marnie is riding in a long-distance bike race. So far, she has ridden 12 miles north, 8 miles east, 3 miles north, 12 miles west, 5 miles south, 4 miles west, and 10 miles south. How far and in which direction does she have to ride back to the starting point to complete the race?

### Find Out

**Think:** What facts do you know?

Marnie has ridden 12 miles north, 8 miles east, 3 miles north, 12 miles west, 5 miles south, 4 miles west, and 10 miles south.

**Think:** What do you need to find out?

How far and in which direction does Marnie have to ride to complete the race?

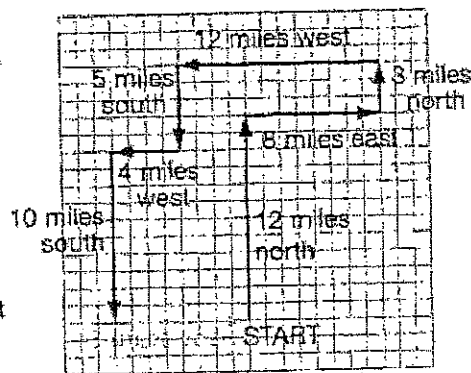
### Plan

**Think:** What strategy can you use?

You can draw a diagram to show the information you know.

### Solve

Use grid paper. Draw a diagram to show where Marnie has ridden.



Draw another arrow to show the distance and the direction she will ride back to the starting point to complete the race.

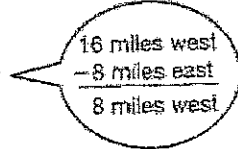
**Solution:** Marnie has to ride 8 miles east to complete the race.

### Look Back

You can use logical thinking to check your answer.

North	South
12 miles	5 miles
+ 3 miles	+ 10 miles
<u>15 miles</u>	<u>15 miles</u>

East	West
8 miles	12 miles
	+ 4 miles
	<u>16 miles</u>



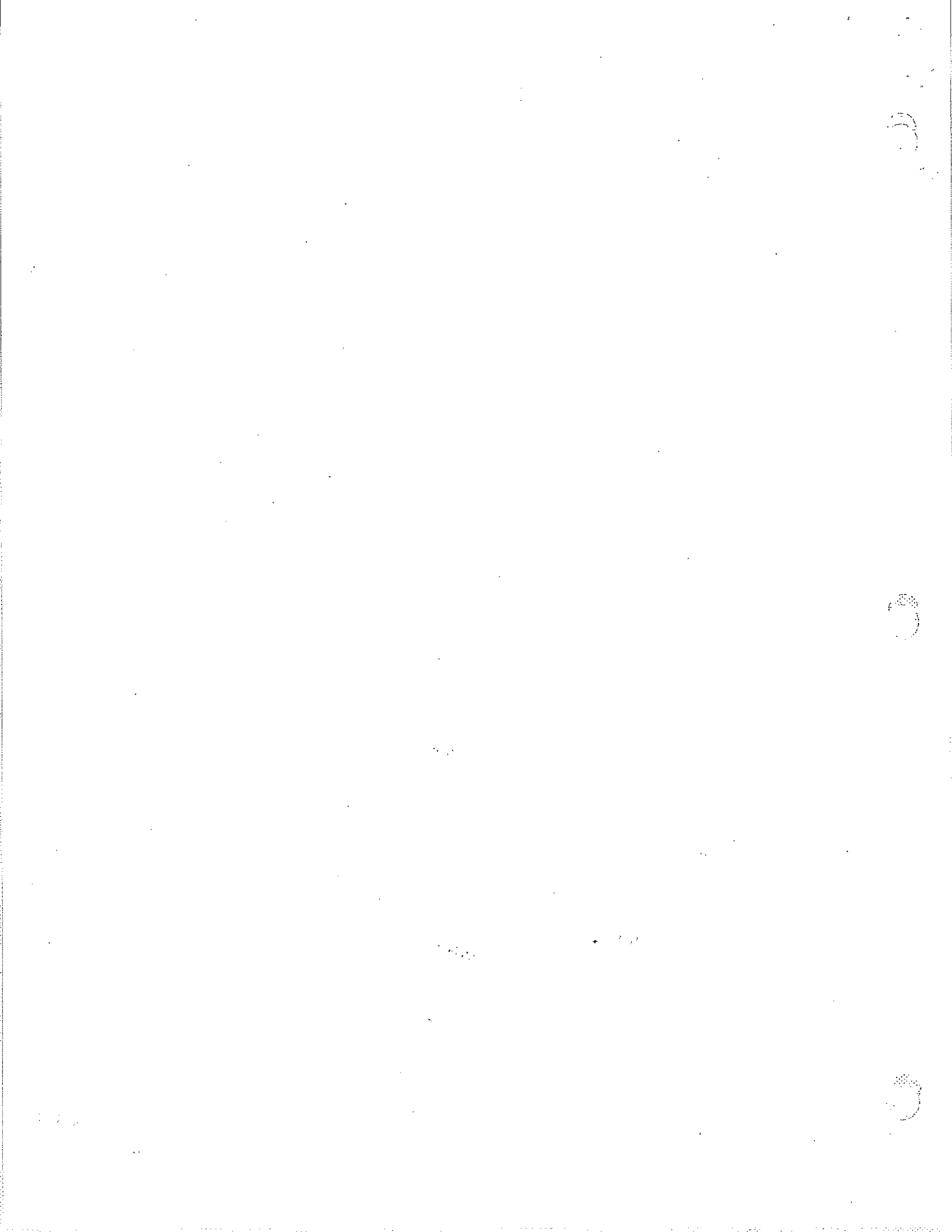
Marnie is 8 miles west, so she has to ride 8 miles east.

## Problem Solving Strategies

- **Draw a diagram (Strategy #1)**
  - Sadie computes the perimeter of a rectangle by adding the length,  $l$ , and width,  $w$ , and doubling this sum. Eric computes the perimeter of a rectangle by doubling the length,  $l$ , doubling the width,  $w$ , and adding the doubled amounts.
    1. Write an expression for Sadie's way of calculating the perimeter. Write an expression for Eric's way as well.
    2. Use both of the expressions to find the perimeter of a rectangle with length 30 and width 75.
    3. Explain why Sadie and Eric always get the same answer, no matter what the length and width of the rectangle are.
  - A volleyball tournament will be held on a soccer field that is 110 yards long and 80 yards wide. Each volleyball court is 25 yards long by 15 yards wide. How many courts will fit on the field?

(No example)

- **Make a model (manipulative) (Strategy #2)**
  - A bag contains 5 blue marbles, 10 red marbles, and 10 yellow marbles. A marble is picked at random.
    1. What is the probability the marble is yellow?
    2. What is the probability the marble is blue or red?
    3. What is the probability the marble is white?
    4. What is the probability the marble is blue, red, or yellow?



# 3 Make an Organized List

You can use the strategy *make an organized list* when you need to find all the possible arrangements or outcomes for a problem.

## Example

Ruben is buying a DVD. That means he can get a second DVD for free. From how many combinations of 2 DVDs can he choose?



## Find Out

**Think:** *What facts do you know?*

Ruben is getting 2 DVDs. He can choose from 7 DVDs.

**Think:** *What do you need to find out?*

From how many combinations can Ruben choose?

## Plan

**Think:** *What strategy can you use?*

You can make an organized list of all the possible combinations of DVDs.

## Solve

Use the letters A–G to stand for the top seven DVDs. Make a list showing all the ways to make a combination of 2 DVDs.

- AB
- AC BC
- AD BD CD
- AE BE CE DE
- AF BF CF DF EF
- AG BG CG DG EG FG

Count the number of pairs.

**Solution:** Ruben can choose from 21 different pairs of DVDs.

## Look Back

You can make a different kind of list to check your answer:

List the letter of the first choice and then show all the possible second choices. Make sure there are no duplicates.

- A: B, C, D, E, F, G
- B: C, D, E, F, G
- C: D, E, F, G
- D: E, F, G
- E: F, G
- F: G

Count the number of second choices. There are 21. ✓

## Problem Solving Strategies

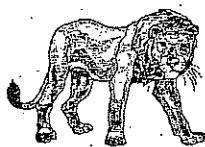
- **Make an organized list (Strategy #3)**
  - When ordering an appetizer at dinner, Marva can have a small, medium, or large salad. She can choose among Italian, French, or Russian dressing on it. How many choices does she have?



# 4 Make a Table or Graph

You can organize information given in a problem by using the strategy *make a table or graph*.

## Example



For most animals, females weigh less than males. The average weight of a female tiger is 286 pounds, a female cheetah is 110 pounds, a female lion is 285 pounds, a female orangutan is 100 pounds, and a female gorilla is 200 pounds. The average weight of a male tiger is 485 pounds, a male cheetah is 120 pounds, a male lion is 430 pounds, a male orangutan is 165 pounds, and a male gorilla is 350 pounds.

For which of these animals are the female and male weights the closest?

### Find Out

**Think:** *What facts do you know?*

You know the average weights of some female and male animals.

**Think:** *What do you need to find out?*

You need to find which animal has the closest female and male weights.

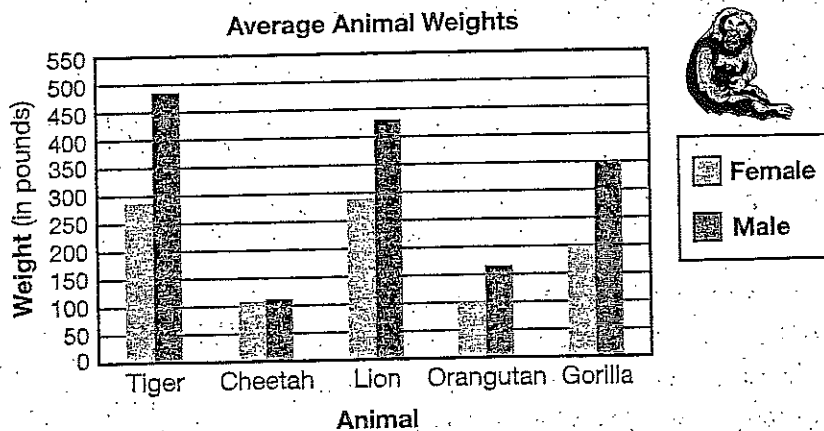
### Plan

**Think:** *What strategy can you use?*

You can make a graph that compares the weights.

### Solve

Make a double-bar graph of the data.



### Look Back

**Solution:** The weights of female and male cheetahs are the closest.

You can subtract to check your answer.

Tiger	Cheetah	Lion	Orangutan	Gorilla
485	120	430	165	350
<u>- 286</u>	<u>- 110</u>	<u>- 285</u>	<u>- 100</u>	<u>- 200</u>
199	10	145	65	150



The cheetah has the smallest difference between female and male weights. ✓

## Problem Solving Strategies

- **Make a table or graph(Strategy #4)**
  - A wildlife preserve surveyed its wolf population in 1996 and counted 56 wolves. In 2000, there were 40 wolves. In 2002, there were 32 wolves. If the population changes at a constant rate, in what year will there be fewer than 15 wolves.
  - John and Will ran for 6th grade class president. There were 36 students voting. John got two votes for every vote Will got. How many votes did each get? (Table)

Votes for Will	Votes for John	Total number of votes
1	2	3
		15
		30
		33
		36

# 5 Look for a Pattern

You can solve some problems by using the strategy *look for a pattern*. Find the rule for a pattern and then use it to solve the problem.

## Example

Suppose you started with \$1 and doubled your money every day. How long would it take you to have \$1,000,000?

### Find Out

**Think:** *What facts do you know?*

You know that the amount of money doubles every day.

**Think:** *What do you need to find out?*

You need to know how long it would take you to have \$1,000,000.

### Plan

**Think:** *What strategy can you use?*

You can look for a pattern and continue it until you reach \$1,000,000.

### Solve

Write a pattern to show that the amount of money doubles every day.

Day 1	\$1	Day 12	$\$1,024 \times 2 = \$2,048$
Day 2	$\$1 \times 2 = \$2$	Day 13	$\$2,048 \times 2 = \$4,096$
Day 3	$\$2 \times 2 = \$4$	Day 14	$\$4,096 \times 2 = \$8,192$
Day 4	$\$4 \times 2 = \$8$	Day 15	$\$8,192 \times 2 = \$16,384$
Day 5	$\$8 \times 2 = \$16$	Day 16	$\$16,384 \times 2 = \$32,768$
Day 6	$\$16 \times 2 = \$32$	Day 17	$\$32,768 \times 2 = \$65,536$
Day 7	$\$32 \times 2 = \$64$	Day 18	$\$65,536 \times 2 = \$131,072$
Day 8	$\$64 \times 2 = \$128$	Day 19	$\$131,072 \times 2 = \$262,144$
Day 9	$\$128 \times 2 = \$256$	Day 20	$\$262,144 \times 2 = \$524,288$
Day 10	$\$256 \times 2 = \$512$	Day 21	$\$524,288 \times 2 = \$1,048,576$
Day 11	$\$512 \times 2 = \$1,024$		

**Solution:** It would take 21 days for you to have \$1,000,000.

### Look Back

You can use a calculator to check your answer.

Enter "1" and then multiply by 2. Continue doubling the amounts until you reach \$1,000,000.

## Problem Solving Strategies

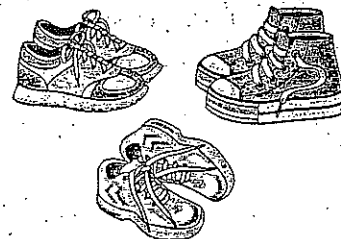
- **Look for a pattern(Strategy #5)**
  - A rectangular table seats two people on each end and three on each side.
    1. How many students can be seated if you push the ends of 5 tables together?
    2. How many students can be seated if you push the ends of 20 tables together?

# 6 Predict and Test

Sometimes you don't know how to solve a problem. You can try the *predict and test* strategy. Make a guess and then test it. If your guess is not correct, you can use that guess to make a better guess.

## Example

The Super Sneaker store has 3,643 pairs of sneakers. There are 1,035 more pairs of women's sneakers than pairs of men's sneakers. How many pairs of women's sneakers are there?



## Find Out

**Think:** *What facts do you know?*

Of the 3,643 pairs of sneakers, there are 1,035 more pairs of women's sneakers than pairs of men's sneakers.

**Think:** *What do you need to find out?*

You need to know how many pairs of women's sneakers there are.

## Plan

**Think:** *What strategy can you use?*

You can use your number sense and then predict and test.

## Solve

Try 1,500 for men's sneakers.

$1,500 + 1,035 = 2,835$  *There would be 2,835 women's sneakers.*

$2,835 + 1,500 = 4,335$  *Add women's and men's.*

*Too high.*

Try 1,300 for men's sneakers.

$1,300 + 1,035 = 2,335$  *There would be 2,335 women's sneakers.*

$2,335 + 1,300 = 3,635$  *Add women's and men's.*

*Too low.*

Try 1,304 for men's sneakers.

$1,304 + 1,035 = 2,339$  *There would be 2,339 women's sneakers.*

$2,339 + 1,304 = 3,643$  *Add women's and men's.*

*This is correct.*

**Solution:** There are 2,339 pairs of women's sneakers.

## Look Back

You can start with the answer and work backward to see if you get the information in the problem.

$3,643 - 2,339 = 1,304$  *Subtract 2,339 pairs of women's sneakers from the total number of sneakers.*

$2,339 - 1,035 = 1,304$  *There are 1,035 pairs of women's sneakers. ✓*

## Problem Solving Strategies

- **Predict and Test (Guess and Check) (Strategy # 6 )**
  - Movie tickets cost \$10 for adults and \$8 for children. On Friday night, the total sales from 40 tickets was \$370. How many adult tickets were sold?

# 7 Use Logical Thinking

When you need to think about how the information you know fits together, you can use *logical thinking* to solve a problem.

## Example

Each of four teenagers has a favorite sport. No two like the same sport. The teenagers are Ben, Sean, Lashandra, and Nancy. The sports are swimming, basketball, soccer, and softball. Sean doesn't like going into the water or playing basketball. Ben doesn't like ball games. Nancy doesn't like indoor games. Sean likes to use a bat. Which sport is each person's favorite?

### Find Out

**Think:** What facts do you know?

You know something about the sports preferences of each person.

**Think:** What do you need to find out?

You need to find out which sport is each person's favorite.

### Plan

**Think:** What strategy can you use?

You can use logical thinking to make a logic table.

### Solve

Make a table showing the names and the sports.

Read each clue. Put an **X** in the box if you know that the person does **not** like that sport. Put a **✓** in the box if you know that the person likes that sport.

	Basketball	Softball	Swimming	Soccer
<b>Ben</b>	X	X	✓	X
<b>Sean</b>	X	✓	X	
<b>Lashandra</b>	✓	X	X	X
<b>Nancy</b>	X		X	✓

Sean doesn't like the water or playing basketball. Sean likes to use a bat.

Nancy doesn't like indoor games.

Ben does not like ball games.

Look at the empty boxes. Use the information in the table to find each person's favorite sport. What conclusions can you draw?

**Solution:** Ben's favorite sport is swimming. Sean's favorite sport is softball. Lashandra's favorite sport is basketball. Nancy's favorite sport is soccer.

### Look Back

Work backward from your answer. Make sure each of your decisions matches the information in the example. ✓

## Problem Solving Strategies

- **Use logical thinking(Strategy #7)**
  - A worm is trying to escape from a well 10 ft deep. The worm climbs up 3 ft every day, but each night it slides back 1 ft. How many days will the worm take to climb out of the well?



# 8 Work Backward

Sometimes you know the amount at the end of a situation, but you need to find a missing part to solve the problem. You can use the strategy *work backward*. Start at the end and work back to the beginning.

## Example

Alonzo had 20% of his salary deducted for taxes. Then he put 25% of the remaining amount into his savings account. He spent 50% of the remaining amount for food. After spending \$38 for clothes, he had \$7 left. How much was his salary?

### Find Out

**Think:** What facts do you know?

You know that 20% of Alonzo's salary was deducted for taxes. He saved 25% of the remainder. He spent 50% of the remaining amount for food and then an additional \$38 for clothes. He had \$7 left.

**Think:** What do you need to find out?

You need to find out Alonzo's salary.

### Plan

**Think:** What strategy can you use?

Since you know how much money Alonzo had left and how much he spent, work backward.

### Solve

$$\$7 + \$38 = \$45$$

Alonzo had \$7 after spending \$38 on clothes.

$$\$45 = 0.5x$$

Alonzo spent 50% of his remaining money for food. 50% = 0.5, so \$45 is 0.5 of the money he had after savings.

$$x = \$90$$

$$\$90 = 0.75y$$

\$90 is 75% of the money he had after saving. 75% = 0.75

$$y = \$120$$

$$\$120 = 0.8z$$

20% of his salary was taken for taxes.

$$z = \$150$$

So, \$120 is 100% - 20% = 80% of his salary. 80% = 0.8

**Solution:** Alonzo's salary was \$150.

### Look Back

You can start with the answer and work forward to check your answer.

$$20\% \text{ of } \$150 = \$30$$

20% of his salary was taken for taxes.

$$\$150 - \$30 = \$120$$

$$25\% \text{ of } \$120 = \$30$$

25% went to savings.

$$\$120 - \$30 = \$90$$

$$50\% \text{ of } \$90 = \$45$$

Spent 50% of the remaining money for food.

$$\$90 - \$45 = \$45$$

$$\$45 - \$7 = \$38$$

Spent \$38 on clothes; had \$7 left. ✓

## Problem Solving Strategies

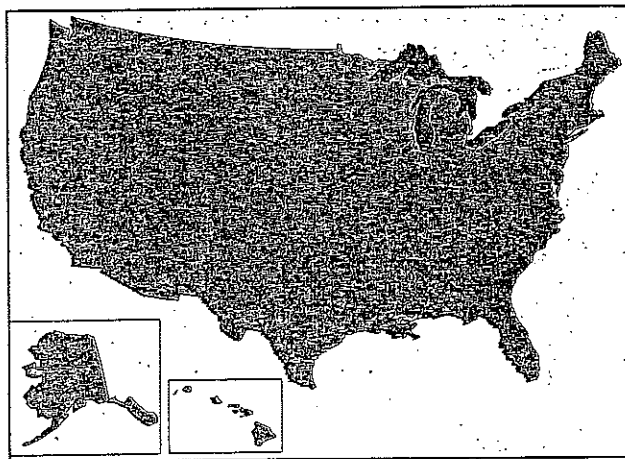
- **Work backwards(Strategy #8)**
  - The closing day activities at the Junior Summer Camp must be over by 2:45pm. We need  $1\frac{1}{2}$  hours for field competitions, another 45 minutes for the awards ceremony, and an hour and 15 minutes for the cookout. Before the festivities begin, we also need an hour for cabin checkout. So how early do we need to get started?
  
  - Luis went to the zoo for a school trip. He paid \$5 for admission. He spent \$14 at the souvenir shop. When he got home, he had \$18 left. How much money did he start with?

# 9 Solve a Simpler Problem

Sometimes the numbers in a problem are large or confusing. You can use the strategy *solve a simpler problem*. Change the numbers in the problem to smaller numbers that are easier to work with. Decide how to solve the problem. Then use your method to solve the original problem.

## Example

In May 2003, the United States population was about 300,000,000. This was about 5% of the world population. About what was the world population then?



## Find Out

**Think:** *What facts do you know?*

You know that 300,000,000 people were about 5% of the world population.

**Think:** *What do you need to find out?*

You need to find out what the world population was.

## Plan

**Think:** *What strategy can you use?*

You can solve a simpler problem. Then use your method to solve the original problem.

## Solve

**Simpler Problem:**

Assume that 3 people were 50% of the population.

$$50\% = 0.5$$

$$3 \div 0.5 = 6$$

*Divide the number of those people by the percent they represent.*

**Original Problem:**

$$5\% = 0.05$$

$$300,000,000 \div 0.05 = 6,000,000,000$$

*Use the real numbers.*

**Solution:** In May 2003, the world population was about 6,000,000,000.

## Look Back

To check your answer, you can find 5% of 6,000,000,000.

$$6,000,000,000 \times 0.05 = 300,000,000$$

*You started with 300,000,000. ✓*

## Problem Solving Strategies

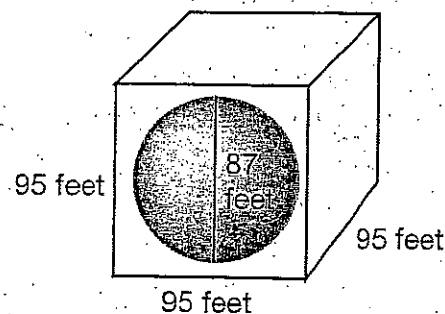
- **Solve a simpler problem (Strategy #9)**
  - How many minutes are there in one week?

# 10 Write a Formula or an Equation

Sometimes you need to find a missing amount to solve a problem. You can use the *write an equation* strategy.

## Example

The planetarium at the Rose Center in New York City is in a sphere that is in a glass cube. The sphere has a diameter of 87 feet, and the edges of the cube are 95 feet. How much larger is the volume of the cube than the volume of the sphere?



## Find Out

**Think:** What facts do you know?

You know that the sphere has a diameter of 87 feet and that the edges of the cube are 95 feet.

**Think:** What do you need to find out?

You need to know about how much greater the volume of the cube is than the volume of the sphere.

## Plan

**Think:** What strategy can you use?

You can use a formula to find each volume. Then you can subtract.

## Solve

Use the formulas for volume. Use 3.14 for  $\pi$ .

### Sphere

$$V = \frac{4}{3}\pi r^3$$

$$\approx \frac{4}{3} \times (3.14) \times (43.5)^3$$

Round 43.5 to 40:

$$V \approx \frac{4}{3} \times (3.14) \times (40)^3$$

$$\approx 267,947 \text{ cubic feet}$$

### Cube

$$V = s^3$$

$$= 95^3$$

Round 95 to 100:

$$V = 100^3$$

$$= 1,000,000 \text{ cubic feet}$$

$$1,000,000 - 267,947 = 732,053 \text{ cubic feet}$$

**Solution:** The difference between the cube and the sphere is about 732,053 cubic feet.

## Look Back

You can use a calculator to check your answer.

$$4 \div 3 \times 3.14 \times 40 \times 40 \times 40 = 267,947$$

$$100 \times 100 \times 100 = 1,000,000$$

$$1,000,000 - 267,947 = 732,053 \quad \checkmark$$

## Problem Solving Strategies

- **Write a formula or an equation(Strategy #10)**
  - The cost of materials needed to build a sled is \$8. A craftsman has a budget of \$2,000. Write an equation then solve to find how many sleds he can make?
  - You order a backpack for \$34 and pens for \$2 each online. You spend \$46, excluding the shipping cost and tax. Write an equation then solve to find how many pens you order?