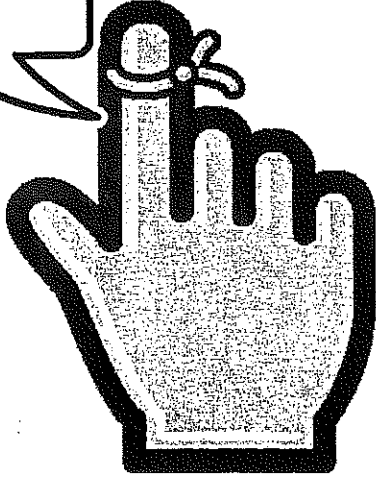


One problem
per week!!



Summer 2013 Math Packet
for rising 8th grade

Name _____

Due _____

Summer 2013 Math Packet for Rising 8th 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?

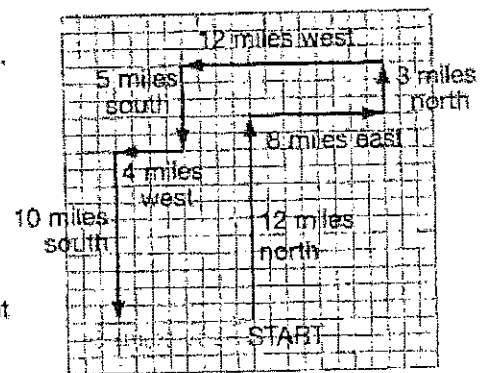
Plan

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>

16 miles west
- 8 miles east
8 miles west

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

Strategy # 1. Draw a diagram (DAD)

You can use this strategy when you need to see the information given in order to solve it.
(Shape / area / perimeter / problems)

Line AB crosses line CD at point H

Angle AHD measures 115° .

What is the measure of angle DHB?

Strategy # 2. Make a model (MAM)
(You will need paper clips to be your fencing)

You can use this strategy when you need to see the data. Then you can watch how the solution is found.

Selena has 16 sections of fencing

Each section is 1 foot wide. She wants to fence in a rectangular garden with the greatest possible area.

What dimensions should her garden have?

Use this space to create with the paper clips at least 4 different "gardens" with 16 paper clips each. Record



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?

Special Sale
2 DVDs
for the price of 1!
Choose from our
top seven DVDs.

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. ✓

Strategy # 3. Make an organized list (MAOL)

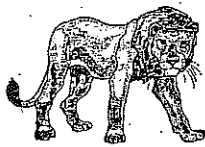
You can use this strategy to help you review the information. The list will help you organize your thinking.

In how many ways can you make \$ 130 using only quarters and nickels?

4 Make a Table or Graph

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

Example



Find Out

Plan

Solve

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?

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.

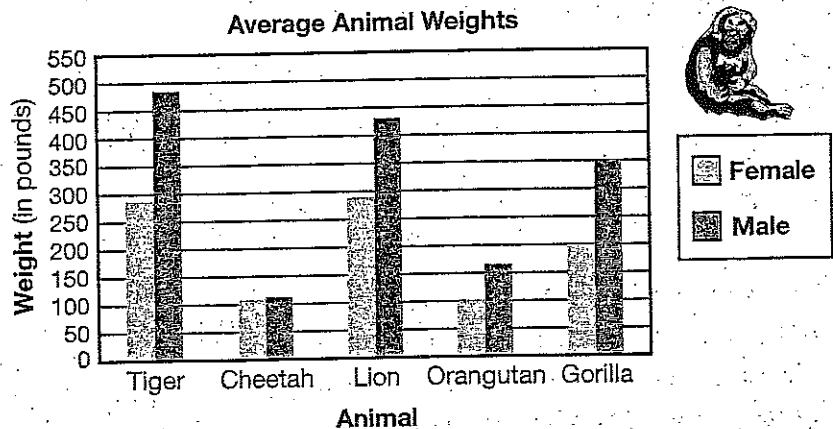
Think: *What strategy can you use?*

You can make a graph that compares the weights.

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. ✓

Strategy # 4. Make a table or a graph (MATG)

You can use this strategy to organize information given in a problem. Tables can help you see relationships and patterns in data.

Miller's boat rental charges \$4.50 per hour, plus a one-time fee of \$18.00 to rent a canoe. Rob paid \$40.50 to rent a canoe. For how many hours did he use the canoe

Hours						
Cost						

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

Find Out

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

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.

× = × = × = ✓

Strategy # 5. Look for a pattern (LFP)

You can use this strategy to organize information given in a problem. If you can find the rule for a pattern, you can use it to solve the problem.

What are the next three numbers in the pattern?

What is the rule for the pattern?

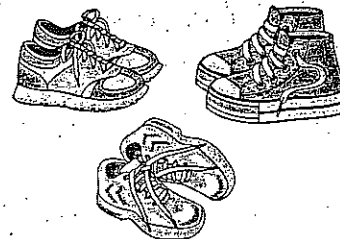
1, 1, 2, 3, 5, 8, _____, _____, _____

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.

$$1,500 + 1,035 = 2,835 \quad \text{There would be 2,835 women's sneakers.}$$

$$2,835 + 1,500 = 4,335 \quad \text{Add women's and men's.}$$

Too high.

Try 1,300 for men's sneakers.

$$1,300 + 1,035 = 2,335 \quad \text{There would be 2,335 women's sneakers.}$$

$$2,335 + 1,300 = 3,635 \quad \text{Add women's and men's.}$$

Too low.

Try 1,304 for men's sneakers.

$$1,304 + 1,035 = 2,339 \quad \text{There would be 2,339 women's sneakers.}$$

$$2,339 + 1,304 = 3,643 \quad \text{Add women's and men's.}$$

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.

$$3,643 - 2,339 = 1,304 \quad \text{Subtract 2,339 pairs of women's sneakers from the total number of sneakers.}$$

$$2,339 - 1,034 = 1,035 \quad \text{There are 1,035 pairs of women's sneakers. ✓}$$

Strategy # 6. Predict and Test (P&T)

You can use this strategy when it is difficult to work out the answer to the problem. You can make a guess and then check it. If your guess is not correct, use that guess to make a better guess.

For \$50.00, Matt can buy a movie pass that allows him to pay only \$1.00 for a matinee. The regular price for a matinee is \$4.00. How many times does Matt have to go to a matinee for the pass to be a good buy?

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
Ben	X	X	✓	X
Sean	X	✓	X	
Lashandra	✓	X	X	X
Nancy	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. ✓

Strategy # 7. Use logical thinking (LT)

You can use this strategy when you need to think about how the information fits together.

The math teacher has a box full of black, red, and white marbles. The probabilities are as follows:

of drawing a black marble: $1 / 3$

of drawing a red marble: $7 / 8$

of drawing a white marble: $5 / 18$

Are there more black, red, or white marbles in the box
Explain your reasoning

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

$$z = \$150$$

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. ✓

Strategy # 8. Work Backward (WB)

You can use this strategy when you know the total but need to find a missing part. Start at the end, and work back to find the answer.

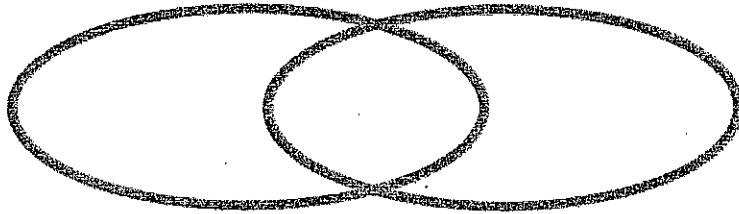
Mrs. Lee gives piano and voice lessons.

Eleven of her students take piano.

Fifteen of her students take voice.

This includes eight students who take both.

How many students does Mrs. Lee have?

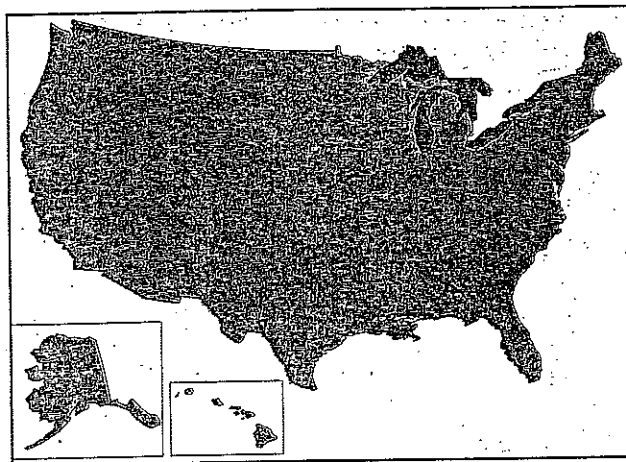


9 Solve a Simpler Problem

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. ✓

Strategy # 9. Solve a simpler problem (SSP)

You can use this strategy when the numbers in a problem are very big. Change them to smaller numbers that are easier to work with. Decide how to solve the problem. Then solve the original problem the same way.

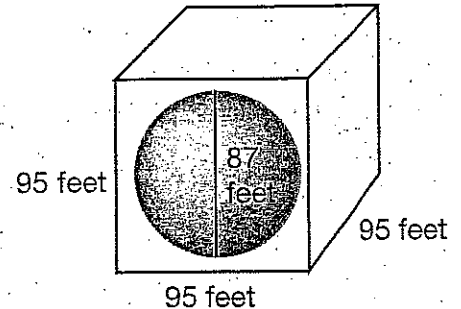
Zack is making a scale model of an aircraft carrier that is 1,050 feet long, and 250 feet wide. His model is 21 inches long. How wide is it?

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 π .

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.

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

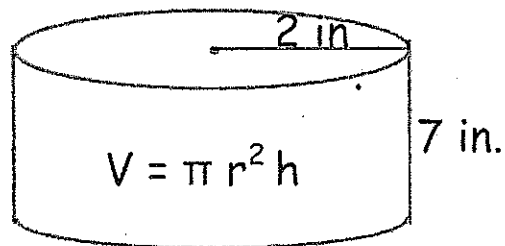
$$100 \times 100 \times 100 = 1,000,000$$

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

Strategy #10. Write a formula or an equation (WAF)

You can use this strategy when you need to find a missing amount to solve a problem.

Mrs Marshall has a vase shaped like a cylinder.



What is the volume of the vase?

Use 3.14 for Pi

Round to the nearest whole number