

Mathematics 6: **Problem Solving Mini-Unit**

Problem solving can be complicated. Some problems include lots of information. Sometimes information is missing and sometimes you have too much of it! There may be several ways to solve a problem. Your first strategy may not help you to reach a solution or your answer may be unreasonable.

A good understanding of mathematics can help when you solve or try to solve a problem. Also, your understanding of mathematics increases almost every time you try to solve a new or different kind of problem! *But you need to know more than just how to do math.* You need to decide *what math* to do. What strategy should you use? What operation(s) should you use? What information should you use? And most importantly, what are you being asked to solve?

OBJECTIVE: To become familiar with the eight standard strategies for solving mathematics problems.

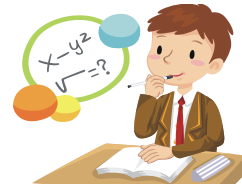
Your Notes:



PROBLEM SOLVING GUIDELINES:

1) Understand the Problem

- What do you know?
- What do you need to find out?



2) Develop a Plan

- Have you ever solved a similar problem?
- What strategies can you use?
- Estimate an answer.

3) Solve the Problem

- Do you need to try another strategy?
- What is the solution?



4) Look Back

- Did you answer the right question?
- Does your answer make sense?

Your Notes:

PROBLEM SOLVING STRATEGIES:

STRATEGY #1: LOOK FOR A PATTERN

Sometimes the numbers in a problem solve a pattern. To solve the problem, find the rule that creates the pattern. Then use the rule to find the answer.

Example: Molly's hourly pay as a dog walker increases each year by the same amount. She earned \$4.25 per hour her first year on the job and \$5.35 per hour her second year on the job. Find her hourly wage during her fourth year on the job.

Pay increase per year: $\$5.35 - \$4.25 = + \$1.10$ per hour per year.

Third Year: $\$5.35 + \$1.10 = \$6.45$ per hour.

Fourth Year: $\$6.45 + \$1.10 = \$7.55$ per hour.

STRATEGY #2: MAKE AN ORGANIZED LIST

Sometimes you need to find the number of ways something can be done. To solve the pattern, make a list of all the ways and count them. It is important to organize your list so that you don't miss any possibilities, or repeat any of the possibilities.

Example: At Stevie's Salad Emporium you can order a garden salad or Caesar salad with or without dressing, with or without croutons and with or without bacon bits. If the manager wants to list all possible combinations on the menu, how many combinations must he list?

Garden:

Caesar:

STRATEGY #3: MAKE A TABLE

A problem involving a relationship between two sets of numbers can often be solved by making a table. A table helps you organize data so that you can see the numerical answer to find the answer.

Example: Lucia emailed ads for her new craft business to three of her friends. She asked each friend to forward the email to three friends. Each friend was then asked to forward the email to three of *their* friends, and so on. How many ads were sent in the sixth round of emails?

Make a table to organize data about the emails:

Mailing	1	2	3	4	5	6
# Sent	3	$3 \times 3 = 9$	$3 \times 3 \times 3 = 27$			

STRATEGY #4: WORK BACKWARD

A problem may tell you what happened at the end of a series of steps and ask you to find what happened at the beginning. To solve the problem, work backward step-by-step to the beginning.

Example: Now that he is a Grade 6 student at Blake Middle School, Jack has to decide when to get up in the morning. He needs 10 minutes to get dressed and make his bed, 5 minutes to brush his teeth and hair, 20 minutes to have breakfast and see his family and new puppy, 12 minutes to check his backpack and lunchbox for the day's materials and lunch and 2 minutes to walk to the bus stop. His bus comes every morning at 7:07 a.m. When should Jack get up?

This problem tells you the end result (when Jack must catch his bus) and all the things which must be done before he catches his bus. To solve, add up all the times and subtract from the 7:07 a.m. bus arrival.

Solution: $10 + 5 + 20 + 12 + 2 = 49$ minutes. $7:07 - 49$ minutes = 6:18 a.m.
Jack must be up by 6:18 a.m.



STRATEGY #6: USE LOGICAL REASONING

To solve a problem using logical reasoning, decide how the facts of the problem relate to each other. Then work your way step by step from the given facts to a sensible solution. Along the way, try to not make false assumptions or draw unreasonable conclusions.

Example: Ian, Beth and Bobby collect stamps, coins and rocks, though not necessarily in that order. Beth is the sister of the rock collector. Bobby once had lunch with both the rock collector and the stamp collector. Match each person with his or her hobby.

	stamps	coins	rocks
Ian			
Beth			X
Bobby			

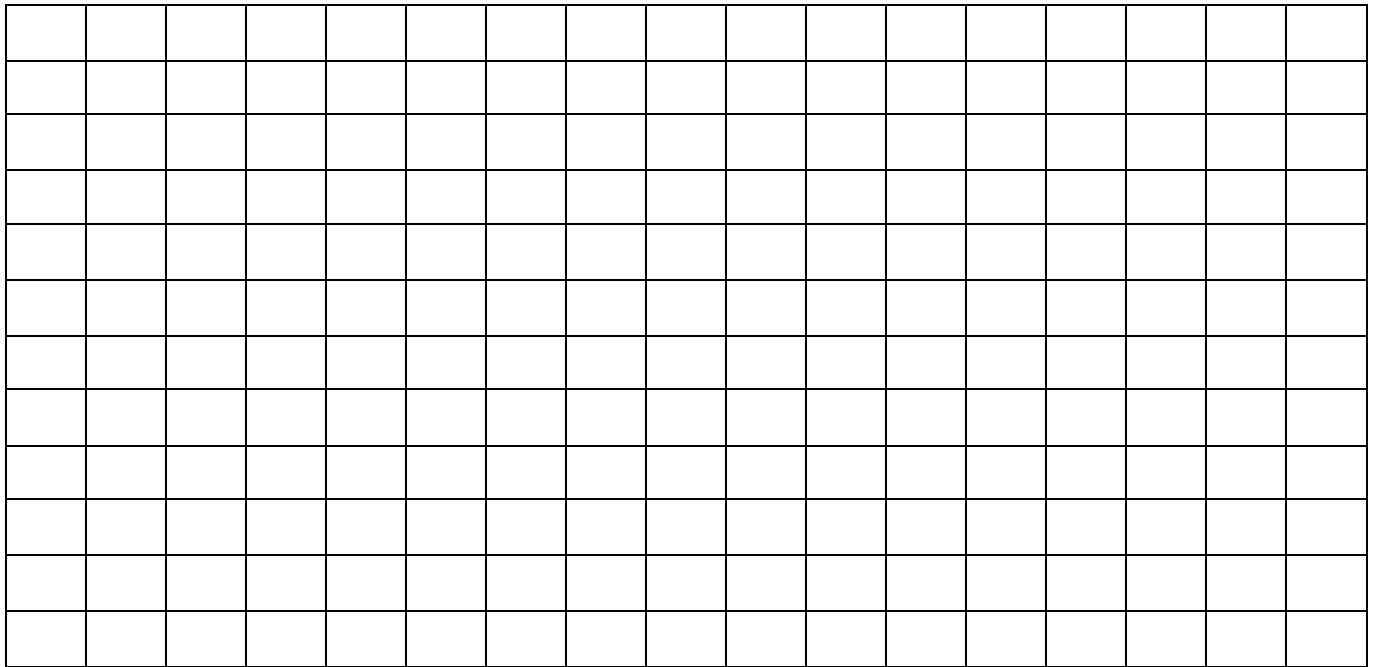
Special Note: this strategy can also be used for algebraic reasoning. For example, if the cost of one scrumptious cupcake at Connie's Cakes is m (yes, for mmmm good!), then the cost of 3 scrumptious cupcakes is " $3 \times m$ ". If I told you that $m = \$2.50$, you could solve the expression " $3 \times m$ " and tell me three cupcakes costs/equals \$7.50. This is just one example of algebraic reasoning and we'll see many, many more as the year progresses!

STRATEGY #7: DRAW A DIAGRAM

Some problems are visual. They may involve objects, places or physical situations. To solve such a problem, draw a diagram to help you see the relationships among the given data. Then use the relationships to find the answers.

All the city blocks in Sunnyville are the same size. Margaret started her paper route at the corner of two streets. She goes eight blocks south, 13 blocks west, 8 blocks north, and 6 blocks east. How far does Margaret travel each day on her route?

Sunnyville



STRATEGY #8: SOLVE A SIMPLER PROBLEM

A problem may seem to be or actually be very complex! It may contain very large numbers or appear to require many steps to solve. Instead of solving the given problem, solve a similar but simpler problem. Look for shortcuts, patterns and relationships. Then use what you've learned to solve the original problem.

Example: A 15 second commercial for the Super Bowl may cost an advertiser 1.7 million this year. If the Super Bowl has 65 minutes worth of commercials, how much money will be made from advertising spots alone?

Solution: Start by solving a simpler problem. Let's try to solve the problem for one minute of advertising time bought and then multiply by 65 to get the total advertising fees. $\$1,700,000 \text{ per } 15 \text{ seconds} \times 4 = \$6,800,000 \text{ per minute} \times 65 \text{ minutes of ad time} = \$442,000,000 \text{ advertising fees for one Super Bowl!!!}$