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Section 1 — Teaching Strategies for Problem Solving

Introduction to Teaching Strategies

Often the most difficult part of problem solving is simply in knowing where to start. The system presented here gives both student and teacher that starting place. The clearly defined four-step method is easily applied to both simple and complex problems and will allow students consistent practice in the thought processes needed to reach correct solutions. Students are provided with ten different strategies to choose from to use as tools in working through problems.

A 4-Step Method to Problem Solving

Step 1 – Discover what the problem is asking you to solve. To do this you must identify the important information and the information that does not help to solve the problem. You must also determine if any necessary information is missing and what you must do to get that information.

Step 2 – Choose a strategy that will help to solve the problem. There may be more than one strategy that you need to use. Find the strategy or strategies that will aid in finding the answer to the problem.

Step 3 – Solve the problem. Work the problem until you find the answer or answers using the strategy or strategies you chose.

Step 4 – Go back over the problem. Check the solution to see that it answers the question.

Problem Solving Strategies

Use Objects To Solve The Problem

You may find it helpful to use objects to try and solve a problem. This will allow students to develop visual images of both the information given in the problem and the solution process. You can use objects such as coloured counters, or scraps of paper. Objects do not need to be elaborate.

Make And Use a Drawing Or Model

It may be helpful to use a drawing or diagram when trying to solve a problem. This could help the student understand data that is in the problem.

Make A Table

Students may find that making a table helps them keep track of data, see that there is missing data and discover data that is asked for in the problem.

Make A Systematic List

Recording work in a systematic list makes it easier to review what has been done and to identify further steps that need to be completed.

Guess And Check

Guess and check is helpful when a problem presents large numbers or many pieces of data. When students use this strategy, they guess the answer and then test to see if it is correct; if the previous answer is incorrect, they guess again. They continue the process to come closer to the solution. This is a trial and error strategy.

Look For A Pattern

By identifying a pattern, students can predict what will come next. This is an important strategy and is used to solve many different kinds of problems.

Work Backwards

In order to solve certain problems, the student needs to make a series of computations starting with information presented at the end of a problem and ending with information presented at the beginning of the problem.

Use Logical Reasoning

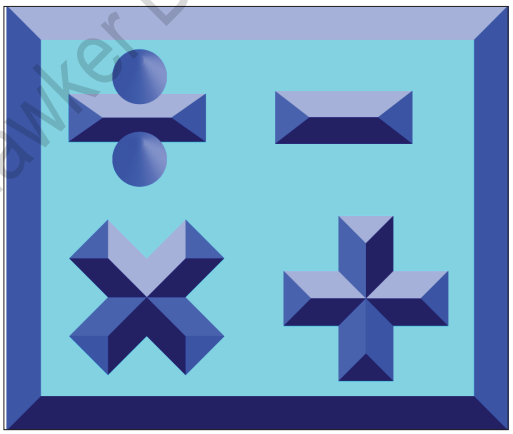
Some problems will include or imply various conditional statements such as: 'if-then-else" or "if something is true, then…." or if something is not true, then…" This kind of problem requires logical reasoning.

Make It Simpler

Making a problem simpler may mean reducing large numbers to smaller ones, or reducing the number of items given in a problem. This in turn may suggest what operation or process to use and could reveal a pattern to use.

Brainstorming

This strategy can be used when all else fails. This strategy means looking at a problem in new and inventive ways. This requires the student to be creative, flexible and to keep trying until the light goes on.



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Problem-Solving Practice Exercises

Logical Reasoning

The after school team is playing softball on the playground. Sue, Colleen, Dave and Mike are playing together.

- Sue and Dave have gloves.
- Dave does not have a hat.
- Mike and Colleen have hats.
- Colleen has a bat.

What name belongs on each player?

What Do You Know

- What question do you have to answer?
- How many are playing softball?
- What are their names?
- What do you know about Sue?
- What do you know about Dave?
- What do you know about Mike?
- What do you know about Colleen

Find the Answer

- What does the first clue tell you?
- What does the second clue tell you?
- What does the third clue tell you?
- What does the fourth clue tell you?

How I Know I'm Right

- Look back to see if your answer fits with what the problem tells you and asks you to find. Read the problem again. Does your answer seem to fit?

Answers

Sue = 

Dave = 

Mike = 

Colleen = 

Act Out Or Use Objects

Sandy has three 5¢ coins, three 10¢ coins and three 20¢ coins. She put them in 3 rows and 3 columns. When she finished, there was one 5¢ coin, one 10¢ coin and one 20¢ coin in each row and in each column. Where did Sandy put each of her coins?

What Do You Know?

- What question do you have to answer?
- How many 5¢, 10¢ and 20¢ coins are there?
- How many rows and columns are there?
- What was in each row and in each column?

Find The Answer

- Where is the 5¢ coin in each row?
- Where is the 10¢ coin in each row?
- Where is the 20¢ coin in each row?
- Look at the columns. Make sure there is on of each in the columns.

How I Know I'm Right

- Does your answer fit with what the problem asks you to find?
- Read over the problem again.
- Does your answer fit?

Answers

5¢ 10¢ 20¢

10¢ 20¢ 5¢

20¢ 5¢ 10¢

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Pencil Give-Away

Mrs Johnson is giving away pencils to her students. There are 5 red, 3 blue, 2 yellow and 6 green pencils. If she hands them out without looking at them, which colour are you least likely to get?

My Maths Work

My answer is _____.

My Thinking

How I Know I'm Right

My Name _____

If you need more room, use the back of this page.

Garden Monsters!

Super Slug, Giant Snail, Mighty Mouse, Black Bird and Red Ant all were hiding out in Mr McGregor's garden last night. Each ate one of his garden plants. The plants were a pink petunia, a red strawberry, a blue blueberry, a purple eggplant and an orange carrot. Match the monsters with the plant they ate. Use the clues below.

* Giant Snail & Mighty Mouse only eat plants whose colours begin with the letter "P".
* Super Slugs only eat red coloured plants.
* Red Ant does not like orange carrots.
* Mighty Mouse did not eat the purple eggplant.

My Maths Work

My answer is _____.

My Thinking

How I Know I'm Right

My Name _____

If you need more room, use the back of this page.

Statistics and Probability – Level 1

Problem Statement	Solution
10 Coins – Can you make one dollar ($1.00) using exactly 10 coins? Show how you figured out your answer. Make a graph showing the number and kinds of coins.	Your change would be 10 ten-cent coins. Strategies would include an understanding that most of the coins will have to be ten-cent coins, if you are to have 10 coins. Students could make a table to work through all options, but this would take a fair amount of time. They should graph their answer.
Ages – Robert is 6 years younger than Shane and 6 years older than Chris. Their average age is 10. How old is each boy?	Shane is 16, Robert is 10 and Chris is 4. If their average age is 10, the sum of their ages must equal 30. Through trial and error, starting with Chris at age 1 and adding the ages together to see if it equals 30, you can find their correct ages.
Allison's Friends – Allison made a chart comparing the heights of some of her friends in centimetres. Mary 145 cm Andrea 120 cm Carla 130 cm Tim 155 cm Which friend is the shortest? Draw and label a graph showing the heights of her friends.	Andrea is the shortest of Allison's friends. Check their graph for accuracy and labelling.
Circles, Squares and Triangles – Your teacher has put 50 shapes that are circles, squares or triangles. There are 10 circles in the bag. There is a 50% chance of randomly selecting a square. How many of the 50 shapes are triangles?	There are 25 triangles in the bag. A 50% chance means that half of the shapes must be triangles. One-half of 50 shapes is 25.

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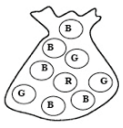
Class Picnic – The year three class took a survey to find out what people wanted to eat at the Class Picnic. 15 people wanted hamburgers, 23 wanted chicken, 8 wanted hot dogs and 14 wanted tuna sandwiches. Complete the table. Draw and label a graph on the back side of page. Which food is most liked by the year threes? Year Three Class Picnic Food Choices Hamburgers ____ Chicken ____ Hot Dogs ____ Tuna Sandwich ____	The food most liked was chicken (by 23 students). Check their graph for accuracy and labelling. Make sure that they complete the data table.
Garden Monsters – Super Slug, Giant Snail, Mighty Mouse, Black Bird and Red Ant all were hiding out in Mr McGregor's garden last night. Each ate one of his garden plants. The plants were a pink petunia, a red strawberry, a blue blueberry, a purple eggplant and an orange carrot. Match the monsters with the plant they ate. Use the clues below. *Giant Snail & Mighty Mouse only eat plants whose colour begins with the letter "P". *Super Slugs only eat red coloured plants. *Red Ant does not like orange carrots. *Mighty Mouse did not eat the purple eggplant.	Super Slug ate the Red Strawberry. Giant Snail ate the Purple Eggplant. Mighty Mouse ate the Pink Petunia. Black Bird ate the Orange Carrot. Red Ant ate the Blue Blueberry.
Golf Matches – Six people entered into a golf tournament. Each player had to play each other person one time. How many games were played? Use drawings to help explain your answer and your thinking.	There were 15 golf games played. Player 1 must play Player 2, Player 3, Player 4, Player 5 and Player 6. This is 5 games. Player 2 has played Player 1, but he must play against Player 3, Player 4, Player 5 and Player 6. This is 4 more games. Player 3 has already played against Player 1 and Player 2, but must go against Player 4, Player 5 and Player 6. This is 3 additional games. Player 4 still has to play against Player 5 and Player 6, which is 2 more games. And last, Player 5 must play Player 6, adding 1 more game. The total is 5 + 4 + 3 + 2 + 1 or 15 games.

How Many Numbers? – If you are given a four-digit number of 6318, how many new four-digit numbers can you create without using the same digit twice? Making a chart may help you figure it out.	There are 24 possible number arrangements. 6183, 6138, 6831, 6813, 6318 and 6381 3618, 3681, 3816, 3861, 3168 and 3186 1683, 1638, 1836, 1863, 1368 and 1386 8163, 8136, 8361, 8316, 8613 and 8631
How Many Peanuts? – The students in Mrs Alexander's class were each given a small bag of peanuts. Each student opened their bag and counted the number of peanuts it contained. Here are the numbers each student reported: 15, 22, 18, 17, 17, 20, 16, 14, 21, 20, 19, 18, 15, 20, 21, 18, 17, 19, 20, 17 If someone asked you, "About how many peanuts are in a bag?" what would you say? Explain your thinking at each step and your answer(s).	There are approximately 18 peanuts in a bag. If you add all of the peanuts in the bags together, you get 364 peanuts. There were twenty students, so the average per bag is about 18 peanuts (364 divided by 20 equals 18 and a small amount more.).
Ice-Cream Survey – David took a survey of the people in his class. He found out that 8 people like chocolate ice-cream best, 6 people like strawberry best, 6 people like vanilla best and 4 people don't like any of these. Make a graph to show these results. Tell two things you learned from the graph.	Best graph to make would be a bar graph. Check student statements against their graph.
Ice-Cream Toppings – Andy visited his local ice-cream shop this morning to buy himself a bowl of ice-cream. He found out that they had three flavours of ice-cream and four toppings. How many one flavour, one topping combinations did he have to choose from? Explain your answer(s) and your thinking.	There are 12 choices of one flavour, one topping dishes of ice cream. If I choose Flavour 1, I have four choices of topping. If I choose Flavour 2, I have four choices of topping. If I choose Flavour 3, I have four choices of topping. Adding all of these together, I get 12 possible combinations.
Introductions – Five people enter a room and introduce themselves to each other. If everyone shakes everyone else's hand just once, what is the total number of handshakes that occur?	There will be 10 handshakes. #1 shakes hands with #2, #3, #4 and #5. Then #2 shakes hands with #3, #4 and #5. Next, #3 shakes hands with #4 and #5. Finally, #4 shakes hands with #5.
Marble Bag – Jacob was getting ready to play marbles with a friend. His marble bag is shown below. If he reaches in without looking and takes out one marble, what colour is he most likely to get? (R = red, B = blue, G = green) 	Jacob is most likely to take out a blue marble. If I count the marbles in the bag, I find there are 5 blue marbles, 3 green marbles and 1 red marble, for a total of 9 marbles. Over half of the marbles are blue, making it the most likely to be drawn out.

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