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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, test to see if it is correct and guess again if the previous answer is incorrect. 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

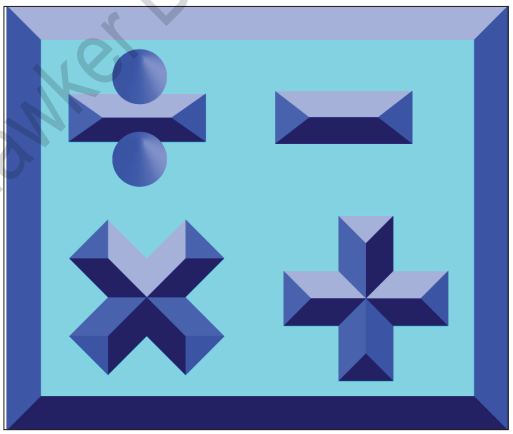
Some problems will include or imply various conditional statements such as: " if-then-else" or "if something is true, then…" or "if something is not true, then…" This kind of problem requires logical reasoning.

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 use 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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Lots of Mittens

Some children went outside in the snow to make snowballs. When they came back in, they left their mittens on the table to dry. There were 18 mittens. How many children made snow balls.

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.

Pieces of Pie

Big Bob took 2/3 of a pie, but could only eat 1/2 of what he took. His son, Little Bob, took 1/2 of a pie, but could only eat 2/3 of what he took. Which of them ate more? Explain why the answer works as it does. Be sure to include a diagram.

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.

Arnie Takes Pictures on Holiday

Arnie brought 3 rolls of film along with him on his trip overseas. Each roll would let him take 36 pictures. He took 67 pictures the first day. How many rolls of film did he load into his camera? How many pictures could he still plan on taking the second day without buying more film?

My Maths Work

My answer is _____.

My Thinking

How I Know I'm Right

Calculations and Estimation – Level 1

19 Wheels – Grant looked out his window and saw 19 wheels going down the street. What vehicles did he see? Show your thinking. What other ideas can you show?	There could be 4 cars or trucks and 1 tricycle. Or there could be 3 cars or trucks, 2 motorcycles or bicycles, and 1 tricycle. There might be other combinations, but in all cases, there will have to be one vehicle with an odd number of wheels.
23 Children – 23 children ride the bus. 6 children are already on the bus. How many children still need to get on?	17 students still need to get on the bus – the bus picks up a total of 23, and you subtract the 6 who are already on the bus, giving you 17 students who still need to get on the bus.
Apples and Bananas – Mr Clark brought 13 apples and 18 bananas to school as snacks for his students. He has 24 students in his class. Every student received at least one of the fruits. If all of the apples and bananas were given out, how many students received more than one piece of fruit?	7 students will receive more than one piece of fruit – 13 apples plus 18 bananas equals 31 pieces of fruit to give to 24 students. This leaves 7 additional pieces of fruit for the students.
Award-Winning Ribbons – You have 60 blue 1st place ribbons. You have 1/2 as many red 2nd place ribbons as you have blue ribbons, and you have 1/2 as many green 3rd place green ribbons as red ribbons. How many green 3rd place ribbons do you have?	You have 15 green 3rd place ribbons. You have 60 blue 1st place ribbons. You have 1/2 as many red second place ribbons, or 30 ribbons (1/2 x 60). And, you have 1/2 as many green third place ribbons as red second place ribbons, or 15 ribbons (1/2 x 30).
Brett's Wheels – Brett had 2 bicycles and 3 tricycles. How many wheels is that? Show how you got your answer.	Brett has 13 wheels. Each bicycle has 2 wheels for a total of 4 wheels (2 x 2). Each tricycle has 3 wheels for a total of 9 wheels (3 x 3). You add these together to get 13 (4 + 9).
Buying Lollies – Your grandmother gave you $6.25 to spend on lollies. She said you could only spend $.25 each day. You plan to start spending your money on the first of June. On what day will you run out of money?	You will run out of money on June 25th. You start spending 25¢ each day on the 1st of June. That means that you spend $1.00 every four days. It takes 24 days to spend $6.00 and one more day to spend the remaining 25¢, or a total of 25 days.
Change Back – You are buying an item that costs $14.35. You want your change to be a $10 note. How much money must you give the cashier?	You must give the cashier $24.35 so that you have paid her $10 more than the item costs. She can then give you back a $10 note. You can use any combination of coins and notes to make up the $24.35.

Change for Fifty – How many different ways can you make change for a fifty-cent coin?	Possible answers are: 1) ten 5¢ coins; 2) five 10¢ coins; 3) two 20¢ coins and one 10¢ coin; etc. You could also come up with other combinations using 5¢ coins in place of larger denominations.
Chocolate Bar – A chocolate bar is cut into several equal pieces. If George eats 1/3 of the pieces, and Sara eats 1/2 of the remaining pieces, there are 12 pieces left over. Into how many pieces was the chocolate bar originally divided? Explain your thinking at each step.	The chocolate bar was originally broken into 36 pieces. There are 12 pieces left over and Sara had just eaten 1/2 of what George had left. This means that Sara ate 12 pieces. When George finished, there were then 24 pieces. The amount he ate was 1/3 of the original number, which means he left 2/3 of the original number. If 2/3 equals 24 pieces, each 1/3 has a value of 12. The original number was 36.
Chocolate Chip Biscuits – Angela and Cathy talked their mother into making some chocolate chip biscuits. The biscuits were so big she decided to cut each one in half. Angela ate nine halves and Cathy ate seven halves. How many whole biscuits did they eat altogether? Explain your thinking with diagrams, words and numbers.	They ate a total of 8 biscuits. If Angela ate 9 halves and Cathy ate 7 halves, they ate 16 halves together. Divide 16 by 2 and you get 8 whole biscuits.
Concert Tickets – Of 1200 concert tickets sold, 1/2 sold for $15, 1/3 sold for $10 and the rest sold for $7. How many tickets sold for $7?	There were 200 tickets that sold for $7 each. There were 1200 tickets sold. One-half of the 1200 tickets were sold for $15 each (600 tickets). One-third of the 1200 tickets were sold for $10 each (400 tickets). The total for those two groups is 1000 tickets. This leaves 200 tickets for $7 each (1200 – 1000 = 200)
Cows and Chickens – Alan's class visited a farm last week. When standing outside the barn door, he could see 30 legs. How many cows and chickens did he see when he went inside? Show and tell as many possibilities as you can figure out.	7 cows and 1 chicken; 6 cows and 3 chickens; 5 cows and 5 chickens; 4 cows and 7 chickens; 3 cows and 9 chickens; 2 cows and 11 chickens; 1 cow and 13 chickens.
Guinea Pig Problem – Our guinea pig has 4 toes on each foot. He has 4 feet. How many toes does he have altogether? Show how you figured out your answer.	He has 16 toes. There are 4 feet, each with 4 toes for a total of 16 toes (4 x 4 = 16).

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