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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

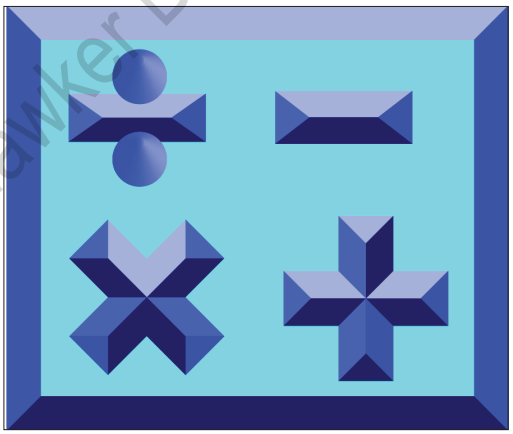
Some problems will include or imply various conditional statements such as: " if-then-else" or "if something is true, then…." or "if something is not true, then…" This kind of problem requires logical reasoning.

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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Heidi's Dogs

Heidi has two dogs named Pepper and Harper. She has 34 dog biscuits to split between the two dogs so that Harper will get exactly 10 more biscuits than Pepper. How many biscuits will each dog 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.

Ladybird Convention

The Ladybird Convention met in Sydney's garden. On the first day there were 5 ladybirds. On the second day, there were 11 and on the third day there were 18 ladybirds. At this rate, how many ladybirds will there be on the 10th day?

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.

Algebraic Relationships – Level 1

16th Birthday – Manny was born in 1999. Carl is three years older than Manny. In what year will Carl celebrate his 16th birthday?	He will celebrate his 16th birthday in 2012. If Carl is 3 years older than Manny, who was born in 1999, Carl must have been born in 1996. If he turns 16, it will be 16 years after he was born, or in 2012 (1996+16=2012).
Age Problem – David is nine years older than Mike and three years older than John. The total of their ages is 36. How old is each person?	David is 16 years old, John is 13 years old and Mike is 7 years old.
Baking Pies – On Monday, Mrs Meyers baked two pies. On Tuesday, she baked four pies. Wednesday, she baked 6 pies. If the pattern continues, how many will she bake on Friday?	She will bake 10 pies on Friday. There are five days on which she bakes pies and she bakes 2 more pies each day than she did the day before. So, on the 5th day, she bakes 10 pies (5 x 2 = 10).
Bob's Mother – Bob's mother is 32 years old. Her son Bob is 8 years old. Right now his mother is four times as old as Bob. In how many years will she be only twice as old as Bob?	Bob's mother is now 32 years old and Bob is 8 years old. One way to solve the problem is to make a table showing their ages each year until Bob's mother is twice as old as Bob. When Bob is 24, his mother will be 48, which is twice as old as Bob. This will occur in 16 years (24-8=16).
Bouncing Ball – A special super ball is dropped from 64 metres high. Each time the ball hits the ground, it bounces back only half as high as the distance it fell. The ball is caught when it bounces back to a high point of 1 metre. How many times does the ball hit the ground? You may use drawings to help explain your answer and your thinking.	The ball bounces 6 times. The first time it comes back up to a height of 32 metres. The second time, it comes back to a height of 16 metres, the third time to 8 metres, the fourth time to 4 metres, the fifth time to 2 metres and the sixth time to 1 metre, at which height it is caught.
Coloured Cubes – Sam has six cubes. He has more red cubes than green ones. He has twice as many green cubes as yellow cubes. How many cubes of each colour does he have?	He has 1 yellow cube, 2 green cubes and 3 red cubes. Since none of the colours have the same number of cubes, your only choices are 1, 2 and 3. Using the relationship data, it follows that 1 cube is yellow, 2 cubes are green and 3 are red.

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Consecutive Days – If the sum of four consecutive days is 46, what is the date of the 5th consecutive day?	The date is the 14th. The five dates are the 10th, 11th, 12th, 13th and 14th. The sum of the first four dates is 46 (10 + 11 + 12 + 13 = 46). A good place to start is the fact that four consecutive dates has to total 46, which means that the dates will not be in the single digit range, nor will they be in the 20s.
Fish in Maria's Aquarium – Maria has more than 10 fish, but less than 20 fish in her aquarium. If you count by threes and count by fours, you say the number of fish she has. How many fish does Maria have?	Maria has 12 fish in her aquarium. This is the only number that you say when you count by 3s and by 4s. (12 is divisible by both 3 and 4.)
Go Fly a Kite! – Eddie was flying his kite. He had let out 10 metres of string when the wind began to blow very strongly. He decided to bring his kite down, but each time he brought in 1 metre of string, the wind would blow so hard that it would take back out 0.5 metres of string. How many times did he have to bring in string to finally get his kite back down to the ground?	He had to bring in string 20 times. Each time, he brought in 1 metres of string, but lost 0.5 metres. This means that he only gained 0.5 metres each time. If he had 10 metres of string to bring in, divide 10 metres by 0.5 metres for an answer of 20. This is the number of times that he brought in string to get the kite to the ground.
Going to the Circus – Alex, Heidi, Carla and Kate are going to the circus. They are waiting in line to buy their tickets. Using the information below, place the four students in the order they are standing in line. Carla is standing in front of Alex. The 3rd person's name has 4 letters. Alex is standing between Heidi and Carla. Heidi is standing behind Kate. _____ _____ _____ _____ TICKETS	The order for the people from back to front of the ticket line is: Kate, Heidi, Alex and Carla.
Golf Lessons – Travis had his schedule for his golf lessons damaged when he spilt water on it. Look for a pattern in what is left of the schedule. **Golf Lessons** *Monday* 11.30 a.m. Tuesday 11.45 a.m. Wednesday _____ _____ 12.15 p.m. _____ 12.30 p.m. Saturday _____ What were the missing days and times? Explain how you filled in the pattern.	On Wednesday, the time should be 12.00 p.m.. Thursday should follow Wednesday and Friday should follow Thursday. On Saturday, the time should be 12.45 p.m. Each day, the time of the lesson is 15 minutes later.

Hamburgers, Hot dogs and Soft drinks – Twenty people attended the New Year's Eve fireworks and bought food at the snack stand. The total of the receipts was $20. Each hamburger cost $3, hot dogs cost $2 and soft drinks were 50¢. How many of each food were purchased?	The key criteria are that there are twenty items purchased, as there are 20 people, and the total receipts is $20.00. This means most people only purchased a soft drink. There were 14 soft drinks, 5 hot dogs and 1 hamburger purchased. (14 x 50¢ = $7.00, 5 x $2.00 = $10.00, 1 x $3.00 = $3.00, $7.00 + $10.00 + $3.00 = $20.00 spent, and 14 + 5 + 1 = 20 items purchased.)
Handshakes – Six 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 occurred?	It will take 15 handshakes for everyone to shake everyone else's hand just once. Call them A, B, C, D, E and F. A shakes hands with B, then with C, then with D, then with E, and last, with F. This is 5 handshakes. Since A and B have already shaken hands, B must shake hands with C, then with D, then with E, and finally, with F. This is 4 handshakes. C has already shaken hands with A and B. So C must shake hands with D, then with E, and then with F. This is 3 handshakes. As A, B, C, and D have already shaken hands with each other, D must still shake hands with E and F. This is 2 handshakes. Last, E must shake hands with F. This is 1 handshake. The total handshakes is 5+4+3+2+1 or 15 handshakes.
Heads and Feet – A farmer has some hens and some rabbits. Together these animals have ten heads and twenty-eight feet. How many of each animal does the farmer have?	Since each rabbit and hen has only one head and there are ten heads, there are only ten animals. Making a table of rabbits and chickens (totalling 10) and their corresponding number of feet will allow you to select the only answer where there are 28 feet. There are four rabbits and six chickens (4 x 4 = 16 feet, 6 x 2 = 12 feet, and 16 + 12 = 28 total feet for the 10 animals).
Heidi's Dogs – Heidi has two dogs named Pepper and Harper. She has 34 dog biscuits to split between the two dogs so that Harper will get exactly 10 more biscuits than Pepper. How many biscuits will each dog get?	Harper gets 22 dog biscuits and Pepper gets 12 dog biscuits. If we subtract the 10 extra biscuits from the 34 total biscuits, we get 24 biscuits. If we divide these between the two dogs, each gets 12 biscuits (1/2 of 24 = 12). Then Harper gets the extra 10, giving him a total of 22 biscuits.

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