Ready-Ed Publications

PHOTOCOPY MASTERS

Primary Maths
PROBLEMS *for*
8-10
year olds

* **Task cards for developing a range of maths problem solving strategies.**

* **Activities cover all key learning areas of the maths curriculum.**

Introduction

The *Primary Maths Problems* series is a comprehensive teacher resource containing a variety of reproducible mathematical problem task cards – some with one solution, some with a number of solutions and some open ended. The problems are related to practical everyday mathematical situations, with each activity designed to challenge students to use their knowledge and problem solving skills.

Problem solving can develop many valuable skills in our students such as logical reasoning, creative thinking and communication skills. Students require perseverance, flexibility in ideas and methods, reflective thinking and confidence if they are going to be successful in this area. The problems will ask students to draw on a number of mathematical strategies in order to solve them. These strategies need to be introduced and taught to students if they are going to gain the skills necessary to solve a variety of problems. For students to solve a problem they first need to read the facts carefully and understand what the problem is asking them to do. They then need to work out a plan for solving the problem, carry out the processes involved and hopefully look back over their answer and assess the results successfully.

Problems can be solved using a number of different strategies. These strategies may include:
- Think, estimate and check
- Draw a diagram or picture
- Look for patterns
- Make a model
- Act out the problem
- Construct a table or a graph
- Write a statement
- Make a list
- Calculate
- Reflect and assess results

Prior to presenting the problems from this book to your students, put a list of these strategies on display. Go through each one and present students with an example to work with. Keep the strategies on display, then as your students work through the various problem cards from this book, ask them which strategies they need to solve each problem. In some cases they may need to use more than one strategy to solve a problem. A checklist included in this book allows teachers and students to keep a record of the strategies used to solve each problem. The above strategies are explained more thoroughly and with examples further on in the teaching notes, which ideally should be worked through with the students.

The problem cards in this book have been divided into the four main areas of the maths curriculum:
- SPACE
- NUMBER
- MEASUREMENT
- CHANCE and DATA

The principles of WORKING MATHEMATICALLY and REASONING and STRATEGIES have been incorporated into each of the four main areas.

Contents

PROBLEM CARDS: Space and Location

TITLE	STRATEGY	OUTCOME	PAGE #
Task 1: Bridges	Make a model	Identifies and represents useful shapes in construction.	..... page 13
Task 2: Lines	Draw a diagram	Identifies lines within shapes.	..... page 13
Task 3: Straight Lines	Make a model	Recognises and represents straight lines in construction.	..... page 14
Task 4: Curved Lines	Make a model	Recognises and represents curved lines in construction.	..... page 14
Task 5: Cylinders	Make a model	Uses 2D shapes to construct a 3D model.	..... page 15
Task 6: Rabbit Hutch	Make a model	Constructs a 3D model for a purpose.	..... page 15
Task 7: Farmyards	Make a model	Visualises and constructs shapes using lines.	..... page 16
Task 8: Houses	Make a model	Makes simple models of 3D shapes. Recognises useful shapes in construction.	..... page 16
Task 9: Towers	Make a model	Identifies and uses useful shapes for construction.	..... page 17
Task 10: Symmetry	Draw a diagram	Identifies and uses symmetry for design purposes.	..... page 17
Task 11: Tessellating Tiles	Look for patterns Draw a diagram	Recognises and uses tessellating shapes for design purposes.	..... page 18
Task 12: The Aquarium	Draw a diagram	Uses and understands the language of location.	..... page 18
Task 13: Step It Out	Act it out Write a statement	Uses and understands the language of location.	..... page 19
Task 14: Local Map	Write a statement	Visualises, finds and compares paths on simple maps.	..... page 19
Task 15: Lost!	Make a list	Interprets and describes location using a compass.	..... page 20
Task 16: Stranded	Calculate	Uses knowledge of space and number to solve a problem.	..... page 20
Task 17: Playground	Draw a diagram	Visualises, designs and records features when making a simple map.	..... page 21
Task 18: Lost Treasure	Draw a diagram	Uses compass points to interpret and describe direction.	..... page 21
Task 19: Zoo Map	Look for patterns	Uses grid references to organise and locate items on a map.	..... page 22/23
Task 20: School Map	Draw a diagram	Plans and draws simple maps of a familiar environment.	..... page 22
Task 21: Assessment Cubes	Make a model	Uses 2D shapes to construct a 3D model.	..... page 24
Task 22: Assessment Class Position	Draw a diagram	Understands and demonstrates position in a familiar environment.	..... page 24

PROBLEM CARDS: Number

TITLE	STRATEGY	OUTCOME	PAGE #
Task 1: The Cinema	Draw a diagram Calculate	Selects appropriate operations and computation methods to solve problems involving numbers.	..... page 25
Task 2: Number Combinations	Look for patterns Make a list	Uses knowledge of number to represent multiple numbers.	..... page 25
Task 3: Emus and Wombats	Draw a picture Estimate and check	Solves a problem using knowledge of number and number groups.	..... page 26
Task 4: Magic Squares	Calculate	Uses addition to solve number patterns.	..... page 26
Task 5: Goals and Points	Estimate and check	Uses addition and multiplication facts to solve a problem.	..... page 27
Task 6: Equations	Make a list Calculate	Generates equations using set numbers and operations.	..... page 27
Task 7: 8 Km Run	Calculate Look for patterns	Uses knowledge of multiplication and addition to solve a problem.	..... page 28
Task 8: Trip to the Museum	Calculate	Uses knowledge of division to solve a problem.	..... page 28
Task 9: Street Numbers	Look for patterns	Uses knowledge of number facts and patterns to solve a problem.	..... page 29
Task 10: High 5	Draw a diagram Look for patterns	Uses knowledge of number facts and patterns to solve a problem.	..... page 29

Curriculum Links

The activities in this book can be linked to the following areas in the Mathematics curriculum documents.

VICTORIA*
Number
Numbers, Counting and Numeration – 2.1, 2.2, 2.3, 2.4
Mental Computation and Estimation – 2.1
Computation and Applying Number – 2.1, 2.2, 2.3, 2.4
Number Patterns and Relationships – 2.1, 2.3
Space
Shape and Space – 2.1, 2.3, 2.4, 2.5, 2.6
Location – 2.1, 2.2, 2.3, 2.4
Measurement and Data
Measuring and Estimating – 2.1, 2.3, 2.4, 2.5
Time – 2.1, 2.2
Using Relationships – 2.1
Chance – 2.1, 2.2
Data – 2.1, 2.2, 2.3, 2.4
Reasoning and Strategies
Mathematical Reasoning – 2.3, 2.3, 2.4
Strategies for Investigation – 2.1, 2.2

Incorporates VELS: Number, Space, Measurement, Chance and Data, Structures and Working Mathematically.

WESTERN AUSTRALIA
Working Mathematically
Contextualise Mathematics – WM 2.1
Mathematical Strategies – WM 2.2
Reason Mathematically – WM 2.3
Apply and Verify – WM 2.4
Space
Represent Location – S 2.1
Represent Shape – S 2.2
Represent Transformations – S 2.3
Reason Geometrically – S 2.4
Measurement
Understand Units – M 2.1
Direct Measure – M 2.2
Estimate – M 2.3
Indirect Measure – M 2.4
Chance and Data
Understand Chance – C&D 2.1
Collect and Organise Data – C&D 2.2
Summarise and Represent Data – C&D 2.3
Interpret Data – C&D 2.4
Number
Understand Numbers – N 2.1
Understand Operations – N 2.2
Calculate – N 2.3
Reason About Number Patterns – N 2.4

SOUTH AUSTRALIA
Exploring, Analysing and Modelling Data – 2.1, 2.2, 2.3
Pattern and Algebraic Reasoning – 2.9, 2.10, 2.11
Spatial Sense and Geometric Reasoning – 2.12, 2.13, 2.14
Number – 2.6, 2.7, 2.8
Measurement – 2.4, 2.5

NEW SOUTH WALES
Working Mathematically
Questioning – WMS 2.1; Applying Strategies – WMS 2.2;
Communicating – WMS 2.3; Reasoning – WMS 2.4;
Reflecting – WMS 2.5
Number
Whole Numbers – NS 2.1; Addition and Subtraction – NS 2.2
Multiplication and Division – NS 2.3; Fractions and Decimals –
NS 2.4; Chance – NS 2.5
Patterns and Algebra – PAS 2.1
Data – DS 2.1
Space and Geometry
Three-dimensional Space – SGS 2.1; Two-dimensional Space –
SGS 2.2a, SGS 2.2b; Position – SGS 2.3
Measurement
Length – MS 2.1; Area – MS 2.2; Mass – MS 2.4, Time – MS 2.5;
Volume and Capacity – MS 2.3

QUEENSLAND
Number
Number Concepts – N 2.1
Addition and Subtraction – N 2.2
Multiplication and Division – N 2.3
Measurement
Length, mass, area and volume – M 2.1
Time – M 2.2
Space
Shape and Line – S 2.1
Location, Direction and Movement – S 2.2
Patterns and Algebra
Patterns and Functions – PA 2.1
Equivalence and Equations – PA 2.2
Chance and Data
Chance – CD 2.1; Data – CD 2.2

N.T. / Tas. / A.C.T (National Curriculum)
Working Mathematically
Investigating – 3.1; Using Problem Solving Strategies – 3.3;
Applying and Verifying – 3.4; Using Mathematical Language – 3.5
Space
Spatial Ideas – 2.7a, 2.7b; Visualising, Analysing and
Representing Arrangements and Locations – 2.8; Visualising,
Analysing and Representing Shapes – 2.9; Visualising, Analysing
and Representing Movements and Transformations – 2.10
Number
Count and Order – 2.11; Number Patterns – 2.12; Equations –
2.13; Applying Number – 2.14; Mental computation – 2.15;
Written computation – 2.16; Calculators – 2.17
Measurement
Choosing Units – 2.18; Measuring – 2.19; Estimating – 2.20;
Time – 2.21; Using Relationships – 2.22
Chance and Data
Understanding, Estimating and Measuring Chance Variation –
2.23; Collecting Data – 2.24; Organising Data – 2.25; Displaying
and Summarising Data – 2.26; Interpreting Data – 2.27

PRESENTING THE PROBLEM CARDS

Prior to presenting the cards, display a list of the strategies needed for solving problems to your class. Provide an example of each strategy by solving a related problem. The problem cards may be used in a variety of formats, including:

- *As a whole class*
- *In small groups*
- *In pairs*
- *Individually*
- *As an extension task*
- *As a homework task*

USING THE PROBLEM CARDS

Photocopy the relevant cards suited to the key learning areas your class is covering and distribute according to one of the above formats. Each problem card will contain the following:

1. Task number, key learning area and title;
2. Material required to complete the problem tasks;
3. 1 to 4 problem tasks;
4. A challenge task for early finishers or those needing further extension;
5. A student self assessment area;
6. Relevant indicator/s or learning focus.

Note: Challenge questions can be answered using another sheet of paper.

> SHAPE AND SPACE (MEASUREMENT)

TASK 1

BRIDGES

SELF ASSESSMENT

Materials: *pencil *straws *sticky tape *scissors *2 chairs * 'matchbox' car

1. List what you believe are the best shapes to use when constructing a bridge.

2. Use straws and sticky tape to construct a bridge sturdy enough to hold a 'matchbox' car. Place the bridge between two chairs with a distance of 20 cm. Think about the best shapes to use to build the base and the sides of your bridge.

Challenge: If your bridge needed to be 50 cm long, would you need to alter it? Make notes on the back of this sheet.

Indicator: Identifies and represents useful shapes in construction.

ASSESSMENT AND ANSWERS

Two assessment task cards are located at the end of each strand for teachers to collect and assess. An assessment checklist is located at the end of the introductory section of this book for teachers to keep a record of the strategies and skills students are using as they work through each problem card. There is also provision on each problem task card for students to note their own self-assessment. They are simply required to shade in an icon to represent how they felt they performed on a task. Answers or possible solutions are also provided at the back of this book with the exception of open-ended problems where answers would vary or require a teacher to check the end results.

PROBLEM SOLVING STRATEGIES

Think, estimate and check

This skill is often used subconsciously in problem solving as well as many other areas of maths. It should be the first step taken whenever a student is presented with a problem. Students read the problem at least once, think about what it is asking of them and estimate an answer and then check to see if they are correct. While solving a problem using this method, students may still need to work through a number of other strategies, such as calculating mentally or writing notes or sums, drawing up a table or chart or even checking using mathematical tools such as a calculator, scales, ruler and so on.

Example:

If Alex, who is 12 years old, is one quarter the age of his mother and father, half the age of his sister and double the age of his younger brother, how old are all the members of his family combined?

STEP 1: Read over the problem with the students and ask them to think about what the problem is asking them to do. As this is a two part problem, point out the following steps that need to be estimated and solved.

STEP 2: Work out the age of each member of the family, using Alex's age to help.

E.g. mother and father are 12 x 4 = 48 ($\frac{1}{4}$ of 48 = Alex's age),
his sister is 12 x 2 = 24 (½ of 24 = Alex's age) and his younger brother is ½ of 12 = 6.

Therefore Alex's mother and father are both 48 years old, his sister is 24 years old, his younger brother is 6 years old and Alex is 12 years old.

STEP 3: Add the ages of each member of his family to get the combined age.

E.g. *48 + 48 + 24 + 12 + 6 = 138 years.*

Draw a diagram/picture

This skill can be very useful in helping a student visualise the problem, making it often easier to interpret and solve. In this case students would read over the problem, think about what it is asking and draw a diagram/picture to help them solve it.
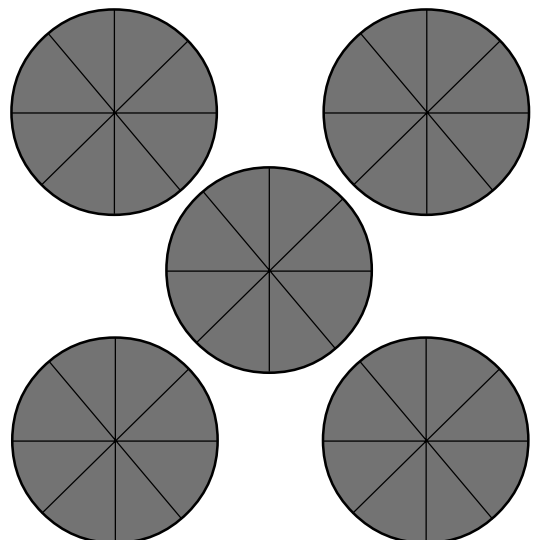
Example:

12 friends were at a party enjoying pizzas for a snack. Each pizza had 8 slices. If 6 friends ate 4 slices each, 4 ate 3 slices each and 2 friends had 2 slices each, how many pizzas did they eat altogether?

STEP 1: Read the problem and work out what it is asking.

STEP 2: Draw the number of slices of pizza mentioned or draw several pizzas and divide them into 8ths and shade the number of slices eaten.

STEP 3: Count up the number of pizzas eaten and record the answer. (*The answer is 5 pizzas.*)

TASK 1

BRIDGES

Materials: •pencil •straws •sticky tape •scissors •2 chairs • 'matchbox' car

1 List what you believe are the best shapes to use when constructing a bridge.

• _____   • _____

• _____   • _____

2 Use straws and sticky tape to construct a bridge sturdy enough to hold a 'matchbox' car. Place the bridge between two chairs with a distance of 20 cm. Think about the best shapes to use to build the base and the sides of your bridge.

Challenge: If your bridge needed to be 50 cm long, would you need to alter it? Make notes on the back of this sheet.

Indicator: Identifies and represents useful shapes in construction.

TASK 2

LINES

Materials: •pencil •paper

1 Name three places you can see a **horizontal** line.

• _____ • _____ • _____

2 Name three places you can see a **diagonal** line.

• _____ • _____ • _____

3 How many diagonal lines can you draw inside a pentagon? *(Note: from corner to corner.)*

_____
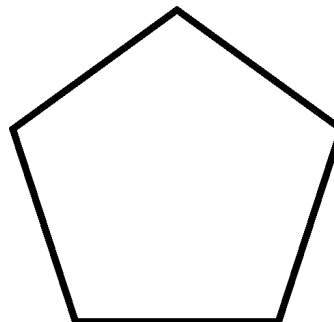
Challenge: How many diagonal lines can you draw inside a hexagon?

_____

Indicator: Identifies lines within shapes.

TASK 13

STEP IT OUT

Materials: • pencil

1 In your classroom who is sitting:

a. to your left? _____

b. to your right? _____

c. directly in front? _____

d. directly behind? _____

2 If you were to stand up and take three steps forward, who or what would you be standing near? _____

3 Describe how many steps and in which direction you would need to take to reach the teacher's desk.

_____

_____

_____

Challenge:
Describe how many steps, and in which direction you would need to go, to reach the school office from your classroom.

Indicator: Uses and understands the language of location.

TASK 14

LOCAL MAP

Materials: • pencil • paper

1 The Smith family need to travel from their house to a party at the local Scout Hall. Look at the map here and work out the **quickest** way for them to get there. Describe it to the Smith family.

SMITH FAMILY HOME — Smith Way — Smith Way — Low Place — PETROL STATION — Smith Way — Rainy Road — SCOUT HALL — Lucky Street — SHOPS — Mint Street — Howe Street
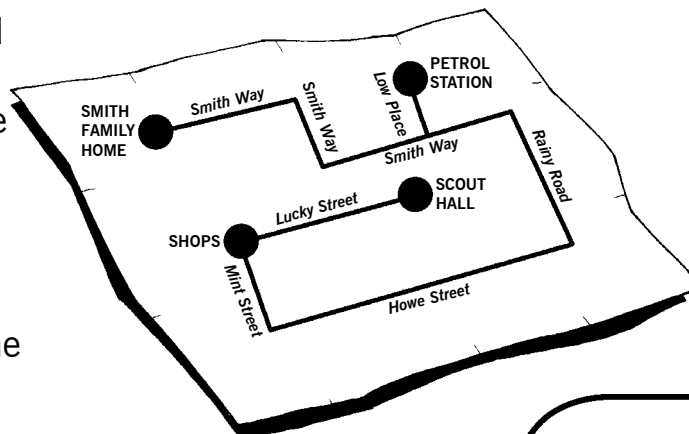
2 If they had to stop to buy petrol along the way, describe the route they would have to travel. Write your explanation to the Smith family on another sheet of paper.

Challenge:
On the back of this sheet, describe the quickest way from your house to your school.

Indicator: Visualises, finds and compares paths on simple maps.

TASK 21

COIN DONATIONS

Materials: • pencil

1 A kind volunteer collected $20.00 in a donation tin for the poor. The tin contained $2.00, $1.00, 50c, 20c and 10c coins. Make two different lists of the possible combinations of coins the volunteer collected.

LIST 1:

_____

_____

_____

_____

_____

_____

_____

LIST 2:

_____

_____

_____

_____

_____

_____

_____

Challenge:
If the total amount was $50.00, make a list of the possible combination of coins. Use the back of this sheet to write your list.

Indicator: Uses knowledge of money to form combinations of amounts.

TASK 22

SCHOOL CANTEEN

Materials: • pencil

1 On Friday Jason ordered his lunch from the canteen. He ordered a hot dog ($2.00), a party pie (80c), chocolate milk ($1.30), a giant snake (60c) and tomato sauce (15c). How much did his lunch cost altogether?

_____

2 How much change would he receive from $5.00?

_____

3 The following Friday he had the same lunch order, except without chocolate milk. How much did it cost this time? How much change would he receive from $5.00?

_____

Challenge: If Jason had the same lunch as in Question 1 every school day for a week, how much would it cost?

_____

Indicator: Makes mental and written calculations involving money.

TASK 25

FRACTIONS AND VALUES

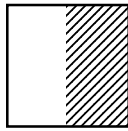**Materials:** • pencil

1 If the value of a whole square is $1.00, find the value of the following fractions of the squares:

a. ½ _____

b. ¼ _____

c. $^1/_5$ _____

d. $^1/_{10}$ _____

e. ¾ _____

f. $^7/_{10}$ _____

g. $^2/_5$ _____

h. $^1/_{20}$ _____

Challenge: If a whole cake cost $25.00, how much would three quarters of a cake cost?

_____
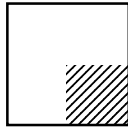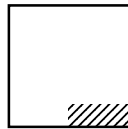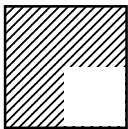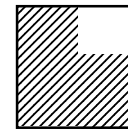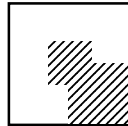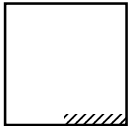
Indicator: Uses knowledge of fractions in relation to money.

TASK 26

PARTY PLANNING

Materials: • pencil • paper

1 Imagine you were planning a party for 20 of your friends (including yourself) and you decided to order pizza. If 12 people wanted one quarter of a large pizza (e.g. two pieces each) and eight people wanted half a large pizza, how many pizza would you need to order? On a sheet of paper, draw a diagram to help you. Write your final answer here:

_____

2 If each guest had 2 x 250 ml cups of soft drink, how many litres of soft drink would you need to buy?

_____

_____

_____

Challenge: The birthday cake has been cut into 20 slices. If $^8/_{10}$ of your guests had a whole slice, how many slices would you have left?

_____

Indicator: Uses knowledge of numbers and fractions to solve a problem.

TASK 9

KING'S CROWNS

Material: •pencil •two equal-sized containers of water •teaspoon• tablespoon

1 If a king handed you three identical looking crowns and asked you to find out which was made of gold, which was made of silver and which was made of half gold and half silver, how could you find out using only three buckets of water? *(Note: Gold is heavier than silver.)* **Draw what you believe the results will be on the three buckets.**

'GOLD CROWN'

'SILVER CROWN'

'½ GOLD AND ½ SILVER'

Challenge: Describe what happens to the water in the bath when you get in?

_____

_____

2 Carry out a similar experiment to see if a teaspoon or tablespoon is heavier. Which is heavier? _____

Indicator: Demonstrates an understanding of weight, capacity and water displacement.

TASK 10

STRANDED

Materials: •pencil

1 A group of 10 people are stranded on a deserted island with only an inflatable lifeboat. If the lifeboat can hold a maximum capacity of 300 kg, how many adults wighing 60 kg could fit on the boat?

_____

_____

How many children weighing 25 kg could fit on the above lifeboat?

2

_____

_____

_____

Challenge: Why do you think aeroplanes only let you take a certain amount of luggage on board? Write your thoughts on the back of this sheet.

Indicator: Demonstrates an understanding of mass.

TASK 19

TRAIN TIMETABLE

Materials: • pencil

1 A train departs Sunnyville station approximately every half hour (on the hour and half hour) and reaches the city 45 minutes later. If the train stops every **four** minutes at a station and spends **one** minute there, how many stops must there be between Sunnyville and the city?

_____

2 If you caught the following trains from Sunnyville, what time would you arrive in the city?

a. 8am _____

b. 10:30am _____

c. 3pm _____

d. 7pm _____

e. 9:30pm _____

f. 11:30pm _____

Challenge: How many trains would travel between 6am and 12 noon.

_____

Indicator: Reads and work out simple timetables.

TASK 20

EXCURSION TIMETABLE

Materials: • pencil
• paper

1 Year 3T and Mrs Rose were going on an excursion to the local zoo on Tuesday 15 April. However, due to rain the trip had to be cancelled and rescheduled for 10 days time. What would be the new day and date for the excursion?

_____

2 The other problem was that Mrs Rose lost her timetable for the day. On a sheet of paper, work out a new timetable for Mrs Rose to take with her. Your timetable must include times for:

• Departure by bus from the school
• Arrival at zoo (the school is 30 min. drive from the zoo)
• Recess and lunch breaks
• Time to see the various animals
• Return to school

Challenge: If the zoo was expecting a few other classes to arrive on the same day, how do you think they would organise the different groups? Use the back of this sheet.

Indicator: Creates and demonstrates an understanding of calendars and timetables.