

Primary Maths

PROBLEMS *for*

Years

4-6

- * **Task cards for developing a range of maths problem solving strategies.**
- * **Activities cover all key learning areas of the maths curriculum.**

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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:

- GEOMETRY
- NUMBER
- MEASUREMENT
- STATISTICS

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

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PROBLEM CARDS: Geometry

TITLE	STRATEGY	ACHIEVEMENT OBJECTIVE	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	ACHIEVEMENT OBJECTIVE	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: Kiwis and Sheep	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 achievement objectives in the Mathematics curriculum document.

NUMBER (Levels 2 and 3)

Exploring number

Students will:

- read any 3-digit number;
- understand the meaning of the digits in a 2- or 3-digit whole number;
- order any set of three or more whole numbers (up to 99);
- write and solve comparison problems;
- write and solve story problems which involve halves, quarters, thirds, and fifths;
- explain the meaning of the digits in any whole number;
- explain the meaning of the digits in decimal numbers;
- order decimals up to 2 decimal places.

Exploring computation and estimation

Students will:

- make sensible estimates and check the reasonableness of answers;
- recall the basic multiplication facts;
- mentally perform calculations involving addition and subtraction;
- write and solve problems which involve a choice of any combination of the four arithmetic operations;
- solve practical problems which require finding fractions of whole number and decimal amounts.

MEASUREMENT (Levels 2 and 3)

Estimating and measuring

Students will:

- order and compare lengths, masses, and volumes, and describe the comparisons, using measuring language;
- measure by counting non-standard units;
- compare the values of coins and notes;
- read prices and give change for sums of money;
- represent a sum of money by two or more different combinations of notes and coins;
- demonstrate knowledge of the basic units of length, mass, area, volume (capacity), and temperature by making reasonable estimates.

Developing concepts of time, rate, and change

Students will:

- read aspects of time, including days of the week and clocks (to hours and half hours);
- know the units of time, e.g. minute, hour, day, week, month and year;
- read and interpret everyday statements involving time;
- show analogue time as digital time, and vice versa.

ALGEBRA (Levels 2 and 3)

Exploring patterns and relationships

Students will:

- continue a repeating and sequential pattern and write a rule for this;
- make up and use a rule to create a sequential pattern;
- state the general rule for a set of similar practical problems;
- illustrate and talk about relationships;
- use graphs to represent number, or informal relations.

ALGEBRA (cont.)

Exploring equations and expressions

Students will:

- write number sentences using =, from story contexts;
- solve problems of the type: $\quad + 15 = 39$.

GEOMETRY (Levels 2 and 3)

Exploring shape and space

Students will:

- identify, and describe in their own language, the following 2- and 3-dimensional shapes: triangle, square, oblong, circle, oval, pentagon, hexagon, diamond, box, cylinder, and sphere;
- draw pictures of simple 3-dimensional objects;
- follow and give a sequence of instructions related to movement and position;
- describe and interpret position, using the language of direction and distance;
- draw and interpret simple scale maps.

Exploring symmetry and transformations

Students will:

- create and talk about symmetrical and repeating patterns;
- create and talk about geometric patterns which repeat (show translation), or which have rotational or reflection symmetry;
- design and make a pattern which involves translation, reflection, or rotation;
- enlarge on grid paper, simple shapes to a specified scale.
- make clockwise and anti-clockwise turns.

STATISTICS (Levels 2 and 3)

Statistical investigations

Students will:

- collect everyday objects, sort them into categories, count the number of objects in each category, and display and discuss the results;
- collect and display discrete numerical data and whole number data in pictograms, venn diagrams, tally charts, strip graphs, and bar charts, as appropriate.

Interpreting statistical reports

Students will:

- use their own language to talk about the distinctive features in their own and others' data displays;
- make sensible statements about an assertion on the basis of the evidence as a statistical investigation.

Exploring probability

Students will:

- classify events from their experiences as certain, possible, or impossible;
- compare familiar or imaginary, but related, events and order them on a scale from least likely to most likely;
- use a systematic approach to count a set of possible outcomes;
- predict the likelihood of outcomes on the basis of a set of observations.

Teachers' Notes

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:

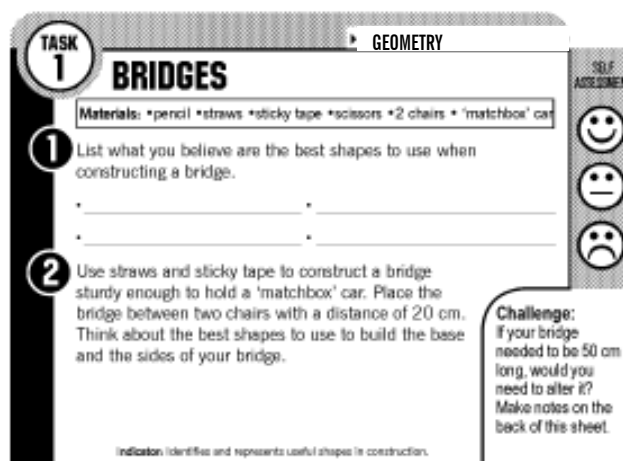
- *As a whole class*
- *In small groups*
- *In pairs*
- *Individually*
- *As an extension task*
- *As a homework task*

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.



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.

Teaching Points

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 $12 \times 4 = 48$ ($\frac{1}{4}$ of 48 = Alex's age),
his sister is $12 \times 2 = 24$ ($\frac{1}{2}$ of 24 = Alex's age) and his younger brother is $\frac{1}{2}$ 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.

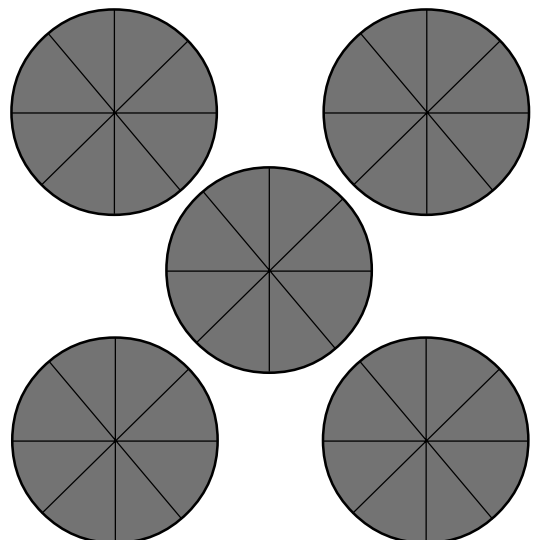
Example:

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 13

► GEOMETRY

STEP IT OUT

Materials: •pencil

SELF ASSESSMENT

- 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

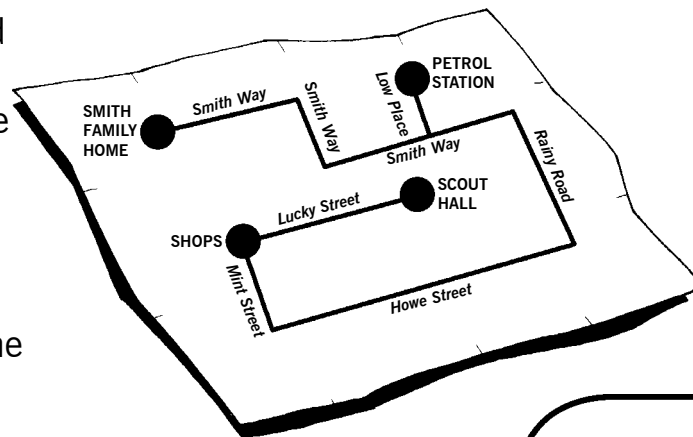
► GEOMETRY

LOCAL MAP

Materials: •pencil •paper

SELF ASSESSMENT

- 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.



- 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
15**

► GEOMETRY (LOCATION)

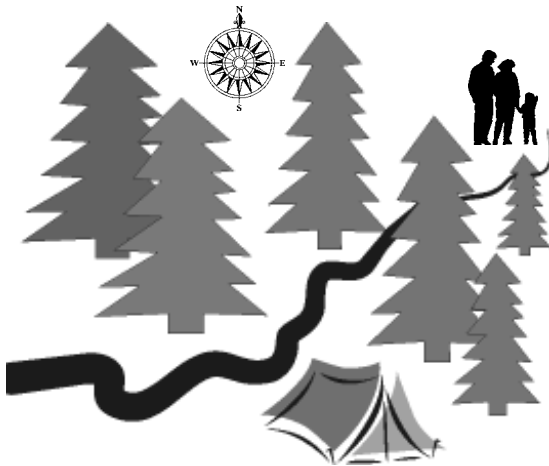
LOST!

Materials: •pencil •paper

SELF
ASSESSMENT

1

A family of three campers are lost in the middle of a large forest. They have only a few supplies left (torch, compass, rope, muesli bars, jackets, an empty water bottle and matches). All they know is that their camp is to the east of the river. Help the family out of the forest by writing as many helpful suggestions for them as you can.



You may write your suggestions on another sheet of paper.

Challenge:

What important things should you do before you go exploring an unknown forest? Make a list under your suggestions for the family.

Indicators: Interprets and describes location using a compass.



**TASK
16**

► GEOMETRY (LOCATION)

STRANDED!

Materials: •pencil

SELF
ASSESSMENT

1

There has been a flood near a local farm causing a herd of 48 sheep and 12 lambs to be stranded on top of a hill. The only way the farmer can rescue the herd is by using a tractor pulling a trailer. The trailer can hold only 6 sheep or 12 lambs at a time. How many trips will the farmer need to take to rescue his entire herd? Show your working below.

2

If the herd consisted of 480 sheep and 120 lambs, how many trips would the farmer need to make?

Challenge:

On the back of this sheet, make some other suggestions as to how you could save the herd of sheep, other than using a tractor.

Indicator: Uses knowledge of space and number to solve a problem.



**TASK
3**

► NUMBER

KIWIS AND SHEEP

Materials: • pencil

SELF
ASSESSMENT

1

In a paddock at one particular time there are 50 legs visible, belonging to either sheep or kiwis. How many kiwis and how many sheep could there be? (Note: There can be a number of possible answers.)



Challenge: If 100 legs were visible, what combinations of sheep and kiwis might there be?

Indicator: Solves a problem using knowledge of number and number groups.

**TASK
4**

► NUMBER

MAGIC SQUARES

Materials: • pencil

SELF
ASSESSMENT

1

In magic squares the numbers in each row, column and diagonal add up to the same number total. **Circle** the squares that are magic. **Cross** the squares that are not.

a	5	5	9	b	7	7	4	c	8	1	6	d	10	8	18
	10	6	2		6	8	5		3	5	7		20	12	4
	3	8	7		6	2	1		4	9	2		6	16	14



2

Now create your own magic squares with the given totals.

Total = 12

Total = 24

Total = 15

a

b

c

Challenge: Create your own magic squares, delete a few numbers and give them to a friend to solve the missing numbers.

Indicator: Uses addition to solve number patterns.

**TASK
19**

► NUMBER

FOOTBALL CARDS

Materials: •pencil

SELF
ASSESSMENT

1

James likes to collect football cards. To complete his set of cards he needs only eight more players. Each pack contains three cards, of which there is always two new cards and one which he already has. How many more packs of cards does James need to buy to complete his set?

2

If each pack of cards cost \$1.50, how much will it cost him to complete his set?

Challenge: If there are 60 cards in a set, how many packs will James need to purchase in order to complete his set? _____
(Remember: each set contains two new cards and one he already has.)

Indicator: Uses knowledge of number patterns and money to solve a problem.



**TASK
20**

► NUMBER

COIN COMBINATIONS

Materials: •pencil •coins

SELF
ASSESSMENT

1

List as many combinations of coins as you can to make these amounts of money.

a. 70c _____

b. 90c _____

c. \$1.30 _____

d. \$4.60 _____

e. \$7.90 _____

Challenge: What would be the least combination of notes and coins you could use to make \$27.10c?

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



**TASK
19**

► MEASUREMENT

TRAIN TIMETABLE

Materials: •pencil

SELF
ASSESSMENT



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**

► MEASUREMENT

EXCURSION TIMETABLE

Materials: •pencil
•paper

SELF
ASSESSMENT



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.

TASK 9

► STATISTICS

SCHOOL CROSSING

Materials: •pencils

SELF ASSESSMENT



1 If you had to decide where to put a new crossing near your school, how would you do it? Write down the steps you would need to take.

2 After you had worked out the best spot, how would you inform the school community?

Challenge: How do you think the community decides where traffic lights should go?

Indicator: Determines appropriate procedures to collect information for a purpose.

TASK 10

► STATISTICS

FAVOURITE OUTFITS

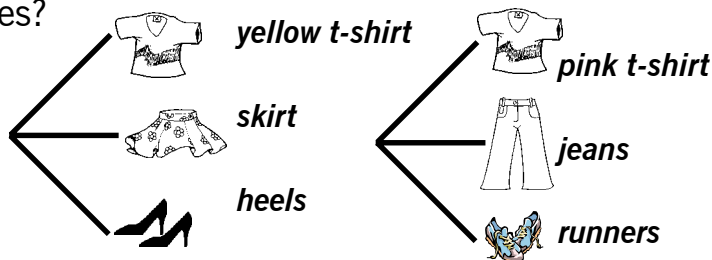
Materials: •paper •pencils

SELF ASSESSMENT



1 Sophie's two favourite outfits appear on these tree diagrams. What other combinations of outfits could Sophie make using these favourite clothes?

You may wish to list them on a tree diagram.



2 Jacks' favourite clothes include three t-shirts (red, blue and white), two pairs (blue and black) of jeans, and two pairs of runners (white and grey). How many different outfits could Jack wear using his favourite clothes? (*Hint: It may help to draw a tree diagrams like the ones above, using another sheet of paper.*)

Challenge: Use tree diagrams to illustrate your favourite outfits on a piece of paper.

Indicator: Summarises data into simple diagrams.