PHOTOCOPY MASTERS

Ready-Ed
Publications

Primary Maths

PROBLEMS *for*

Years

6-8

*   **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:
- GEOMETRY
- NUMBER
- MEASUREMENT
- STATISTICS

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

Contents

PROBLEM CARDS: Geometry

TITLE	STRATEGY	ACHIEVEMENT OBJECTIVE	PAGE
Task 1: Parallel Tower	Make a model	Identifies lines in our environment and uses them in construction.	page 13
Task 2: Perpendicular Lines	Make a model	Recognises, describes and represents perpendicular lines.	page 13
Task 3: Angles	Look for patterns	Recognises, names and classifies various angles.	page 14
Task 4: House Design	Make a model	Recognises, names and uses angles for design purposes.	page 14
Task 5: Cubes	Make a model	Makes and constructs shapes using cubes.	page 15
Task 6: Pentominoes	Make a model	Makes and constructs pentominoes using cubes.	page 15
Task 7: Triangles	Make a model	Identifies and uses triangles to create various shapes and patterns.	page 16
Task 8: Brick Wall	Look for patterns	Visualises and explains the parts of a 3D shape that are not seen.	page 16
Task 9: Tessellating Path	Look for patterns / Draw a diagram	Uses shapes to design a tessellating pattern.	page 17
Task 10: Tricky Tangrams	Look for patterns	Manipulates tangram pieces to create shapes and patterns.	page 17
Task 11: Symmetrical Letters	Look for patterns	Identifies line of symmetry in various shapes.	page 18
Task 12: Using Grids	Draw picture	Uses a grid square to enlarge or reduce a 2D shape.	page 18
Task 13: Class Position	Draw a diagram	Demonstrates knowledge of grids and the language of location.	page 19
Task 14: Flight 125	Draw a diagram	Uses and understands the language of location.	page 19
Task 15: Carousel	Draw a diagram	Demonstrates knowledge of fractions when dealing with location.	page 20
Task 16: Local Map	Draw a diagram	Identifies and draws simple scale plans of familiar location.	page 20
Task 17: Pizza Delivery	Est. and check / Make a list	Interprets and uses a local map to plan a journey.	page 21
Task 18: Fete Plan	Draw a diagram	Uses given information and compass points to draw a simple plan.	page 21
Task 19: Lost Cattle	Make a list	Uses compass points to specify location.	page 22
Task 20: Trapped in a Maze	Make a list	Uses language of location to create a path through a maze.	page 22
Task 21: Assessment: Office Building	Make a model	Visualises and explains the parts of a 3D shape that are not seen.	page 23
Task 22: Assessment: School Map	Draw a diagram / Make a list	Visualises and plans journeys on simple maps.	page 23

PROBLEM CARDS: Number

TITLE	STRATEGY	ACHIEVEMENT OBJECTIVE	PAGE
Task 1: Creature Collection	Est. and check / Draw a picture	Uses knowledge of number and number processes to solve a problem.	page 24
Task 2: Cross Numbers	Est. and check	Manipulates numbers to arrive at a set total.	page 24
Task 3: Concert Hall	Est. and check / Calculate	Uses knowledge of number facts and multiplication to solve a problem.	page 25
Task 4: Four 4s	Est. and check, Calculate	Constructs and completes number sentences involving the four operations.	page 25
Task 5: Ages	Est. and check	Selects relevant information to solve a problem using number facts.	page 26
Task 6: How Many Days?	Calculate	Uses a calculator to solve a problem involving multiplication and addition.	page 26
Task 7: Making Numbers	Make a list / Look for patterns	Uses knowledge of number and place value to create numbers.	page 27
Task 8: 200 Metre Sprint	Make a list / Look for patterns	Uses knowledge of number and ordinal number to solve a problem.	page 27
Task 9: Swimming Sports	Calculate / Draw a diagram	Uses knowledge of number and ordinal number to solve a problem.	page 28
Task 10: AFL Game	Est. and check / Calculate	Uses knowledge of number operations to solve a problem.	page 28
Task 11: Golf Game	Est. and check	Uses knowledge of addition and subtraction 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 - 4)

Exploring number
Students will:
• 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;
• find fractions equivalent to one given;
• express a fraction as a decimal and vice versa;
• express a decimal as a percentage and vice versa;
• express quantities as fractions or percentages of a whole.

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;
• find a given fraction or percentage of a quantity;
• demonstrate knowledge of the conventions for order or operations.

MEASUREMENT (Levels 2 - 4)

Estimating and measuring
Students will:
• order and compare lengths, masses, and volumes, and describe the comparisons, using measuring language;
• demonstrate knowledge of the basic units of length, mass, area, volume (capacity), and temperature by making reasonable estimates;
• calculate perimeters of circles, rectangles, areas of rectangles and volumes of cubes from measurements of length;
• read and construct a variety of scales, time tables, and charts;
• design and use a simple scale.

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);
• read and interpret everyday statements involving time;
• show analogue time as digital time, and vice versa;
• perform calculations with time, including 24-hour clock times.

ALGEBRA (Levels 2 - 4)

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;
• use a rule to make predictions;
• state the general rule for a set of similar practical problems;
• use graphs to represent number, or informal relations;
• sketch and interpret graphs on whole number grids which represent simple everyday situations.

ALGEBRA (cont.)

Exploring equations and expressions
Students will:
• write number sentences using =, from story contexts;
• find and justify a word fromula which represents a given practical situation.

GEOMETRY (Levels 2 - 4)

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;
• 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;
• draw diagrams of solid objects made from cubes;
• specify location, using bearings or grid references.

Exploring symmetry and transformations
Students will:
• 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;
• describe the reflection or rotational symmetry of a figure or object.

STATISTICS (Levels 2 - 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.

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PRESENTING THE PROBLEM CARDS

Prior to presenting the cards, display a list of the strategies needed for solving a problem 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.

> TASK 1 ▸ GEOMETRY
>
> **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, 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 ($\frac{1}{2}$ 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.*)
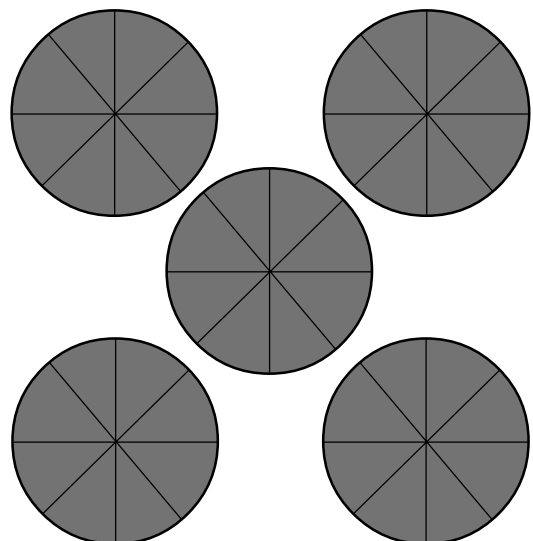
TASK 11 — SYMMETRICAL LETTERS

Materials: •pencil •ruler

1 Which letters of the alphabet pictured below are symmetrical? Draw the line of **symmetry** (vertical, horizontal or both) through the symmetrical letters.

A B C D E F G H I J K L M

N O P Q R S T U V W X Y Z

2 Is your name symmetrical? Write it below in upper case letters and see.

Challenge: On the back of this sheet, or using another sheet of paper, find and draw a shape from the classroom that is not symmetrical. Explain why it is not symmetrical.

Indicator: Identifies the line of symmetry in various shapes.

TASK 12 — USING GRIDS

Materials: •A4 paper •pencils

1 Grids can be useful in helping you enlarge and reduce pictures. Enlarge one of the pictures below onto an A4 piece of paper. Rule up faint lines to help you.
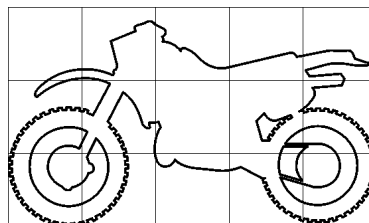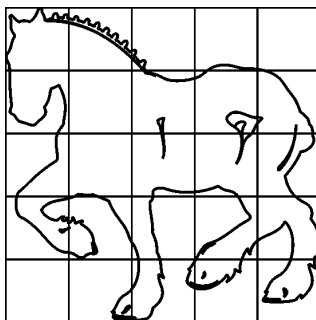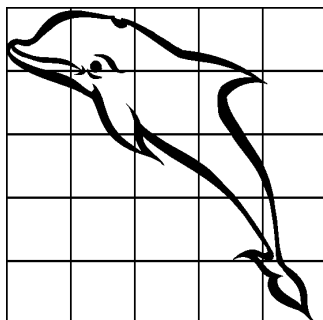
2 How do grids help someone copy a picture?

_____

_____

_____

Challenge: Find a large picture you like in a magazine or newspaper, draw a grid over the top of it and copy it onto a smaller piece of paper.

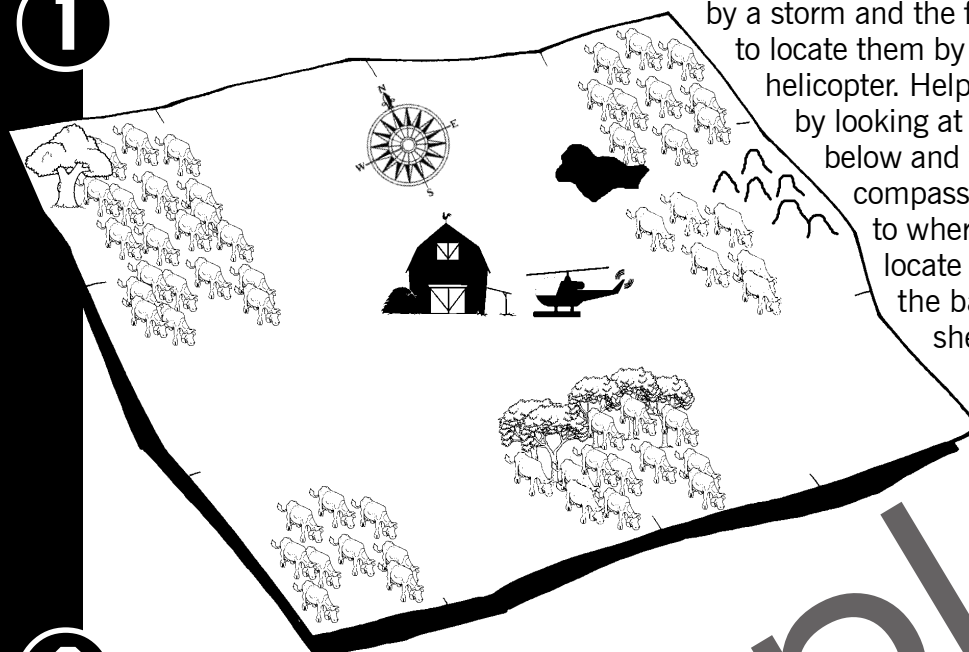**Indicator:** Uses a grid square to enlarge or reduce a two-dimensional shape.

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TASK 19

LOST CATTLE

Materials: • pencil

A herd of cattle has been spilt up by a storm and the farmer is trying to locate them by air in a helicopter. Help out the farmer by looking at the diagram below and writing compass directions as to where he can locate his cattle. Use the back of this sheet.

①

Challenge:
If the farmer only manages to rescue the cattle in the northern area, how many are left?

_____

② How many cattle are there altogether? _____

Indicator: Uses compass points to specify location.
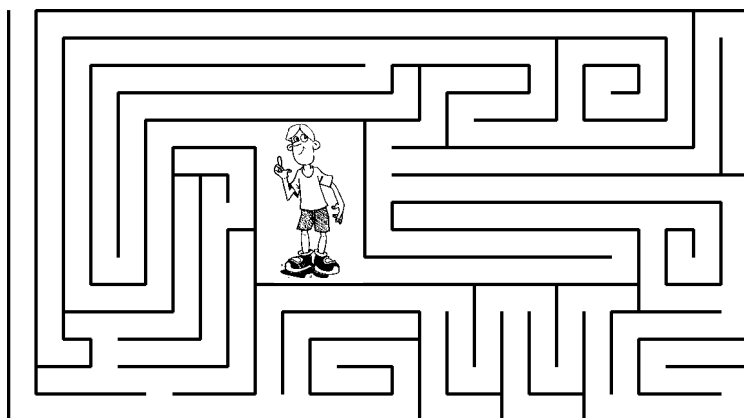

TASK 20

TRAPPED IN A MAZE

Materials: • pencil • paper

① Peter has found himself trapped in the middle of a giant maze and has been trying for some time to get out. Look at the maze and write a set of instructions for Peter which he can use to help him get out. (Hint: Use location words such as right turn, left turn, forward, back, north, south, east, west and the number of steps he should take.)

Challenge: Design and draw your own maze for a friend to try and follow a path from the centre to the outside.
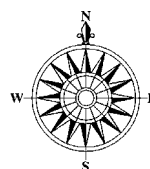
② Draw the path Peter will take to follow your directions out of the maze.

Indicator: Uses the language of location to create a path through a maze.

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TASK 1

CREATURE COLLECTION

Materials: • pencil

1 On Saturday Alex collected 13 beetles, eight spiders, 28 ants and two ladybirds. On Sunday he added 14 slaters, two butterflies and seven snails to his collection.
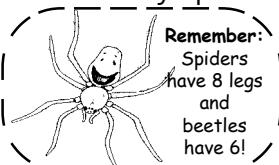
a) How many creatures did he collect altogether on the weekend?

_____

b) How many more insects did he collect on Saturday, compared to Sunday?

_____

2 Alex set up a house for some beetles and spiders he had collected. The legs of these insects totalled 54. How many beetles and how many spiders does he have?

Remember: Spiders have 8 legs and beetles have 6!

Challenge: If the legs of a spider and beetle collection totalled 150, how many beetles and how many spiders would there be?

_____

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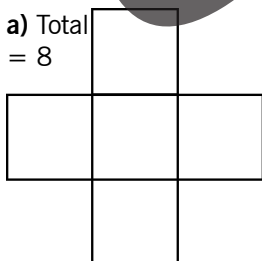

TASK 2

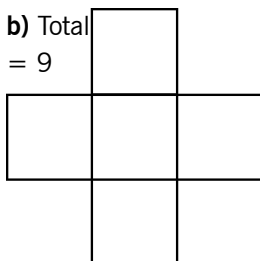## CROSS NUMBERS

Materials: • pencil • paper

1 Using only the numbers **1**, **2**, **3**, **4**, **5** fill in the squares in the cross so that they equal the answers below, when totalling the numbers horizontally or vertically.
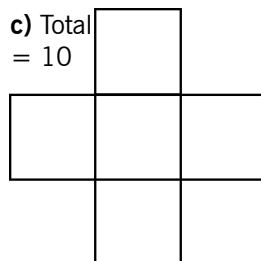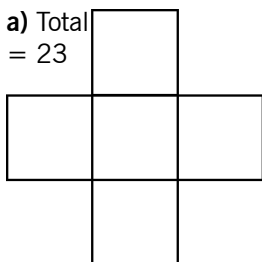
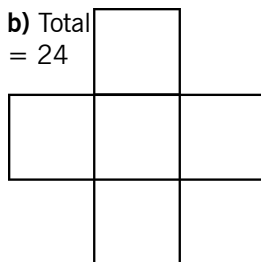a) Total = 8

b) Total = 9

c) Total = 10

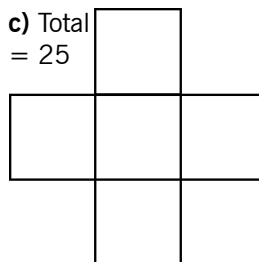**2** Use the numbers **6**, **7**, **8**, **9**, **10** to complete these cross numbers, with the following totals.

a) Total = 23

b) Total = 24

c) Total = 25

Challenge: On another piece of paper, create your own cross combination with the numbers **20**, **40**, **60**, **80**, **100** and a total of **180**.

Indicator: Manipulates numbers to arrive at a set total.

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TASK 23

UNIFORM SHOP

Materials: • pencil • calculator

1 The school uniform shop is having a special sale for the start of the school year. Look at the specials below and fill out the chart below to show the savings.

ITEM	NORMAL COST	SALE COST	SAVING
a) school socks	$4.00 each	3 for $10.00	
b) sports socks	$3.00 each	2 for $5.00	
c) hats	$5.50	10% off	
d) shorts	$10.00	10% off	
e) shirt	$15.00	10% off	
f) dress	$22.00	10% off	

2 Find the cost of the following orders at the sale cost.

a) Jessica: 3 pairs of school socks, 1 hat and 1 dress

b) Joel: 4 pairs sports socks, 1 shorts and 1 shirt

c) Ben: 1 pair school socks, 2 hats, 1 shorts and 2 shirts

Challenge: Who out of Jessica, Joel and Ben made the greatest saving on their orders?

_____

_____

Indicator: Uses knowledge of percentages, number operations and money to solve a problem.

TASK 24

TOY SALE

Materials: • pencil • calculator

1 With Christmas approaching, the local toy shop is having a sale. All items are marked 20% off or one fifth less than the original cost. Look at the items listed below and calculate the sale cost for each of the children's Christmas lists.

• Lego Bionnical kit $12.00 • Craft set $15.00 • Jewellery making set $20.00
• Game Boy Games $35.00 • Diary with key and pen set $10.00 • Football team wallets $7.50
• Dive sticks $5.00 • water pistols $8.00 • Brats dolls $25.00

a) SARAH: A jewellery making set, dive sticks and Brats doll.

b) MATTHEW: A Bionnical kit, a game boy game and a water pistol.

c) JOHN: A craft set, football wallet, dive sticks and water pistol.

d) MARY: A craft set, diary set and game boy game.

Challenge: Which child's list showed the greatest saving?

_____

_____

2 How much would it cost at the original and discounted cost if you purchased one of each item?

a) Original cost = _____ **b)** Discounted cost = _____

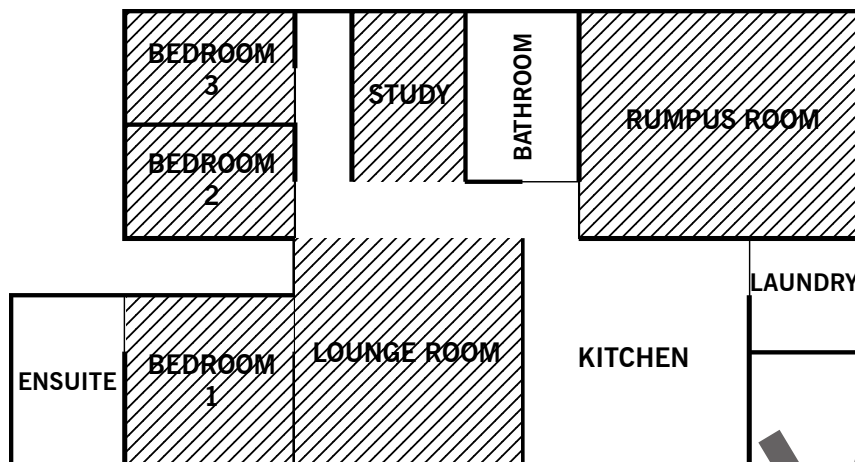**Indicator:** Applies knowledge of percentages, number operations and money to solve a problem.

TASK 13

NEW CARPET

Materials: • pencil • 1 metre ruler or tape measure (Challenge)

① A carpet supplier has been given a plan of a house with the rooms that require new carpet shaded. Help the supplier work out the area of each room so that he can provide the correct amount of carpet.   Scale 1 cm = 1 m

BEDROOM 3

STUDY

BATHROOM

RUMPUS ROOM

BEDROOM 2

LAUNDRY

ENSUITE

BEDROOM 1

LOUNGE ROOM

KITCHEN

Challenge: Measure and calculate the carpeted area of your classroom.

_____

_____

a) Area of bedroom 1 =   **b)** Area of bedroom 2 =

c) Area of bedroom 3 =   **d)** Area of lounge room =

e) Area of rumpus room =   **f)** Area of study =

② What is the total area of the house that requires carpet? _____

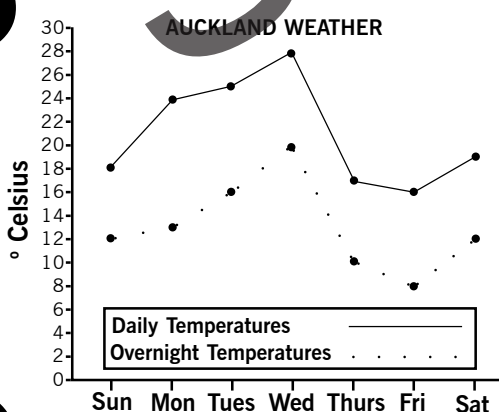**Indicator:** Calculates area from a plan for a purpose.

TASK 14

TEMPERATURE

Materials: • pencil • calculator • Internet (Challenge)

① Look at the graph and answer the following questions on the back of this sheet.

AUCKLAND WEATHER

° Celsius

Daily Temperatures ———
Overnight Temperatures . . . . . .

Sun Mon Tues Wed Thurs Fri Sat

a) What is the graph showing?

b) Which day has the greatest difference between day and overnight temperatures?

c) Which day has the least difference between day and overnight temperatures?

② Calculate the average daily temperature for that week.

_____

③ Calculate the average nightly temperature for that week.

_____

Challenge: Select three different countries and investigate on the Internet what their current daily and overnight temperature is. Type up your findings.

Indicator: Interprets and demonstrates knowledge of graphs and temperature.

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TASK 13

SCHOOL RULES

Materials: •pencil •paper •computer (optional)

1 What do your classmates think of the school rules? To find out, set up a survey listing some of your main school rules with a section for your classmates to answer **Agree / Unsure / Disagree.** (You may wish to use the computer to set up your survey.)

2 Distribute your survey to at least ten classmates, and then read the results.

3 Write a statement about the results.

_____

_____

_____

_____

Challenge: Do you think your survey accurately found out what students really think of the school rules? If not, how could you alter it? Write your ideas on the back of this sheet.

Indicator: Prepares a survey using different categories for a purpose.


TASK 14

HOT LUNCHES

Materials: •pencils •calculator

1 The canteen decided to make a report as to how many hot lunches are sold over a term. They set out the information in the form of a pictograph. If one picture represents 50 items, how many of the following items were sold over the last term?

a) pies _____   b) hamburgers _____

c) chips _____   d) hotdogs _____

e) pizza _____

pies hamburgers chips hotdogs pizza
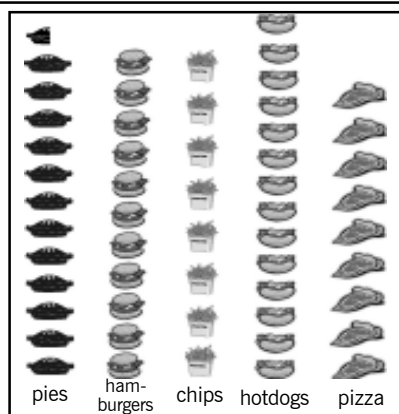
2 If hamburgers cost $3.00, pizzas cost $2.50, pies cost $2.10, hotdogs cost $2.00 and hot chips cost $1.70, which item did the canteen take the most money for?

_____

3 How might the canteen use this information for their ordering for next term?

_____

Challenge: If the canteen makes 50% profit on the hot food items, how much profit did they make this term?

_____

_____

Indicator: Interprets and uses information gathered from a pictograph.