



**Ebook Code:
REUK0040**



For 9 - 10 years

Maths Problem Solving Series

**Strategies and techniques covering all strands of
the curriculum, with activities to reinforce each
problem solving method.**

Written by Val Morey. Illustrated by Terry Allen. © Ready-Ed Publications - 2010.
Published by Ready-Ed Publications (2010) PO Box 276 Greenwood WA 6024
E-mail: admin@readyed.co.uk Web Site: www.readyed.co.uk

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ISBN 1 86397 462 8

Rationale

An outcomes approach to mathematics education means students and teachers need many and varied opportunities for students to demonstrate their learning and their understanding. To be as accurate as possible in determining students' current level of numeracy, those students must be given opportunities to demonstrate their understanding through activities which really show what they are able to do, as well as what they are not. Scoring 100% in a page of exercises tells teachers that a student has learnt what was taught, and can be useful information for checking that criteria have been met, but may not be a demonstration of their true or full mathematical understanding.

In order to make more accurate assessments of students' understanding, and therefore place them carefully within the levels described in the curriculum document, activities are needed which address two important aspects:

- Students must be able to show how well they can apply concepts or processes learnt to different contexts in order to solve a problem; and
- They must be given opportunities to show the "upper limits" of what they know and understand.

The approach in this book allows for both of those requirements.

At the same time, competence in mathematics should mean that students are able and willing to use mathematics in settings outside the maths lesson. This book supports that by providing a wide, cross-curricular context for the activities it contains.

The activities provided in this book are based on realistic situations which school students of age 9 - 10 *could* expect to be familiar with or to face.

Therefore, the National Curriculum document aim of having students "*able to deal readily and efficiently with common situations requiring the use of mathematics*" is addressed.

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Teachers' Notes

This book contains a collection of activities for students aged 9 - 10 to enable them to develop their Mathematical problem-solving skills. Strategies for solving problems are introduced individually and explained, so that these can be taught explicitly, practised and then applied to problems which relate to the students' school or life experience.

The book is devised as a course in mathematical problem solving and should be **worked through sequentially**, rather than "dipped into". It is divided into seven sections, one for each of the problem-solving strategies to be taught. There is no need for teachers or students to have prior familiarity with any of the strategies presented. At the beginning of each section there is an explanation of the strategy to assist teachers and students, and then students are guided through a 'scaffolding' approach to eventual independence. Although the tasks become progressively more complex in each section, all students should be able to manage the initial example and thus become familiar with the strategy. Subsequent problems could then provide extension and/or enrichment activities which are meaningful and interesting.

The activities provided represent excellent opportunities for teachers to see how students apply operational skills learned in Mathematics and they would be ideal to use as part of an assessment portfolio if required. Attainment Target/s linked to the activity on that page will appear in full at the foot of each page to assist teachers in this.

Teachers may even wish to use these activities in curriculum areas other than Mathematics, as many of the problems could easily fit into a Social Sciences, Health Education or Technology & Enterprise program, for example.

Teachers' Notes:

Guess and Check

This strategy is an excellent way to introduce students to a problem-solving approach to mathematics. Many of them will find that they have employed this strategy informally without recognising it as such, and therefore it will seem familiar and within their "comfort zone". Validating "Guess and Check" as a method will be a terrific confidence boost and should help students feel able to approach the other strategies with a positive attitude. At the same time, the students will learn and practise sensible guessing and understand the importance of accuracy in the "check" part of the strategy.

As its name suggests, the students first of all guess an answer to the problem and then use that answer to check whether all requirements of the problem have been met. If not, then the answer is adjusted and checked again.

Teachers should stress that it is extremely unlikely that a student's "guess" is going to be correct - that is not the point - and that the guess provides a starting point, which is the key to all problem-solving.

Student Information Page

When approaching problem solving, the main problem can often be figuring out “where to start”!

Sometimes the easiest and most sensible way is to simply take a guess at what you think the answer might be and then check to see if that’s possible. You’ve probably done something like that yourself. If someone told you that there were twice as many blue chairs as grey chairs in your classroom, and that altogether there were 33 chairs, could you tell them how many blue and how many grey chairs there were?

You could soon find out by the “Guess and Check” method. Your guess is probably going to be closer than you think, although it’s not likely it will be spot on.

Firstly, think about what you know:

You know one number has to be double the other and that they both have to add up to 33. Therefore, the easiest thing to do would be to start with a number for the grey chairs, double it for the blue, and then see if they both add up to 33. So, you won’t guess that there were 4 grey chairs, because then there must have been 8 blue, and together that makes only 12. Likewise, you won’t guess 50 for the grey as that means 100 blue, which is 150 altogether. Already you have an idea of a range inside which the answer may lie.

It can be useful to draw up a grid, based on what you know, and then use it to help you find the solution. As you get the answer for each of your guesses, decide whether your number of grey chairs needs to go up or down.

Here is an example of how this could have been done:

1st guess	2nd guess	3rd guess	4th guess	Answer
8	14	10	12	Grey chairs 11
16	28	20	24	Blue chairs (double) 22
24	42	30	36	Total 33

AT/s * Understands mathematic conjectures as more than simply a guess, makes straightforward tests of conjectures and discards those that fail the test.
 * Calculates with whole numbers, drawing mostly on mental strategies to add and subtract two-digit numbers and for multiplications and divisions related to basic facts.

Have a Guess

Use the "Guess and Check" procedure to find the solution to this problem:

Your new class has 30 students in total. There are four more boys than girls in the class. Use the "Guess and Check" method to find out how many boys and how many girls are in the class. Use the grid below to help you - remember, write in what you know first.

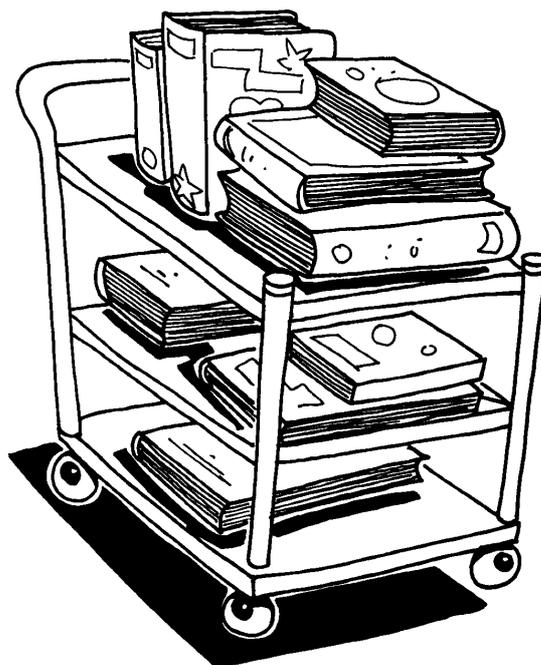
1st guess	2nd guess	3rd guess	4th guess	Answer
				Girls
				Boys
				Total

The solution is 13 girls and 17 boys.

How many guesses did you need? _____

Now have a try at solving the next problem by yourself. Use the grid below and write in what you know before you have your first guess.

It is your turn to help the Library assistant put away returned books on the shelves. She tells you that there are 7 more fiction books than non-fiction books to be replaced, and that altogether, 55 books need replacing. How many of each are there?



1st guess	2nd guess	3rd guess	4th guess	Answer
				Fiction
				Non-fiction
				Total

- AT/s** * Understands mathematic conjectures as more than simply a guess, makes straightforward tests of conjectures and discards those that fail the test.
 * Calculates with whole numbers, drawing mostly on mental strategies to add and subtract two-digit numbers and for multiplications and divisions related to basic facts.

Student Information Page

This strategy is easy to use and helps you to “think straight”. Sometimes a problem does not involve any real calculating, but there is just too much information for you to handle in your head – so, you write it down.

Making a list means you can think about each part in turn without worrying that you will forget the parts that came before.

Let’s say you wanted to buy a birthday present for your friend and your Mum said you could buy one box of Lego and one toy car. When you went to the toy shop, you found 5 different Lego sets and 4 different toy cars to choose from. How many different ways could you make a present of a toy car and a Lego set?

It would be very hard to try and think of all the ways you could do it without writing them down. But there is nothing difficult to actually work out. You only have to make sure you haven’t missed any items out.

Here’s how the “Make a List” strategy helps.

You need to find a system to write down all the possible ways you can do it and stay “in the rules”. The rule this time is to have one Lego set and one toy car.

★ Start by listing all the Lego sets and toy cars separately:

Pirate Pete

Bob the Builder

Jack Stone

Dinosaur

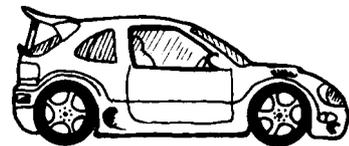
Space Vehicle

Porsche

Mercedes

Focus

Toyota



★ Now start with the first Lego set and match it to each toy car in turn:

Pirate Pete with: Porsche

Pirate Pete with: Mercedes

Pirate Pete with: Focus

Pirate Pete with: Toyota

TOTAL: 4 combinations

★ Now do the same for the next Lego set:

Bob the Builder with: Porsche, Mercedes, Focus, Toyota. Total = 4.

★ You should be able to see that for each one of the Lego sets, there will be 4 different ways you could make the present.

You know there are 5 different Lego sets, so there will be 5 lots of 4. Altogether, there are 20 different ways you could make a present from the toys at that shop.

Can you work out how many there would be if you found another different Lego set? Use the back of this sheet to make a list.

Disco Fever

Try this one on your own now.

You are trying to decide what to wear to the school disco which is coming up soon. Your friends are coming over to help you decide and you get out all the pieces of clothing that you are going to choose from. Your mum comes into your room and says that there are loads of different outfits you can make from the four tops, two skirts, pair of jeans and pair of pants that you have laid out on your bed. It doesn't seem like very much to you, so your mum suggests you work out how many different outfits are possible. She says that if it is less than 10, she'll buy you something new.

Do you get any new clothes?

List 1

List 2

Combinations: (start with the first item from List 1)



AT * Recognises, describes and uses patterns involving operation on whole numbers, and follows and describes rules for how terms in a sequence can be linked by multiplication or an addition or subtraction based strategy.

Student Information Page

You have probably seen questions in Maths books which ask you to find the next number or the next shape in a pattern. You would find it easy to do this one:

Continue the pattern: 10, 20, 30, _____

Once you know the pattern, you don't even need to know every number to be able to fill in a gap further along the pattern. If you had to say what the 8th number in the above pattern would be, you could say it would be 80 because you know 8 lots of 10 is 80.

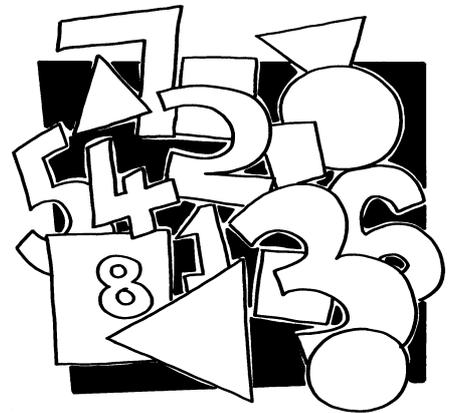
Or if it was a shapes pattern which went square, circle, triangle, square, circle, triangle, etc, you can see that squares would be the 1st, 4th, 7th, 10th shapes and so on.

Complete this pattern now:

Circles would be the 2nd, 5th, _____, _____, _____

Triangles would be the _____, _____, _____, _____

a) What shape would be in the 21st place? _____



These are both quite simple patterns because only one thing is being done at a time. The numbers are increasing by ten every time, and the shapes stay in the same repeated order.

Sometimes, though, number patterns can be a bit harder to figure out because more than one thing is being done to them – different operations, which just means adding, subtracting, multiplying and dividing.

In this number pattern for you to try, two different operations have taken place each time, in order to get to the next number. But it is a pattern because the same two things have been done. See if you can work it out:

2, 5, 11, 23, 47, _____

b) What do you think the pattern is? _____

AT * Recognises, describes and uses patterns involving operation on whole numbers, and follows and describes rules for how terms in a sequence can be linked by multiplication or an addition or subtraction based strategy.

Number Patterns

Here's an even more difficult one for you to try. This time, there are still two different operations on the numbers each time, but one of the operations does not stay exactly the same – but there is a pattern in how it changes!

a) 10, 11, 11, 10, 8, 5, 1, _____

Find the pattern, using the space below for your working.

The key to solving number pattern problems or puzzles is finding **the relationship between the numbers**. Once this relationship has been found, you can use the pattern to work out answers that would take a lot of time. Think (and look) back to when you made a list of all the possible ways you could make your repeat pattern on the border of your work, if you had 4 different colours. What if you had 5 colours? Or 6? Or your whole packet of Textas? You should be able to realise that you would need a very, very long list and it would take you an awfully long time.

So, perhaps there is an easier way! Let's have a look at the pattern which comes from this.

When you had **2** things, the number of possible orders was: **2**
 When you had **3** things, the number of possible orders was: **6**
 When you had **4** things, the number of possible orders was: **24**
 If you had **5** things, the number of possible orders would be: **120**

If you multiply the number of possibilities found each time by the new number of things, you will find out how many new possibilities there are.

2 things: 2 possibilities, x 3 (new number of things) = 6.
 6 possibilities, x 4 (new number of things) = 24.
 24 possibilities, x 5 (new number of things) = 120.

b) If you had 6 things, how many possibilities would there be? _____

Imagine how long it would have taken to make a list of all of those!



**Ebook Code:
REUK0041**



For 10 - 11 years

Maths Problem Solving Series

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of the curriculum, with activities to reinforce
each problem solving method.**

Written by Susan Cull. Illustrated by Terry Allen. © Ready-Ed Publications - 2010.
Published by Ready-Ed Publications (2010) PO Box 276 Greenwood WA 6024
E-mail: admin@readyed.co.uk Web Site: www.readyed.co.uk

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ISBN 1 86397 463 6

Links to Attainment Targets

Page	Related Attainment Target Descriptions
7	Uses Guess and Check as a problem solving strategy.
8	Measures area, perimeter and capacity by counting uniform units and reads whole number scales.
9	Visualises shapes and placement in order to solve spatial problems.
10	Interprets given data and makes numerical statements and estimations based on the frequency of likely outcomes.
12	Uses diagrams to organise known data in order to problem-solve.
13	Uses diagrams to visualise spatial problems. Explores and applies the concepts of perimeter, area and length.
14	Represents problems diagrammatically. Arranges 2D shapes according to geometric criteria.
15	Uses diagrams to visualise problems and organise data; test predictions, justifying their choices.
17	* Makes tables of data to help solve a problem. Decides what information needs to be represented in a table. * Identifies number patterns in word problems; follows a rule to generate number sequences.
18	Tabulates numerical measurements of objects to solve problems. Explores the patterns and relationships between area, length and perimeters of 3D shapes.
19	Visualises and organises spatial data. Interprets data in order to problem-solve.
20	Displays and summarises data using frequencies and measurements.
22	* Makes lists of data collected in order to solve a problem. * Identifies and continues number patterns; selects appropriate operation to solve a number problem.
23	Directly compares measurements of a set of 2D objects (length, area and perimeter).
24	* Identifies the features of 2D and 3D objects and looks for patterns. * Explores networks and paths in order to find the shortest route.
25	Displays data in a list to summarise frequencies and many-to-one correspondence.
27	Makes and tests conjectures based on identified number patterns.
28	Explores and applies the concepts of perimeter, area and length of 2D shapes.
29	Visualises, arranges and explores patterns using 2D shapes.
30	Collects data about 2D shapes and looks for patterns in order to solve a spatial problem.
32	Works backwards, using counting and order to solve number problems.
33	Uses area, length and time measurement concepts to solve a problem.
34	Visualises and arranges 2D shapes so as to meet given geometric criteria; represents 3D objects in a meaningful way so as to solve surface area problems.
35	Organises known data into a table and interprets data by working backwards to solve a problem.
37	Uses logical reasoning as a problem solving strategy, making conjectures based on given data.
38	Uses prior knowledge of the concepts of time, mass and area to logically solve problems.
39	Analyses and arranges 2D shapes, using logical reasoning to solve spatial problems concerning surface area and position.
40	Organises data to solve a particular problem. Uses logical reasoning to formulate answers.
42	Applies the concept of number to a range of simple problems; finds a pattern and then applies it to more complex situations.
43	Applies measurement concepts to a range of simple problems; finds a pattern and then applies it to more complex situations.
44	Analyses spatial arrangements; applies patterns to more complex spatial arrangements.
45	Understands and measures frequencies of events based on given data. Applies knowledge to a more complex situation.

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Rationale

Mathematical problem solving is the ability to use a variety of mathematical thinking processes and skills to interpret familiar and unfamiliar situations.

Students completing mathematical problems will draw upon, and further consolidate a range of strategies, skills, known mathematical concepts and positive attitudes in order to solve the given problem.

Strategies students can use include:

- Guess and Check
- Use a Table
- Find a Pattern
- Logical Reasoning
- Create a Diagram
- Make a List
- Work Backwards
- Solve an Easier Version

Students indicate their understanding of the problem by choosing one or more of the above strategies and devising a plan. Appropriate skills and attitudes must be identified and used by the student to carry out the plan successfully. These skills and attitudes are important for students to develop, not only to solve the mathematical problem, but also to apply to other life situations. Appropriate skills and attitudes include:

- Making decisions
- Showing persistence
- Working collaboratively
- Being flexible
- Choosing technology (calculator, concrete materials)
- Working individually
- Showing initiative
- Developing clear written and verbal skills

Students of age 10 and 11 enjoy working with their peers. When working collaboratively, students will need to verbally communicate clearly to explain their ideas and solutions to their peers. They will also develop their skills to express and listen to different ideas and views. Students will also know that working independently will give them the chance to firmly grasp the features of the problem.

Importantly, through the process of solving mathematical problems, students will need to apply and further develop their understanding of a range of mathematical concepts. The activities in this book will address the following concepts:

- Number
- Space
- Measuring
- Handling Data

The purpose of this book is to provide 10 to 11 year old students with a range of mathematical problems, together with solutions.

The Problems

Structure

The mathematical problems in this book are divided into sections according to the strategy that is required to be used to help solve the problem. At the beginning of each section there is an explanation and example of the strategy. Within each section there is at least one problem to solve from each of the curriculum strands.

Concrete Materials

Students at 10 and 11 years of age should be encouraged to have access to, and use, concrete materials to aid their problem solving.

Solutions

Solutions are given for each problem. There may be other solutions that are correct.

Ideas with Activities

The activities in this book have been produced so that they can be used in a variety of ways. The problems are presented as worksheets, for class use, use as homework exercises or even as questions on tests. Alternatively, the activities can be photocopied onto card and completed by individual students or by groups of students at convenient times. Problems can be tackled and discussed as a whole class, although students should be given opportunities to solve problems individually as well as part of a small group.

Suggestions

The following suggestions may assist with the teaching of problem solving skills:

1. Have a go at completing each problem solving activity in this book yourself. You will get to know what is involved in a problem and how you may help students to find a solution.
2. Ensure opportunities for success. Success in problem solving will ensure increased student enthusiasm.
3. Give students adequate time to think about, and if necessary, discuss each problem.
4. Encourage students to clearly set out their working and clearly write and/or verbalise their conclusions.
5. The main emphasis shouldn't be placed on the final correct solution. Instead the student's efforts at working out the problem should be recognized and praised even if the final answer is incorrect.

Problem Solving Strategies

Students should be encouraged to follow a general problem solving procedure:

1. Read the problem carefully to understand what you are asked to find out and what information you have been given.
2. Choose a strategy and make a plan.
3. Carry out the plan and solve the problem.
4. Check the working out and make sure that your solution is actually answering the question.

* Create a Diagram

Creating a diagram can help students to picture the problem and find the solution. To Create a Diagram, students must read the problem carefully and draw the information that has been given to them in the question. They can then work out the solution from the diagram they have drawn.

* Guess and Check

The Guess and Check strategy can be helpful for many types of problems. When students use this strategy they will make a reasonable guess, based on the information that they have been given and then check to see if their guess is correct. Their guesses should get closer and closer to the answer, until the correct answer is found.

* Use a Table

Using a table is a good way to sort out and organize the information that has been given in the question. The information that has been set out in the table will hopefully lead students to the correct solution

* Logical Reasoning

This strategy requires students to use the information they have been given in the question to eliminate possible solutions to finally discover the correct solution.

* Make a List

Making a List is a strategy that will help students sort out the information that has been given in the problem. Once the students can see all of the possibilities for the solution, they can then attempt to solve the problem more easily.

* Find a Pattern

When students use this strategy they look for a pattern from the information that has been given. Once the pattern has been identified the students can predict what will happen next and then continue the pattern to find the correct solution.

* Work Backwards

Working Backwards is an excellent strategy to use when the final outcome of the problem has already been given. Students just need to work out what the events were that occurred previously.

* Solve an Easier Version

Sometimes the problem is too difficult to solve in one step. When this happens the students will be able to make the problem more simple by dividing it into smaller and easier steps, re-wording the problem or using smaller numbers.

Student Information Card

Guess and Check

The Guess and Check strategy can be helpful for many types of problems. When you use this strategy you will need to make a reasonable guess, based on the information that you have been given, check your guess and check again if necessary. When you check, your guesses should get closer and closer to the answer, until you reach the correct answer itself.

Example: Paul is 12 years old and his mum is three times as old.
How many years must pass before his mum is twice as old?

1. What do you know already?

You know that Paul is 12 and his mum is 3 times as old as Paul, which must mean that Paul's mum is 36 years old ($3 \times 12 = 36$).

2. Make a guess.

4 years must pass.

3. Check your guess.

In 4 years time Paul will be 16 and Paul's mum will be 40. Your guess is not correct because 40 is not twice or double 16.

4. Make a guess.

10 years must pass.

5. Check your guess.

In 10 years time Paul will be 22 and Paul's mum will be 46. Your guess is not correct because 46 is not twice 22 (but getting closer).

6. Make a guess.

12 years must pass.

7. Check your guess.

In 12 years time Paul will be 24 years old and Paul's mum will be 48. Your answer is correct since 48 is twice 24.

8. Correct Solution.

Does your solution answer the question? Yes. 12 years must pass before Paul's mum is twice as old as Paul.

Strategy: Guess and Check

Strand: Number

1. Sandy has exactly £6.00 in fifty and twenty pence coins. She has twice as many 50p coins as 20p coins.

How many of each does she have?

.....



Strategy: Guess and Check

Strand: Number

2. I am a two digit number. I am less than 40 and I am exactly divisible by 3 and 10. Guess and check to discover what number I am.

.....



Strategy: Guess and Check

Strand: Number

3. Mark washed cars on the weekend to raise money for a charity. For every two door car he washed he was paid £3 and for every four door car he received £5.

He washed a total of 17 cars and made £73 for the charity.

How many of each type of car did Mark wash?

.....



Student Information Card

Create a Diagram

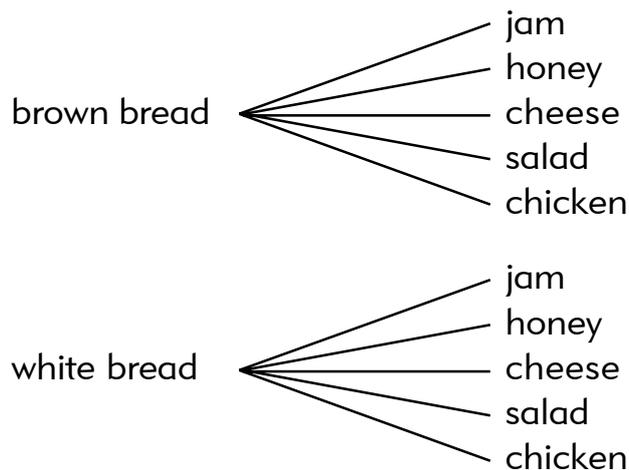
Creating a diagram can help you to picture the problem and find the solution. To Create a Diagram, read the problem carefully and draw the information that has been given to you. Work out the answer from the diagram you have drawn.

Example: Every morning you have to make a sandwich for your lunch. You have a choice of white or brown bread and can choose jam, honey, cheese, salad or chicken filling.
How many different types of sandwiches could you choose to make?

1. What do you know already?

You know from the question that you can make sandwiches with white or brown bread. You also know that you can use jam, honey, cheese, salad or chicken as a filling. You can only use one filling for each sandwich.

2. Draw a diagram.



3. Find the solution.

From the diagram you can count how many different types of sandwiches you could make. You could choose from 10 different types of sandwiches.

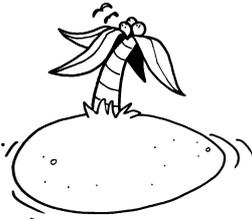
4. Correct Solution.

Does your solution answer the question? Yes. You can make 10 types of sandwiches.

Strategy: Create a Diagram

Strand: Handling Data

9. A father and his two sons want to row to an island to go fishing. Their small row boat will only carry one adult or two children. What is the least number of boat trips needed to get everyone across?



.....
.....
.....

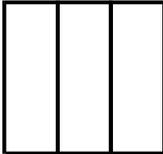


Strategy: Create a Diagram

Strand: Handling Data

10. Jeremy wants to design a striped flag using only blue, red and green. How many different combinations can Jeremy make if each colour can be used once, twice or three times in each flag? Draw the patterns below.

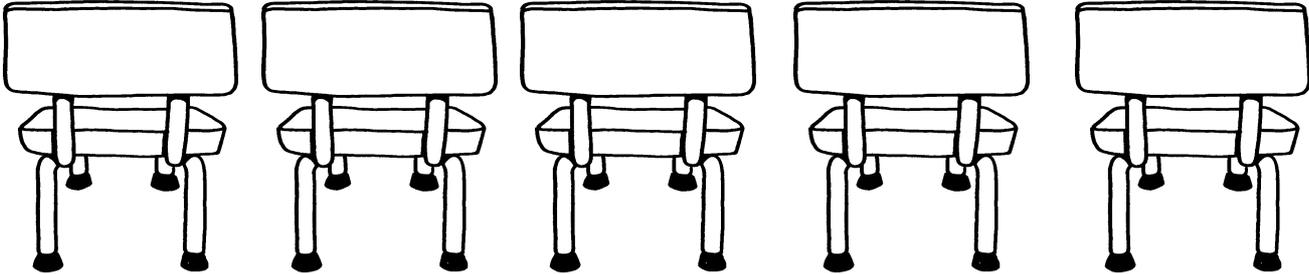
e.g.



Strategy: Create a Diagram

Strand: Handling Data

11. At a school assembly there are 5 seats in a row. Alex must sit next to Sophie but not next to Luke. Luke will not sit next to Kylie. Kylie and Sophie always sit next to each other. Who is sitting next to John? Write the names on the backs of the seats.





**Ebook Code:
REUK0042**



For 11 years+

Maths Problem Solving Series

**Strategies and techniques covering all strands of
the curriculum, with activities to reinforce each
problem solving method.**

Written by Val Morey. Illustrated by Terry Allen. © Ready-Ed Publications - 2010.
Published by Ready-Ed Publications (2010) PO Box 276 Greenwood WA 6024
E-mail: admin@readyed.co.uk Web Site: www.readyed.co.uk

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ISBN 1 86397 464 4

Rationale

An outcomes approach to mathematics education means students and teachers need many and varied opportunities for students to demonstrate their learning and their understanding. To be as accurate as possible in determining students' current level of numeracy, those students must be given opportunities to demonstrate their understanding through activities which really show what they are able to do, as well as what they are not. Scoring 100% in a page of exercises tells teachers that a student has learnt what was taught, and can be useful information for checking that criteria have been met, but may not be a demonstration of their true or full mathematical understanding.

In order to make more accurate assessments of students' understanding, and therefore place them carefully within the levels described in the curriculum document, activities are needed which address two important aspects:

- Students must be able to show how well they can apply concepts or processes learnt to different contexts in order to solve a problem; and
- They must be given opportunities to show the "upper limits" of what they know and understand.

The approach in this book allows for both of those requirements.

At the same time, competence in mathematics should mean that students are able and willing to use mathematics in settings outside the maths lesson. This book supports that by providing a wide, cross-curricular context for the activities it contains.

The activities provided in this book are based on realistic situations which school students of age 11+ *could* expect to be familiar with or to face.

Therefore, the National Curriculum document aim of having students "*able to deal readily and efficiently with common situations requiring the use of mathematics*" is addressed.

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Teachers' Notes

This book contains a collection of activities for students aged 11+ to enable them to develop their Mathematical problem-solving skills. Strategies for solving problems are introduced individually and explained, so that these can be taught explicitly, practised and then applied to problems which relate to the students' school or life experience.

The book is devised as a course in mathematical problem solving and should be **worked through sequentially**, rather than "dipped into". It is divided into seven sections, one for each of the problem-solving strategies to be taught. There is no need for teachers or students to have prior familiarity with any of the strategies presented. At the beginning of each section there is an explanation of the strategy to assist teachers and students, and then students are guided through a 'scaffolding' approach to eventual independence. Although the tasks become progressively more complex in each section, all students should be able to manage the initial example and thus become familiar with the strategy. Subsequent problems could then provide extension and/or enrichment activities which are meaningful and interesting.

The activities provided represent excellent opportunities for teachers to see how students apply operational skills learned in Mathematics and they would be ideal to use as part of an assessment portfolio if required. Attainment Target/s linked to the activity on that page will appear in full at the foot of each page to assist teachers in this.

Teachers may even wish to use these activities in curriculum areas other than Mathematics, as many of the problems could easily fit into a Social Sciences, Health Education or Technology & Enterprise program, for example.

All of the activities can be completed by students working alone, although some are especially suited to group work.

Some activities require the use of school equipment such as sporting equipment, and others need extra materials such as graph paper, coloured card or measuring equipment.

Students should be permitted, even encouraged, to use working paper at all times when engaged in these activities. Teachers can decide whether the notes will be purely for the students' use or if they will form part of assessments. Either way, this is ideal training for secondary school, as well as allowing the students to try out solutions and workings before committing to a solution.

Students should be encouraged to use calculators to assist as appropriate.

Teachers' Notes:

Guess and Check

This strategy is an excellent way to introduce students to a problem solving approach to mathematics. Many of them will find that they have employed this strategy informally without recognising it as such, and therefore it will seem familiar and within their "comfort zone". Validating "Guess and Check" as a method will be a terrific confidence boost and should help students feel able to approach the other strategies with a positive attitude. At the same time, the students will learn and practise sensible guessing and understand the importance of accuracy in the "check" part of the strategy.

As its name suggests, the students first of all guess an answer to the problem and then use that answer to check whether all requirements of the problem have been met. If not, then the answer is adjusted and checked again.

Teachers should stress that it is extremely unlikely that their "guess" is going to be correct - that is not the point - and that the guess provides a starting point, which is the key to all problem solving.

Student Information Page

When approaching problem solving, the main problem can often be figuring out “where to start”!

Sometimes the easiest and most sensible way is to simply take a guess at what you think the answer might be and then check to see if that’s possible. You’ve probably done something like that yourself. If someone told you that your school canteen sells twice as many pies as pasties, and that altogether 87 pies and pasties were sold in a week, could you tell them how many pies and how many pasties were sold?

You could soon find out by the “Guess and Check” method. Your guess is probably going to be closer than you think, although it’s not likely it will be spot on.

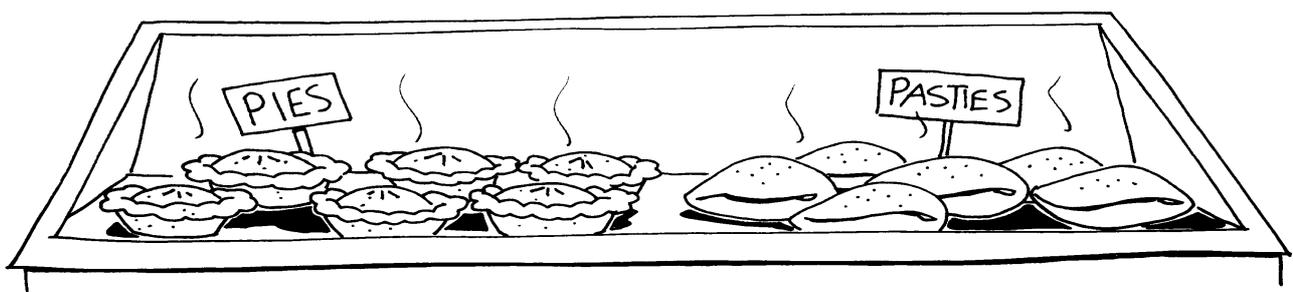
Firstly, think about what you know:

You know one number has to be double the other and that they both have to add up to 87. Therefore, the easiest thing to do would be to start with a number for the pasties, double it for the pies, and then see if they both add up to 87. So, you won’t guess that there were 4 pasties sold, because then there must have been 8 pies, and together that makes only 12. Likewise, you won’t guess 50 for the pasties as that means 100 pies, which is 150 altogether. Already you have an idea of a range inside which the answer may lie.

It can be useful to draw up a grid, based on what you know, and then use it to help you find the solution. As you get the answer for each of your guesses, decide whether your number of pasties needs to go up or down.

Here is an example of how this could have been done:

1st guess	2nd guess	3rd guess	4th guess	Answer	
20	35	26	28	PASTIES	29
40	70	52	56	PIES (double)	58
60	105	78	84	TOTAL	87



AT/s

* Understands mathematic conjectures as more than simply a guess; makes straightforward tests of conjectures and discards those that fail the test.

* Calculates with whole numbers, money and measures, drawing mostly on mental strategies to add and subtract two-digit numbers and for multiplications and divisions related to basic facts.

Class Action

Use the "Guess and Check" procedure to find the solution to this problem:

Your new class has 30 students in total. There are 4 more boys than girls in the class. Use the "Guess and Check" method to find out how many boys and how many girls are in the class. Use the grid below to help you - remember, write in what you know first.

1st guess	2nd guess	3rd guess	4th guess	Answer
				Girls
				Boys (+4)
				Total

The solution is 13 girls and 17 boys.

How many guesses did you need? _____

Sports Store Stumper

Now have a try at solving the next problem by yourself. Draw up a grid below and write in what you know, before you have your first guess.

As part of your job as sports monitor, you need to conduct a weekly check of all the balls in the sports store. When you checked, you could see that there were 3 more cricket balls than tennis balls lined up on the shelf. When you counted the balls, you counted them together and only got a total number of 45 for the two kinds. Now the Phys. Ed. teacher is asking you how many tennis balls are in the store. Can you find out, without going back and counting them?



Create a grid in the box below to help you solve the problem.

AT/s * Understands mathematic conjectures as more than simply a guess; makes straightforward tests of conjectures and discards those that fail the test.
 * Calculates with whole numbers, money and measures, drawing mostly on mental strategies to add and subtract two-digit numbers and for multiplications and divisions related to basic facts.

Teachers' Notes:

Find a Pattern

Much higher order mathematical thinking involves applying patterns which are understood and known to be true, and mathematicians are used to looking for and "seeing" patterns as part of their approach to their work. Thus, developing a facility for patterning is an important facet of developing numeracy.

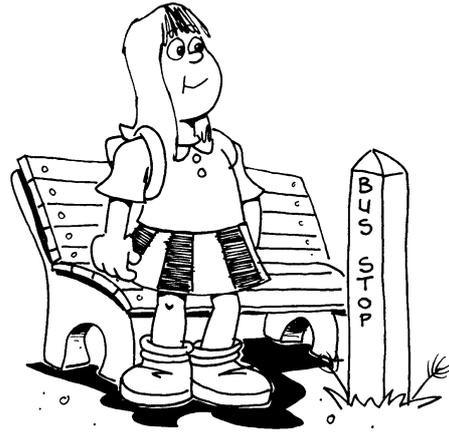
Students will no doubt be used to exercises in which they have to identify, and then possibly continue, patterns in number or shape. However, in many of these exercises, merely finding the pattern is the point.

In this section, students practise finding patterns in order to solve a problem or reach a solution. It is the application of the pattern which is important.

Watching Your Watch

The bell for the start of school sounds when your watch shows a time of 8.48 am and you think you're starting school two minutes early. But at morning recess, which begins at 10.20 am, your watch shows 10.17 am. Then at lunchtime, officially at 12.05 pm, your watch shows 12:00:50 pm. You won't be able to adjust your watch until you get home and use the special tool. You need to catch a bus home at the correct time of 3.35 pm, but you want to get a book from the library first.

What time, according to your watch, will you have to be at the bus stop for your bus?



Patterns in the Water

You are growing bulbs in your classroom and recording the rate of growth and the amount of water needed. You have marked the side of the jar into 20 ml gradations, and each day you check the water and top the level up to 200 ml.

On the first day, you decide no water is needed as you can see the level has barely changed; however, by the next day it is down to 190 ml, so you top it up. You then have to wait until Monday to check your bulb, and on Monday morning, the plant needs 18.75 ml to bring it back to 200 ml.

Which day can you expect to find the jar completely dry?



AT/s * Recognises, describes and uses patterns involving operations on whole or fractional numbers and follows and describes rules for how successive terms in a sequence or paired quantities can be linked by a single operation.
 * Measures by counting uniform units including where part-units are required, and measures length, mass, capacity, time and angle, reading whole number scales.