Contents

Introduction 4

Maths Problems 5

- Look for Patterns 5
- Experiment 6
- Make a List 7
- Work Backwards 7
- Draw a Picture/Use a Model 8
- Use Logical Reasoning 8
- Solve a Simpler Problem 9
- Guess and Check 9
- Review 10
- Look for Patterns 12
- Experiment 14
- Mixed Practice 16
- Use a Picture/Use a Model 17
- Solve a Simpler Problem 19
- Work Backwards 21
- Mixed Practice 22
- Review: Make a List 24
  Look for Patterns 25
  Guess and Check 25
  Experiment 26
  Draw a Picture/Use a Model 27
  Solve a Simpler Problem 28
  Use Logical Reasoning 28
  Work Backwards 29
- Final Review 30

The Teacher Guide and Answer Section 32

Introduction

Problem solving is the process of applying acquired knowledge to different situations. It is the basic skill of mathematics and an integral part of the mathematics curriculum at all levels of instruction.

Figure it Out is designed to teach strategies for solving mathematical problems. As students work through the activities, they learn to read problems carefully, to think about the content of problems and to use what they know about numbers and mathematics to decide how to find solutions. Each problem in **Figure it Out** has some unique quality that requires students to think carefully about how to solve it. Students can relate many of the problems to real life.

The most exciting aspect of teaching mathematics is the discoveries students make as they work through problems. Guide them with questions, encourage the use of manipulatives and be sure to give students time and space to discover.

A note on teaching problem solving:
In order for students to learn the skills needed to solve problems, it is important for you to create a problem-solving environment in the classroom. This involves three factors. First, students must see you as a problem solver and absorb your problem-solving processes. You should verbalise your thought processes. Second, problem solving takes time. Always provide students with sufficient time to explore problems. Third, problem solving is a noisy activity. You should be prepared to tolerate higher noise levels in the classroom when students are solving problems.

A note on co-operative learning groups:
Assigning students to groups of three or four to work co-operatively at solving problems can be a very effective teaching method. Any of the pages in **Figure it Out** can be completed by students working in small groups. Groups should be comprised of students who work well together. Placing students of varying abilities in one group is usually successful. Rules for group work should be established in advance and adhered to.

A note on using manipulatives:
Learning theories suggest that students whose mathematical learning is firmly grounded in concrete experiences will be more likely to bridge the gap between the world in which they live and the abstract world of mathematics. The manipulatives—objects that appeal to many senses and can be handled—help students understand both the meaning of mathematical ideas and the application of these ideas to real-world situations. Throughout the book, a variety of manipulatives is used. You should encourage students to use different kinds of manipulatives as they work through the problems. If the classroom is well equipped, there will be many choices of objects to use as counters. If these types of manipulatives are not available in the classroom, you can collect common objects to use. With the help of students and parents, and some ingenuity, you can quickly accumulate many materials. Possible manipulatives to use as counters include the following:

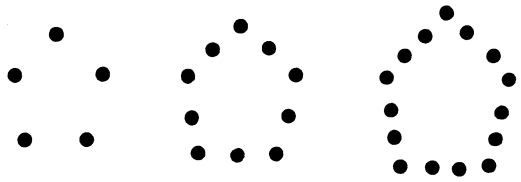
beads, bingo chips, bottle tops, bread tags, buttons, dried beans, keys, old game pieces, paper clips, pasta, pipe cleaners, icy pole sticks, shells, straws

One important final note:
The joy of solving problems is the variety of approaches that students will use to find the answers. Many of these strategies are included in this booklet; many more can't be included as they are "invented strategies", which the student devises and explains to the group. It is important that all the different ways that students discover to solve the problems be considered important and be discussed in class. Do not channel all student solutions to all problems into a particular strategy simply because that strategy is named in the title of the lesson.

Look for Patterns

Look for number patterns to help you solve the problems.

1. How many dots will be in the 10th pentagon?



1 2 3

Answer: _____

2. Write the missing numbers.

1 x 9 + 2 = _____

12 x 9 + 3 = _____

123 x 9 + 4 = _____

___ x ___ + ___ = 11,111

___ x ___ + ___ = ___

___ x 9 + ___ = 111,111,111

3. Write the answer to the following number sentence.

50 - 49 + 48 - 47 + 46 - 45 . . . + 4 - 3 + 2 - 1 = ?

Answer: _____

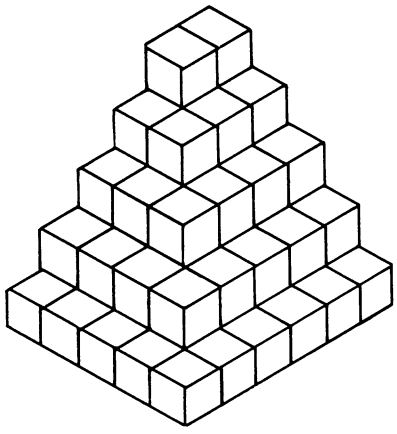
4. What is the sum of all the odd numbers from 1 to 39?

Answer: _____

Experiment

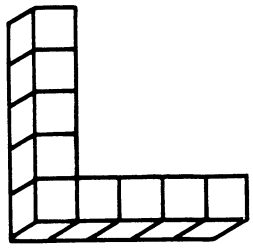
Work with other students. Experiment with the information in the problems to solve them.

5. The diagram shows 5 layers of a tower built of cubes. If there were 6 layers, how many cubes would there be in the bottom layer?



Answer: _____

6. To form the L, 9 cubes were linked together. The L was then dipped into red paint so that all of its sides were completely covered. If the cubes in the L were separated, how many cubes would have 4 red faces?



Answer: _____

7. What are all the odd 5-digit numbers you can make using the digits 2, 4, 5, 6 and 8 if you do not repeat a digit in a number?

Answer: _____

8. The Taylor family has 9 children. Once a year, each child gives a present to each of the other children. Together, the 9 children buy one gift for their mother and one gift for their father. How many gifts do the Taylor children buy altogether?

Answer: _____

Draw a Picture/Use a Model

Draw pictures or use models to solve the problems.

15. Two trains travel in the same direction on parallel tracks. Train A starts out 50 kilometres ahead of Train B. Train A travels 90 kilometres per hour and Train B travels 100 kilometres per hour. In how many hours will the trains be in the same place?

Answer: _____

16. Tamika steps into the lift on the second floor. She goes up 12 floors, down 5 floors, up 9 floors and down 3 floors. Then she steps out of the lift. Onto what floor does she step out?

Answer: _____

17. In the town hall meeting room, I sit in the fourth row from the front, which is also the twelfth row from the back. Each row has 14 seats. How many people can be seated in the meeting room?

Answer: _____

Use Logical Reasoning

Use logical reasoning to solve the problems.

18. List all the different pairs of numbers in which the sum of all the digits in each pair is 19 and the sum of the numbers in each pair is 100.

Answer: _____

_____

19. Joni bought a bike for $50 and sold it for $55. Then she bought the same bike for $60 and sold it for $65. How much money did she make or lose?

Answer: _____

20. A scale will balance with a basketball on one side and a softball and two golf balls on the other side. A basketball and a golf ball will balance with a softball and a tennis ball. A softball will balance with a tennis ball and a golf ball. How many golf balls will balance with a basketball?

Answer: _____