

## **Contents**

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Introduction .....	4
Maths Problems .....	5
• Act it Out .....	5
• Use a Picture .....	6
• Guess and Check .....	7
• Mixed Practice .....	8
• Use a Pattern .....	9
• Make a List .....	10
• Use Logic .....	10
• Reviews .....	13
The Teacher Guide and Answer Section .....	42

## **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:

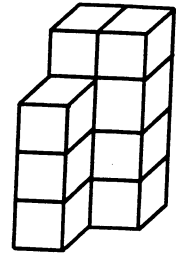
beads, bingo chips, bottle tops, bread tags, buttons, dried beans, keys, old game pieces, paper clips, pasta, pipe cleaners, icy pole sticks, shells, straws

### **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.

**Act It Out**

1. The tower in the picture is made out of blocks. How many blocks do you need to build the tower?



**Questions:** Think first, then write the answers.

- a. Can you see all the blocks you need to use? \_\_\_\_\_  
How do you know that? \_\_\_\_\_

- b. How many blocks are in the short part of the tower?  
\_\_\_\_\_

Can you see all the blocks in the short part of the tower?  
\_\_\_\_\_

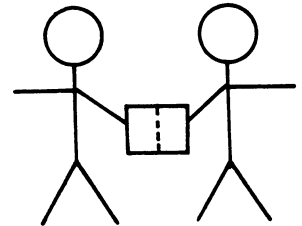
- c. How many blocks are in the tall part of the tower?  
\_\_\_\_\_

How many blocks do you think you cannot see in the tall part of the tower?  
\_\_\_\_\_

Use blocks to build the tower. Make sure your tower looks like the picture. Count the blocks you used.

**Answer:** You need \_\_\_\_\_ blocks to build the tower.

2. There are 20 children in the class. Each child needs half of a piece of paper to make a card. How many pieces of paper does the whole class need?



**Questions:** Think first, then write the answers.

- a. How many children can make a card from one piece of paper? \_\_\_\_\_  
How do you know that? \_\_\_\_\_

- b. How many pieces of paper do 4 children need to make cards? \_\_\_\_\_

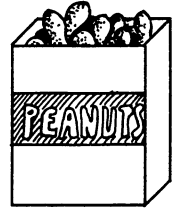
- c. Will the answer to the problem be greater than or less than 20? \_\_\_\_\_  
Why do you think so? \_\_\_\_\_

Use pieces of paper to find the answer.

**Answer:** The whole class needs \_\_\_\_\_ pieces of paper.

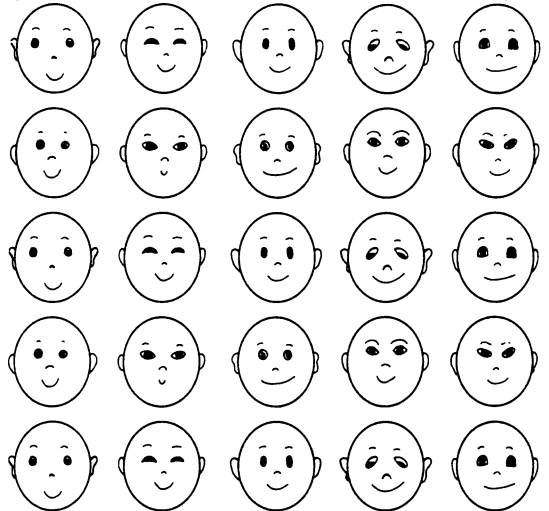
**On Your Own**

3. Tim and Sue share a box of 12 peanuts. Each child gets the same number of peanuts. How many peanuts will each child get?



Use 12 counters. Work with a friend. Find the answer.

**Answer:** Each child will get \_\_\_\_\_ peanuts.



**Use a Picture**

4. There are 25 children in Mrs. Thayer's class. The children sit in rows. There are 5 children in each row. There are 2 boys and 3 girls in each row. How many boys are in the class? How many girls are in the class?

**Questions:** Think first, then write the answers.

- Do you think there are more boys or more girls in the class? \_\_\_\_\_  
Why do you think so? \_\_\_\_\_
- How many girls are in the first row? \_\_\_\_\_  
How many boys are in the first row? \_\_\_\_\_  
Use the picture. Show the boys and girls in the first row. Write a B or a G on each face.
- How many girls are in the second row? \_\_\_\_\_  
How many boys are in the second row? \_\_\_\_\_  
Write a **B** or a **G** on each face in the second row.
- In 2 rows, there are 10 children. How many are boys? \_\_\_\_\_  
How many are girls? \_\_\_\_\_

Write a **B** or a **G** on the rest of the faces. Remember there are 2 boys and 3 girls in each row.

**Answer:** There are \_\_\_\_\_ boys and \_\_\_\_\_ girls in Mrs. Thayer's class.

5. Some ducks and pigs are in the shed. Together they have 6 heads and 16 legs. How many ducks and pigs are in the shed?

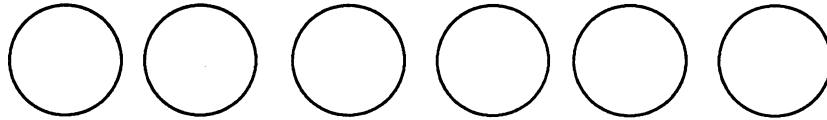
**Questions:** Think first, then write the answers.

- Altogether, how many animals are in the shed? \_\_\_\_\_  
How do you know this? \_\_\_\_\_
- How many legs does 1 pig have? \_\_\_\_\_  
How many legs does 1 duck have? \_\_\_\_\_

c. How many legs do 6 pigs have? \_\_\_\_\_

How many legs do 6 ducks have? \_\_\_\_\_

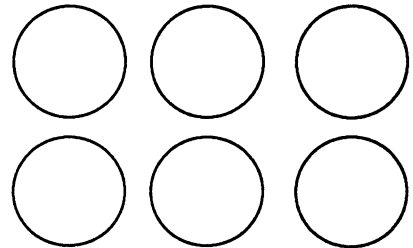
Use the circles as heads. Draw ducks with 2 legs and pigs with 4 legs. You should draw 16 legs altogether.



**Answer:** There are \_\_\_\_\_ ducks and \_\_\_\_\_ pigs in the shed.

**On Your Own**

6. Rich's Pet Shop sells only rabbits and chickens. There are 8 animals in the shop. Altogether, the animals have 22 legs. How many rabbits and chickens are in Rich's shop?



Draw legs on the circles to find the answer.

**Answer:** There are rabbits \_\_\_\_\_ and \_\_\_\_\_ chickens in Rich's store.

**Guess and Check**

7. Susanna has 16 cards. She puts all the cards into 2 piles. She puts the same number of cards in each pile. Then she puts all the cards into 8 piles. She puts the same number of cards in each pile. What is another number of piles Susanna can make so that there is the same number of cards in each pile?

**Questions:** Think first, then write the answers.

a. When Susanna makes 2 piles, how many cards are in each pile?

\_\_\_\_\_

b. When Susanna makes 8 piles, how many cards are in each pile?

\_\_\_\_\_

c. Use all the cards in the picture below. Circle 3 sets of cards. Try to put the same number of cards in each set. What happens? \_\_\_\_\_

\_\_\_\_\_

d. Use 16 cards. Put all the cards into 5 piles. Try to put the same number of cards in each pile. What happens? \_\_\_\_\_

\_\_\_\_\_

Use the picture or use some cards. Work with a friend. Find the answer.

