CONTENTS

INTRODUCTION TO *MATHS DISCOVERIES ABOUT CHANCE & DATA, BOOK 2*

The explorations and investigations in this book are designed to help students develop the maths skills and understandings articulated in the CSFII Learning Outcomes.

Manipulatives are wonderful tools and models for students to use. They enable students to explore concepts in ways that are impossible on paper. When students are able to hold something in their hands, to look at it and move it around in various ways, and to take it apart, their learning is greatly enhanced. They are able to investigate and explore concepts in concrete ways; this allows them to integrate concepts into their basic maths understandings from a sound base of personal experience. The intrinsic value of manipulatives in maths education is the underlying premise of this book.

In *Maths Discoveries About Chance & Data, Book 2,* students will be using dice, transparent spinners, centimetre cubes, and two-colour counters. They will be using dice and two-colour counters to determine possible outcomes and test predictions in experiments. They will be placing transparent spinners over various spinner circles given on exploration pages or constructed by themselves. Students will use centimetre cubes to develop cube graphs that lead into bar graphs and circle graphs. They will also place the cubes in a paper bag and draw cubes at random from the bag to determine outcomes. These materials are integral to developing the concepts of probability and graphing. Students need to use a variety of materials to demonstrate a transfer of the concepts of probability. Additionally, students will use the materials to develop various ways of displaying data at the concrete level before they represent them symbolically.

USING *MATHS DISCOVERIES ABOUT CHANCE & DATA, BOOK 2*

Contents

This book contains a series of 40 short problem-solving activities—explorations—divided into eight sections. There are five similar explorations in a section. Each section of explorations is preceded by teaching notes that identify the skills and understandings developed in the explorations and describe an activity for introducing the explorations. The teacher notes may also suggest questions that can be used to encourage students to think and communicate about what they have learnt, provide ideas for extending the activities, and suggest ways to assess student learning.

This book also contains three longer, more open-ended activities—investigations. The investigations give students the opportunity to extend and deepen their learning and to apply what they have learnt to solving a problem.

Suggestions for Classroom Use

The explorations are sequenced according to level of difficulty within each section and from section to section throughout the book.

These activities can be used by students working individually, in pairs, or in small cooperative learning groups. Working together encourages students to talk about their thinking and about their discoveries. Students will benefit from articulating their thinking

and from hearing how others may have solved the same problem in a different way. Encourage the students to share their ideas with other pairs of students, with other small groups, or with the whole class.

Open-ended questions that invite students to express their thoughts are critical to the classroom discussion. As students share the insights they have gained through developing their solutions, they teach one another important concepts about mathematics.

If the students have not used particular manipulatives before, give them time to become familiar with them. Then let students begin the explorations.

Students might enjoy doing Investigation 1, Parachuting Probability, after they have completed Explorations 1-15. This investigation offers the opportunity for the students to apply what they have learnt about outcomes, predicting outcomes, and fairness. Investigation 2, in which students use data to construct a glyph, can be used after students have completed Explorations 16-20. Students might enjoy doing Investigation 3 after they have completed Explorations 21-40. In this investigation, they simulate collecting toys from kids' meals from a local fast-food restaurant.

Materials Needed

It is recommended that you have these materials available for each student or pair of students to use: 1 set of polyhedra dice, 2 regular 6-sided dice, 1 transparent spinner, 10 centimetre cubes in each of 5 colours, 10 two-colour counters, crayons or markers, and 2 brown paper bags (lunch-bag size).

You can make copies of the explorations for each student or pair of students to use, or you can place copies in a learning centre. Students may record directly on the front and back of the exploration pages. For some of the explorations, students may also need extra paper, graph paper, or the circle graph, die pattern, or spinner circle on page 58.

For Investigation 1, students will need: plastic sheeting (such as a bag from a dry cleaner), string, paper clips, scissors, tape, and chart paper.

For Investigation 2, students will need: car magazines or car descriptions, crayons or markers, and blank paper.

For Investigation 3, students will need: crayons or markers, strips of paper, a paper bag, and blank paper.

NOTES ABOUT EXPLORATIONS **1–5**

MATHS SKILLS AND UNDERSTANDINGS

- Determine the expected probability of each outcome; express probability as a fraction
- Explore concepts of chance through experiments with rolling dice, flipping two-colour counters, and spinning spinners
- Record results of experiments, using tally marks
- Compare results of experiments with the expected probabilities
- Explore equally likely outcomes

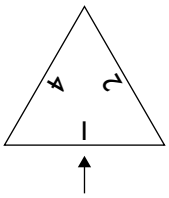
GETTING READY

For the introductory activity, each group of four students will need a tetrahedron die.

For the explorations, each pair of students will need an octahedron die, a dodecahedron die, two-colour counters, and a transparent spinner. Each student will need a copy of the explorations.

INTRODUCING THE EXPLORATIONS

Divide the class into groups of four and give each group a tetrahedron die. Ask, **What is the shape of the face of the die? What are the possible outcomes if you roll this die? What is the probability of rolling an even number? Is it the same for an odd number? How do you know?** Have students list possible outcomes and determine probabilities. (The possible outcomes are 1, 2, 3 and 4. Each outcome has an equal chance of occurring, so the probability of each outcome is 1 out of 4, or $\frac{1}{4}$.)



Ask the students to roll the die 10 times and record the rolls. (You may need to show students that the number which 'comes up' is the number at the lower edge of the die facing the player.) Collect class data and record it using a line plot. Ask, **How well did your group's data match the expected probability? How well did the combined data for all groups match the expected probability?**

TALKING AND WRITING ABOUT THE EXPLORATIONS

To help students reflect upon what they have discovered during the explorations, you can ask questions for discussion or journal writing. **How did you determine the outcomes for rolling a die with eight sides? Does each number have the same chance of coming up? How do you know? What does it mean when you say that an even number has 4 out of 8 chances of being rolled? Is this the same as 50%? Why or why not? What does it mean when you say two outcomes are equally likely? What did you find out when you compared the results of your experiments with the expected probability?**

EXTENSION IDEAS

Ask students to make a six-sided die so that each outcome is equally likely. They can mark the sides of the die with different shapes, numbers or colours. With a partner, have them roll the die and record the trials for 20 times and discuss the results.

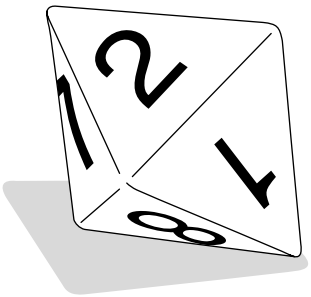
EXPLORATION 1

Name .....

Use an octahedron die and a pencil.
Record your work.

A. If you roll an octahedron die, what are the possible outcomes? What is the probability of rolling each number?

Number	Possible Outcomes	Chance or Probability
1		1 out of 8 or $\frac{1}{8}$
2		out of or
3		
4		
5		
6		
7		
8		
an even		



B. Now try an experiment. Roll an octahedron die 25 times. Use tally marks to record your results.

1		5	
2		6	
3		7	
4		8	

How many times did you roll an even number?

How many times did you roll a number that was greater than 3?

How many times did you roll a prime number?

How did your results compare to the expected probabilities listed in A?

If you were to roll the die 100 times, how many times would you expect to roll a 6?

Think and Write

Is there an equal chance of rolling an even number and an odd number?
How do you know? Explain your answer.

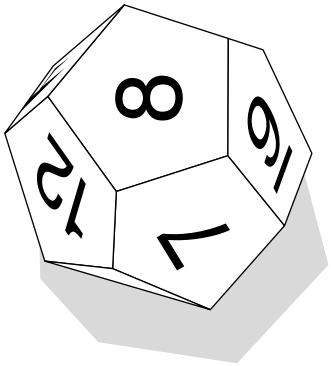
EXPLORATION **2**

Name .....

Use a dodecahedron die and a pencil.
Record your work.

A. If you roll a dodecahedron die, what is the probability of these numbers coming up?

Possible Outcomes	Chance or Probability
number 5	1 out of 12 or $\frac{1}{12}$
even number	out of or
multiple of 3	
number less than 6	
square number	
prime number	



B. Now try an experiment. Roll a dodecahedron die 25 times. Tally your results.

Number Rolled	Number of Times
number 5	
even number	
multiple of 3	
number less than 6	
square number	
prime number	

Compare your results with the probability of each outcome. How close were they?

Think and Write

What outcomes would be possible if you rolled two dodecahedra dice?
What would be the probability of rolling two fives? How do you know?