

INTRODUCTION

What is the **FOCUS** series?

FOCUS is a mathematics-strategy practice series. Each student book in the series provides brief instruction and concentrated practice for students in one targeted Mathematics Strategy. **FOCUS** also allows students the opportunity for self-assessment of their performance. It allows teachers the opportunity to identify and assess a student's level of mastery.

Six Mathematics Strategies featured in the **FOCUS** series:

- Building Number Sense
- Using Estimation
- Using Algebra
- Using Geometry
- Determining Probability and Averages
- Interpreting Graphs and Charts

The **FOCUS** series spans eight year levels, from year one to year eight. The introductory passages in each lesson are written at or below year level, allowing students to focus on the mathematics without struggling with the reading.

Book	Reading Level
Book A	at or below year one readability
Book B	at or below year two readability
Book C	at or below year three readability
Book D	at or below year four readability
Book E	at or below year five readability
Book F	at or below year six readability
Book G	at or below year seven readability
Book H	at or below year eight readability

What is Determining Probability and Averages, the Mathematics Strategy featured in this **FOCUS** book?

Determining probability involves finding the likelihood that an event will occur. Probability is determined by comparing a specific outcome with all of the possible outcomes in a given situation. In the early years, students study probability in terms of *more likely*, *less likely* and *equally likely* outcomes. As they progress, students learn to express probability in fraction form. The numerator represents a specific outcome, and the denominator represents the total number of possible outcomes. Students in the upper year levels also learn to express probability in percentage and decimal form.

Finding the average of a group of numbers provides information about how each number relates to the group as a whole. Students in years two to eight learn how to calculate averages. The addends that they work with increase in size and number as students progress through the year levels. In years seven and eight, students are introduced to several measures of central tendency. They learn to identify and calculate the mean, median, mode and range of a data set.

Students in year one learn important readiness concepts. They sort objects into groups. They practise sorting items by size, shape and colour. Students also combine sets into one group and then make equal groups.

In the middle years students learn to calculate the total number of possible combinations in a given situation. The number of possible combinations is determined by calculating the product of the numbers of items in the given categories.

How should I use the **FOCUS** series in the classroom?

The **FOCUS** series can be used effectively in the classroom in several ways. Here is a suggestion for using the program in **whole class, large group, small group, paired** and **individual** formats.

To the Student

(inside front cover of the student book)

Read and discuss this with the whole class or large group to make sure students understand what they are to do in the book.

Learn About

(pages 2–3 of the student book)

Read the two pages of instruction in the Mathematics Strategy to the whole class or large group. Model using the Mathematics Strategy. Use information from the Mathematics Strategy Tips for the Teacher on pages 12–13 of this teacher guide to prompt additional in-depth discussion of the Mathematics Strategy, as appropriate. Make sure all students understand the features of the Mathematics Strategy and how to apply the Mathematics Strategy before they go on. The Learn About requires approximately 45 minutes.

Lesson Preview

(pages 4–5 of the student book)

Read the boxed directions to the whole class or large group. Emphasise what students should watch for as they read the problem. Have students read the problem individually. Guide the whole class or large group in answering the two selected-response questions. Then discuss why each answer choice is correct or not correct. Make sure all students understand how to answer the Mathematics Strategy questions before they go on. The Lesson Preview requires approximately 45 minutes.

Lessons

(pages 6–45 of the student book)

For each lesson, have students read the directions and the passage individually, in pairs or in small groups. Have students answer the selected-response questions and the constructed-response question individually, in pairs or in small groups.

Have students use the Tracking Chart on page 47 of the student book to note the date that they have finished each lesson. When the questions in all five lessons in a group have been corrected, have students note the number of correct responses for each lesson and then the number of correct responses for the whole group of lessons.

Each lesson, plus tracking, requires approximately 45 minutes. Allow students 30 minutes to read the passage and answer the questions, and allow 15 minutes to discuss the responses. Discuss the answers to the questions with the whole class or large group, or with pairs, small groups or individuals. (See **What is the correction procedure?** on page 4 of this teacher guide.)

Self-Assessment: When students have finished each group of five lessons, have them complete the appropriate Self-Assessment. When students have finished all twenty lessons, have them complete Self-Assessment 5. Each Self-Assessment requires approximately 20 minutes.

Discussion: When students have finished each group of five lessons, discuss their performance individually or in small groups. When students have finished all twenty lessons, discuss their performance individually or in small groups. Each discussion requires approximately 25 minutes.

MATHEMATICS STRATEGY TIPS FOR THE TEACHER

Using probability can help you predict whether an event will occur.

Students explore the probability of an event's occurring as more likely than, less likely than, or equally likely as another event. For example, if there are more red shirts in a wardrobe than any other colour, the likelihood of picking a red shirt without looking at the rack of shirts is *more likely than* that of picking any other colour shirt.

Organised lists, such as the charts on the Learn About page, can be used to determine the probability of events occurring. One column lists the types of objects in a data set. The other column lists the number, measurement or value of each type of object. If one of the objects in the data set is chosen randomly, the greatest number in the chart indicates the most likely event. Conversely, the least number in the chart indicates the least likely event. Equal numbers in the chart indicate events that are equally likely to occur when items are selected randomly.

In addition to charts and lists, spinners can be used to show probability. Many spinners have sections that are all of equal size. Each of the spaces is labelled. Sometimes there are different numbers of spaces that display each label. Draw a circular spinner that has 8 equal sections. Label 3 of the sections *A*, 2 of the sections *B*, 2 of the sections *C*, and 1 section *D*. Discuss with students the likelihood of the spinner's landing on each letter. Explain that the spinner is most likely to land on *A* because more sections are labelled *A* than any other letter. The spinner is least likely to land on *D* because there are fewer sections labelled *D* than any other letter. The spinner is equally likely to land on sections *B* and *C* because an equal number of sections are labelled *B* and *C*.

Learn About

Determining Probability and Averages: Probability

Probability is the chance or likelihood that an event will happen. One event can be more likely to happen, less likely to happen or equally likely to happen as another event.

The chart shows the number of lollipops in a box. The probability of picking an orange lollipop is greatest. There are more orange lollipops than any other flavour. The probability of picking a watermelon lollipop is least. There are fewer watermelon lollipops than any other flavour.

Lollipops	
Flavour	Number
Strawberry	23
Lemon	17
Watermelon	15
Orange	32

A toy shop has a wide selection of rubber balls. A box at the back of the shop is filled with small rubber balls. The chart shows the number of balls in the box. Is a customer more likely to pick a green ball or a red ball from the box?

Rubber Balls	
Colour	Number
Red	26
Blue	48
Black	15
Green	42

There are more green balls than red balls in the box. A customer is more likely to pick a **green ball**.



Probability is the chance or likelihood that an event will happen. One event can be more likely to happen, less likely to happen or equally likely to happen as another event.

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Determining Probability and Averages Book C CAS9881 • © 2009 Hawker Brownlow Education

Explore the probability of events occurring in the classroom. Ask students to identify the months during which their birthdays occur. Record the number of students whose birthdays occur during each month. Then ask as a question such as this: "If we randomly choose a student from the class, is it more likely that his or her birthday will be in March or July?" You may need to explain the concept of *random* by providing an example such as picking names from a bag. Encourage students to think of their own questions. If students ask questions for which the outcomes are impossible, you might want to explain why such outcomes or events are impossible.

How Is *FOCUS on Mathematics* Supported by Research?

FOCUS on Mathematics is supported by research from mathematical researchers and organisations, including the National Math Advisory Panel and National Council of Teachers of Mathematics, both from the US. Much of the research on effective instruction for mathematical students parallels the recommendations of the NMAP (2008). Many of these recommendations are integrated into the *FOCUS on Mathematics* series, including: word-problem focus, explicit instruction with modelling and focused practice.

Word-Problem Focus

Word problems are the proving ground for students to demonstrate their mastery of mathematical fluency and conceptual understanding. Having the ability to transfer what they have learned to new problem-solving situations is one of the major goals for mathematical education (NCTM, 2006; NMAP, 2008). “The issue of transfer, that is, the ability to use skills learned to solve one class of problems, such as similar triangles, to solve another class of problems, such as linear algebra, is a vital part of mathematics learning” (NMAP, 2008, p. 30). And yet, students, on average, have the most difficulty solving word problems.

The *FOCUS on Mathematics* series provides repeated and focused practice of key maths strategies in the context of word problems. With more than 800 word problems in the series, students gain multiple opportunities to practise core maths concepts and strategies.

Explicit Instruction with Modelling

Explicit instruction is a hallmark of effective instruction for struggling and on-level students. Explicit instruction is one of the instructional methods that research has proved to be effective. “By the term *explicit instruction*, it is meant that teachers provide clear models for solving a problem type using an array of examples, that students receive extensive practice in use of newly learned strategies and skills, that students are provided with opportunities to think aloud (i.e. talk through the decisions they make and the steps they take), and that students are provided with extensive feedback” (NMAP, 2008, p. 23). Each of these features, can be found in the *FOCUS on Mathematics* series. With explicit instruction and teacher modelling, skill efficiency is nearly guaranteed by students (Hiebert & Grouws, 2008).

FOCUS on Mathematics uses explicit instruction in the teaching of the mathematical strategies. The explicit instruction occurs in the Learn About section and the Lesson Preview section. Through the Learn About section, students receive explicit instruction consisting of a definition, semi-concrete and visual representations of the maths concepts, and a usage rule for the maths strategy. Additionally, *FOCUS on Mathematics* is a perfect vehicle for struggling students because it does not overwhelm students with the presentation of information. In the Learn About lesson, students initially experience the maths concepts in short presentations, usually three to seven sentences long. A Remember box text feature is a point of reference for students to use while attending to lessons. The Remember box is consistently placed in each book of the series. Struggling or novice maths students usually skip or gloss over text features, which are valuable tools. With repeated exposure and external prompting by the teacher, students learn to pay attention to the text feature.

Focused Practice

One of the major callings from from expert panels and organisations is for deeper learning and practice of mathematical skills and strategies. Focusing on specific key mathematical topics allows “teachers to commit more time each year to topics receiving special emphasis. At the same time, students would have opportunities to explore these topics in depth, in the context of related content and connected applications, thus developing more robust mathematical understandings” (NCTM, 2006, p. 4).

ANSWER KEY *(continued)*

Lesson 9 (page 22)

1. D 2. B 3. C 4. C

5. Solution: The average number of T-shirts in each of the 3 remaining colours is 15.

Sample Explanation: *First, I found the total number of gold, blue and green T-shirts.*

$$20 + 10 + 15 = 45$$

Then I divided the total number of gold, blue and green T-shirts by 3.

$$45 \div 3 = 15$$

Lesson 10 (page 24)

1. A 2. C 3. D 4. B

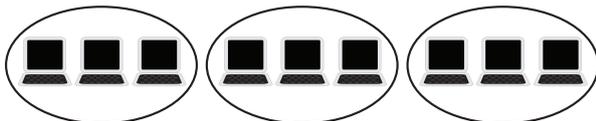
5. Solution: Holly is less likely to choose “turn on computers” or “straighten books on shelves” than “sharpen pencils”.

Sample Explanation: *I looked at the chart and found that “turn on computers” and “straighten books on shelves” both require fewer than 3 students.*

Lesson 11 (page 26)

1. C 2. C 3. B 4. D

5. Solution: Kevin sent an average of 3 emails to Patty each day.



Sample Explanation: *First, I found the total number of emails that Kevin sent to Patty.*

$$5 + 3 + 1 = 9$$

Then I divided the 9 emails that Kevin sent to Patty into 3 equal groups. There were 3 emails in each group.

Lesson 12 (page 28)

1. C 2. B 3. B 4. B

5. Solution: The average amount of time spent exercising each day is 4 minutes.

Sample Explanation: *I divided the total amount of time spent exercising by the number of days.*

$$20 \div 5 = 4$$

Lesson 13 (page 30)

1. D 2. B 3. C 4. C

5. Solution: Paul is now equally likely to choose peach juice or apple juice.

Sample Explanation: *First, I subtracted 3 from the number of bottles of apple juice.*

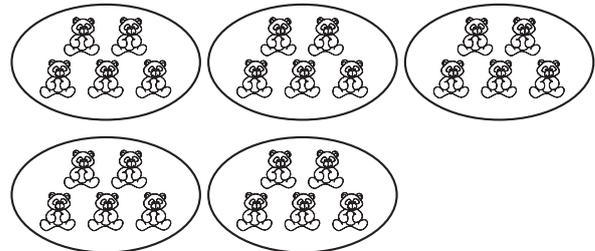
$$14 - 3 = 11$$

Then I looked at the chart and found that there are also 11 bottles of peach juice.

Lesson 14 (page 32)

1. A 2. B 3. C 4. B

5. Solution: Jim made an average of 5 stuffed animals each month.



Sample Explanation: *First, I added the number of stuffed animals that Jim made in August to the total of the other 4 months.*

$$20 + 5 = 25$$

Then I divided the 25 stuffed animals that Jim made into 5 equal groups. There are 5 stuffed animals in each group.

Lesson 15 (page 34)

1. C 2. C 3. A 4. B

5. Solution: John is more likely to choose a black marble from Fran’s bag than a purple one.

Sample Explanation: *I looked at the chart and found that there are more than 15 black marbles.*