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

Understanding probability can help you determine the chance that a certain event will occur.

Probability is the likelihood that a certain event will occur. It is calculated by dividing the number of favourable outcomes by the total number of possible outcomes. In the example at the top of the Learn About page, selecting a yellow piece of confetti is the favourable outcome. The total number of possible outcomes is the number of pieces of confetti in the bag. In this example, there are 580 pieces of confetti in the bag. There are 120 yellow pieces of confetti. The probability of picking a yellow piece of confetti can be expressed as a fraction by writing the number of favourable outcomes as the numerator and the total number of possible outcomes as the denominator. So, the probability of picking a yellow piece of confetti is $\frac{120}{580}$, which can be simplified to $\frac{6}{29}$. Check students' work to ensure that they do not mistakenly place the number of favourable outcomes as the denominator and the total number of possible outcomes as the numerator.

The probability of selecting a piece of yellow confetti can also be written as a percentage. First, divide the number of favourable outcomes (120) by the total number of possible outcomes (580): $120 \div 580 \approx 0.207$. Then multiply the decimal by 100 to find an equivalent percentage: $0.207 \times 100 = 20.7\%$. Check students' work to ensure that they properly place the decimal point when converting the decimal to a percentage.

Learn About
Determining Probability and Averages: Probability

Probability is the chance that a certain event will occur. The probability of an event occurring is found by comparing the number of favourable outcomes to the total number of outcomes. Probability can be represented as a fraction or as a percentage.

The chart shows the number of each colour of pieces of confetti in a bag. To find the probability of picking a yellow piece of confetti, first find the total number of pieces of confetti. Then divide the number of yellow pieces of confetti by the total number of pieces of confetti. You can write the probability as a fraction or as a percentage.

Confetti

Colour	Number
Red	150
Blue	180
Yellow	120
Green	50
White	80

Fraction:

Total number of pieces of confetti: 580

Number of yellow pieces of confetti: 120

Probability: $\frac{120}{580} = \frac{6}{29}$

Percentage:

$\frac{6}{29} = 6 \div 29 \approx 0.207$

$0.207 \times 100 = 20.7\%$

Tamsin writes each letter of WOOLLOOMOOLOO on a card and places the cards face down on the table. What is the probability of Tamsin selecting a card with an L on it? Write the probability as a fraction and a percentage, rounded to the nearest per cent.

There are 3 cards with an L written on them and 13 cards in all.

$\frac{3}{13} = 3 \div 13 \approx 0.23$ and $0.23 = 23\%$

The probability of picking a card with an l on it is $\frac{3}{13}$ or **23%**.

Remember:

Probability is the chance that a certain event will occur. The probability of an event occurring is found by comparing the total number of favourable outcomes to the total number of outcomes.

2   *Determining Probability and Averages Book F CAS0246* • © 2009 Hawker Brownlow Education

In the example displayed in the shaded box on the Learn About page, there are 4 favourable outcomes and 11 total possible outcomes. Written as a fraction, the probability of picking a card with an *S* on it is $\frac{4}{11}$. Written as a percentage, this probability is about 36.4%.

Extend the problem by asking students to identify another letter in the word *Woolloomooloo* that has the greatest probability of being picked (*O*). Ask students to identify the letter that has the least probability of being picked (*W*). Finally, have students calculate the probability of picking the letter *L* ($\frac{3}{13}$ or about 23%).

RESEARCH SUMMARY

The following is a summary of the research upon which the *FOCUS on Mathematics* series is based.

Overview

The *FOCUS on Mathematics* series is a targeted maths-strategy practice program geared towards both on-level and off-level maths students. The research summary is based on a literature review of academic monographs, journals and reports by content-area researchers and education experts.

The summary covers the following topics in support of the series *FOCUS on Mathematics*:
- Introduction to the Series
- What Is the Need for *FOCUS on Mathematics*?
- How Is *FOCUS on Mathematics* Supported by Research?
- How Does Research Support the Assessments Found in *FOCUS on Mathematics*?
- Quick-Reference Chart: From Research to Application: Strategies and Features in *FOCUS on Mathematics*

Introduction to the Series

FOCUS on Mathematics is a series designed for on-level and struggling maths students who need repeated practice. *FOCUS on Mathematics* centres on brief instruction and concentrated practice with targeted maths concepts and strategies in the context of word problems.

The *FOCUS on Mathematics* series covers:

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

What Is the Need for *FOCUS on Mathematics*?

There is a current drive in mathematics education to meet 21st-century skills so that today's students will be competitive in tomorrow's workforce. Several expert panels and mathematical organisations have sounded the alarm bell for improving students' mathematical understanding (e.g. NCTM, 2006; NMAP, 2008), as recent tests also show that students' mathematical progress is slowing (e.g. NCES, 2007).

In answer to these concerns about students' lacklustre mathematical performance, maths experts and researchers have joined forces to combat the slowing of mathematics progress.

The release of several major reports has named algebra as a "gateway to higher mathematics", which then leads to greater successes in both the academic and working lives of students (NCTM, 2006; NMAP, 2008). In response to this joint effort, these experts have also laid a pathway for students to follow in order to develop the mathematical skills and knowledge to master algebra. The *FOCUS on Mathematics* series may be an effective tool to help students along this pathway of proficiency to algebra.

The *FOCUS on Mathematics* series provides students with explicit instruction of key mathematical concepts and strategies combined with targeted practice in the context of word problems.

ANSWER KEY

FOCUS on Determining Probability and Averages, Book F

Lesson 1 *(page 6)*

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

5. Solution: In a random month the probability that the normal high temperature in Brisbane is greater than in Perth is $\frac{3}{4}$.

Sample Explanation: *First, I analysed the table and found that there are 9 months in which Brisbane has a higher average maximum temperature than Perth. The total number of months, or outcomes, is 12. I expressed the probability as a fraction by writing the number of desired outcomes as the numerator and the number of possible outcomes as the denominator. Finally, I simplified the fraction.*

$$\frac{9}{12} = \frac{3}{4}$$

Lesson 2 *(page 8)*

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

5. Solution: The probability of spinning red or blue is $\frac{1}{2}$.

Sample Explanation: *The spinner has 2 blue sections, 1 red section and 6 total sections. I added 2 + 1 to find the total favourable outcomes. Then I wrote a fraction to compare the favourable outcomes to the total outcomes.*

$$\frac{3}{6} = \frac{1}{2}$$

Lesson 3 *(page 10)*

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

5. Solution: There are 10 possible combinations. The combinations are: grey-white, grey-tan, grey-blue, grey-black, grey-brown, navy-white, navy-tan, navy-blue, navy-black, navy-brown.

Sample Explanation: *There are 2 jumper colours and 5 sock colours. I multiplied 2 by 5 to find the number of possible combinations.*

$$2 \times 5 = 10$$

I listed the combinations by starting with one jumper colour and pairing it with each of the sock colours. Then I listed the other jumper colour and paired it with each of the sock colours.

Lesson 4 *(page 12)*

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

5. Solution: The lowest probability of being chosen for a job is in July. The probability is $\frac{1}{2}$.

Sample Explanation: *First, I found the total number of jobs needed for each month.*

February: 2 + 6 + 4 = 12
March: 2 + 8 + 2 = 12
April: 2 + 5 + 4 = 11
May: 2 + 6 + 2 = 10
June: 2 + 8 + 4 = 14
July: 2 + 5 + 2 = 9
August: 2 + 6 + 4 = 12
September: 2 + 8 + 2 = 12
October: 2 + 5 + 4 = 11

The month with the fewest jobs is July, with 9 jobs possible. The probability of receiving a job is 9 favourable outcomes divided by 18 total outcomes.

$$\frac{9}{18} = \frac{1}{2}$$

Lesson 5 *(page 14)*

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

5. Solution: Based on the pattern, there will be an average of 72 washes per day in the fifth year.

Sample Explanation: *First, I investigated the pattern for the first four years. The pattern showed that the average number of washes increased by 11 washes each year.*

$$28 + 11 = 39$$
$$39 + 11 = 50$$
$$50 + 11 = 61$$

To continue the pattern, I added 11 to 61.

$$61 + 11 = 72$$

Lesson 6 *(page 16)*

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

5. Solution: There will probably be 3080 customers who are unhappy with their cars.

Sample Explanation: *The two ratios of unhappy customers to surveyed customers can be solved together as a proportion. First, I set both ratios equal to one another.*

$$\frac{220}{725} = \frac{y}{10,150}$$

Then I calculated the cross products of the ratios and set them equal to one another.

$$725 \times y = 10,150 \times 220$$
$$725y = 2,233,000$$

Finally, I divided 2,233,000 by 725 to find the number of people who would be unhappy with their cars.

$$2,233,000 \div 725 = 3080$$