

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, there are 12 fish pins. So, there are 12 favourable outcomes. There is a total of 40 pins. So the total number of outcomes is 40.

The probability of selecting a fish pin can be written as a fraction. The number of favourable outcomes (12) is written as the numerator. The total number of possible outcomes (40) is written as the denominator. In simplest form, $\frac{12}{40}$ is $\frac{3}{10}$. 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 fish pin can also be written as a percentage. Divide the number of favourable outcomes (12) by the total number of outcomes (40): $12 \div 40 = 0.3$. Then multiply the decimal by 100 to find an equivalent percentage: $0.3 \times 100 = 30\%$. Remind students not to reverse the order of the division process by dividing the total number of outcomes by the number of favourable outcomes.

The chart in the shaded box on the Learn About page shows that there are 10 action movies in the box. So the number of favourable outcomes is 10. The sum of the second column (50) is the total number of possible outcomes. The probability of selecting an action movie is $\frac{10}{50} = \frac{1}{5} = 20\%$.

Learn About

Determining Probability and Averages: Probability

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

To find the probability of picking a pin with a fish design, first find the total number of pins. Then divide the number of pins with fish designs by the total number of pins. You can write the probability as a fraction or as a percentage.

Pins	
Design	Number
Heart	11
Sun	13
Fish	12
Flower	4

Fraction:

Number of fish pins: 12

Total number of pins: 40

Probability: $\frac{12}{40} = \frac{3}{10}$

Percentage:

$\frac{3}{10} = 10 \div 3.0$

$0.3 \times 100 = 30\%$

Lynn is moving into a new house with her family. She has all of her DVDs packed in a box. What is the probability of picking an action movie out of the box? Write your answer as a fraction and as a percentage.

DVDs	
Type of Movie	Number
Comedy	12
Action	10
Mystery	15
Cartoon	13

There are 10 action movies and 50 DVDs in all.

$\frac{10}{50} = \frac{1}{5} = 20\%$

The probability of picking an action movie is $\frac{1}{5}$ or 20%.



Probability is the chance or likelihood that an event will occur. The probability of an event occurring is found by comparing the desired event to the total number of possible events.

2

Determining Probability and Averages Book E CAS0123 • © 2009 Hawker Brownlow Education

Direct students' attention to the chart in the shaded box on the Learn About page. Write the following question on the board: "What is the probability of picking a comedy or a cartoon from Lynn's box?" Underline the word *or*. Explain to students that the word *or* indicates that the desired events include both the comedies and the cartoons. The number of desired events is $12 + 13 = 25$. There are 50 total possible outcomes. The probability of selecting a comedy or a cartoon is $\frac{25}{50} = \frac{1}{2} = 50\%$.

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 E

Lesson 1 (page 6)

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

5. Solution: Ross won an average of 6 games in the last several matches.

Sample Explanation: *First, I added all of the numbers of games Ross won.*

$$7 + 4 + 8 + 9 + 2 = 30$$

Then I divided the total number of games that Ross won by the number of matches.

$$30 \div 5 = 6$$

Lesson 2 (page 8)

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

5. Solution: Group five's car travelled 88 centimetres.

Sample Explanation: *First, I multiplied 96 by 5 to find the total distance travelled by all five cars.*

$$96 \times 5 = 480 \text{ cm}$$

Then I found the sum of the distances travelled by the cars in groups 1 to 4.

$$108 + 88 + 96 + 100 = 392 \text{ cm}$$

Finally, I subtracted 392 from 480 to find the distance travelled by group five's car.

$$480 - 392 = 88 \text{ cm}$$

Lesson 3 (page 10)

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

5. Solution: The next runner needs a time of 7.5 seconds or less.

Sample Explanation: *There are 7 times given and 1 more runner to go. I multiplied 8 by the average of 8.4 seconds to find the total time that the coach expects from all eight runners.*

$$8.4 \times 8 = 67.2 \text{ seconds}$$

Then I found the sum of the first seven girls' times.

$$9.2 + 7.8 + 8.2 + 8.6 + 9.0 + 8.8 + 8.1 = 59.7$$

Finally, I subtracted this sum from the coach's expected total to find the time that the eighth runner needs.

$$67.2 - 59.7 = 7.5 \text{ seconds}$$

Lesson 4 (page 12)

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

5. Solution: The probability that Michelle picked a yellow ball is $\frac{2}{25}$.

Sample Explanation: *First, I added the number of blue, red and green balls to find the sum.*

$$170 + 100 + 190 = 460$$

Then I subtracted the sum from 500 to find the number of yellow balls.

$$500 - 460 = 40$$

Finally, I wrote and simplified a fraction to express the probability of picking a yellow ball.

$$\frac{40}{500} \div \frac{20}{20} = \frac{2}{25}$$

Lesson 5 (page 14)

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

5. Solution: James's high score has to be 160.

Sample Explanation: *First, I multiplied to find the total score the team would need to have an average of 150.*

$$6 \times 150 = 900$$

Then I found the sum of the five friends' scores.

$$147 + 139 + 152 + 155 + 147 = 740$$

Finally, I subtracted this total from 900 to find the score that James needs.

$$900 - 740 = 160$$

Lesson 6 (page 16)

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

5. Solution: They would have to pick 40 apples of a fifth variety.

Sample Explanation: *First, I multiplied the average (35) by the number of varieties (4) to find the total number of apples that the Fords picked.*

$$35 \times 4 = 140$$

Then I multiplied 36 by 5 to find the total number of apples they would pick if they picked 5 varieties, with an average of 36 apples of each variety.

$$36 \times 5 = 180$$

Finally, I subtracted the Ford's actual total from the total with 5 varieties to find the number of apples of the fifth variety that they would need to pick.

$$180 - 140 = 40$$