

# 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 Using Estimation, the Mathematics Strategy featured in this *FOCUS* book?

Estimation is the process used to determine approximate values. Estimation is useful in many real-world situations and in determining if a calculated answer is reasonable. Students begin working with estimation by learning to round numbers to given place values. They also learn to perform calculations with rounded numbers.

Students in the early years learn to round whole numbers to the nearest ten and the nearest hundred. They also practise determining which number is closest to a given number. Students round increasingly greater numbers as they progress through the year levels. Students in the later years learn to round time measurements to the nearest hour and the nearest minute.

Beginning in year three, students learn to round decimal numbers. In some situations they round decimals to the nearest whole number. Eventually, students learn to round decimals to the nearest tenth, hundredth and thousandth.

In years one and two, students begin to calculate approximate answers by estimating sums with mainly two-digit numbers. Through the levels, students progress to estimating differences, products and quotients. Students at upper year levels also estimate with mixed numbers, percentages and money amounts.

## 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

Estimation is used to calculate an approximate value when a precise figure is not necessary. Estimation is also used to check the reasonableness of calculations.

Rounding is the first step to estimation. Use a number line to review rounding with students. Draw a number line from 100 to 1000 on the board, and place labelled tick marks for the multiples of 100. Between the multiples of 100, place unlabelled tick marks to represent the multiples of 10. Have students determine whether 340 is closer to 300 or 400 (**300**). Explain to students that numbers located exactly halfway between two multiples of 100, such as 450, are rounded up to the next multiple of one hundred. Extend the activity by using a number line from 1000 to 10,000, with the multiples of 1000 labelled.

Review the procedure used for rounding by discussing the following steps:

- 1) Circle the digit in the place that the number is being rounded to.
- 2) Underline the digit to the right of the circled digit. If the underlined digit is 4 or less, then the circled digit remains the same. If the underlined digit is 5 or greater, add 1 to the circled digit.
- 3) Change every digit to the right of the circled digit to 0.

Ask students to use these steps to round the number 284,761.953 to the following places: hundred thousands place (**300,000**); thousands place (**285,000**); hundreds place (**284,800**); tens place (**284,760**); and hundredths place (**284,761.95**).

## Learn About

### Using Estimation: Rounding Numbers

An **estimate** is a number that is close to the actual number you are looking for. Numbers can be rounded to the nearest ten, hundred, thousand, ten thousand, and so forth. If the digit one place to the right of the place being rounded to is 5 or greater, round up. If the digit one place to the right of the place being rounded to is 4 or less, round down.

For example, the number 343,267 rounded to the nearest ten thousand is 340,000 because the thousands place contains the digit 3, which is less than 4. Therefore, 343,267 rounds down to 340,000.

You can also round decimals and mixed numbers. Decimals and mixed numbers can be rounded to different places. For example, the number 33.79, when rounded to the nearest whole number, rounds up to 34 because the digit 7 in the tenths place is greater than 5. When rounding mixed numbers to the nearest whole number, round up if the fraction is  $\frac{1}{2}$  or more; round down if the fraction is less than  $\frac{1}{2}$ . For example, the number  $25\frac{1}{8}$  rounds down to 25 because  $\frac{1}{8}$  is less than  $\frac{1}{2}$ .

The area of the state of Victoria is 237,629 square kilometres. Round this number to the nearest thousand.

The digit 6 is in the hundreds place in the number 237,629. Six is greater than 5. The rounded figure is **238,000**.



Numbers can be rounded to the nearest ten, hundred, thousand, ten thousand, and so forth. If the digit one place to the right of the place being rounded to is 5 or greater, round up. If the digit one place to the right of the place being rounded to is 4 or less, round down.

2

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Students commonly use the value of the circled digit, rather than the underlined digit, to determine whether to round up or down. Remind students that the circled digit either rounds up or stays the same. Stress that its neighbour to the right, the underlined digit, determines whether the circled digit changes or stays the same.

If students repeatedly make this mistake, have them colour code the digit to the right of the circled digit. For example, they can write the underlined digit in red or highlight it. This visual cue will help them remember that the value of the colourful digit determines whether the circled digit changes or stays the same.

# RESEARCH SUMMARY

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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 Using Estimation, Book F

### Lesson 1 (page 6)

1. A    2. C    3. A    4. D

5. Solution: Josie must pay about \$20 for the trip.

Sample Explanation: *First, I rounded the cost for the zoo admission, lunch and T-shirt to the nearest dollar.*

$$\$8.90 \text{ rounds to } \$9$$

$$\$3.75 \text{ rounds to } \$4$$

$$\$7.20 \text{ rounds to } \$7$$

*Then I found the sum of these amounts.*

$$\$9 + \$4 + \$7 = \$20$$

### Lesson 2 (page 8)

1. C    2. C    3. B    4. D

5. Solution: Andrew worked about 12 hours in all on his project.

Sample Explanation: *First, I rounded  $2\frac{1}{5}$  to 2 hours. Then I multiplied 2 hours by 6 weeks.*

$$2 \times 6 = 12 \text{ hr}$$

### Lesson 3 (page 10)

1. C    2. B    3. B    4. D

5. Solution: Ian's dad's estimate is \$104.

Sample Explanation: *First, I rounded the price of each item to the nearest dollar.*

$$\$2.40 \text{ rounds to } \$2 \quad \$11.99 \text{ rounds to } \$12$$

$$\$2.19 \text{ rounds to } \$2 \quad \$2.89 \text{ rounds to } \$3$$

$$\$3.79 \text{ rounds to } \$4 \quad \$2.29 \text{ rounds to } \$2$$

$$\$2.19 \text{ rounds to } \$2 \quad \$3.19 \text{ rounds to } \$3$$

$$\$9.99 \text{ rounds to } \$10 \quad \$2.39 \text{ rounds to } \$2$$

*Then I multiplied the quantity of each item by its estimated price.*

$$1 \times \$2 = \$6 \quad 3 \times \$12 = \$36$$

$$1 \times \$2 = \$2 \quad 3 \times \$3 = \$9$$

$$2 \times \$4 = \$8 \quad 2 \times \$2 = \$4$$

$$4 \times \$2 = \$8 \quad 1 \times \$3 = \$3$$

$$2 \times \$10 = \$20 \quad 4 \times \$2 = \$8$$

*Finally, I found the sum of the rounded figures.*

$$\begin{aligned} & \$6 + \$2 + \$8 + \$8 + \$20 + \$36 \\ & + \$9 + \$4 + \$3 + \$8 = \$104 \end{aligned}$$

### Lesson 4 (page 12)

1. D    2. A    3. A    4. C

5. Solution: The height of the statue and pedestal in all is about 93 metres.

Sample Explanation: *First, I rounded the numbers to the nearest metre.*

$$46.05 \text{ rounds to } 46$$

$$46.9 \text{ rounds to } 47$$

*Then I added to find the total height.*

$$46 + 47 = 93 \text{ m}$$

### Lesson 5 (page 14)

1. A    2. D    3. B    4. B

5. The difference between the annual maximum and minimum temperatures is 9 degrees.

Sample explanation: *First, I rounded the two numbers to whole numbers.*

$$16.9 \text{ rounds to } 17 \text{ degrees}$$

$$8.3 \text{ rounds to } 8 \text{ degrees}$$

*Then I subtracted the minimum temperature from the maximum temperature.*

$$17 - 8 = 9 \text{ degrees}$$

### Lesson 6 (page 16)

1. B    2. C    3. C    4. D

5. Solution: The total cost of one of each kind of smoothie is about \$15.

Sample Explanation: *First, I rounded the cost of each smoothie to the nearest dollar.*

$$\$2.83 \text{ rounds to } \$3 \quad \$2.11 \text{ rounds to } \$2$$

$$\$2.42 \text{ rounds to } \$2 \quad \$2.29 \text{ rounds to } \$2$$

$$\$2.98 \text{ rounds to } \$3 \quad \$2.67 \text{ rounds to } \$3$$

*Then I added the rounded prices.*

$$\$3 + \$2 + \$2 + \$2 + \$3 + \$3 = \$15$$

### Lesson 7 (page 18)

1. B    2. B    3. C    4. B

5. Solution: Maya made about \$530 in three months.

Sample Explanation: *First, I rounded the amount of money earned for each job to the nearest ten dollars.*

$$\$410 \text{ rounds to } \$410 \quad \$13 \text{ rounds to } \$10$$

$$\$27 \text{ rounds to } \$30 \quad \$75 \text{ rounds to } \$80$$

*Then I found the sum of these amounts.*

$$\$410 + \$10 + \$30 + \$80 = \$530$$