

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 can be used to find the nearest five or ten to given numbers. Explain to students that estimation is used to tell *about how many* when an exact number is not necessary.

Introduce students to estimation by counting by fives to 30. Then name two of the fives, such as 15 and 20. Ask students to identify the whole numbers that come between 15 and 20. Continue the activity by having students identify the whole numbers between other multiples of five, such as 10 and 15. Write the number 22 on the board and ask students to identify the multiple of 5 that is closest to the number 22. Students should realise that 22 is closest to 20.

Use kinesthetic and visual models to help students identify the nearest five to a number. Write the numbers from 0 to 15 on separate sheets of plain white paper. Place them on the floor to make a floor number line. Ask for three volunteers, and have them stand at 5, 10 and 15. Ask another student to stand at any other number on the line, such as 12. Have students identify whether this classmate is closer to the student standing at 5, 10 or 15. Continue the activity with other examples, helping students make connections between where they are standing and the numbers that represent the nearest fives.

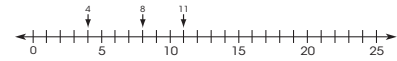
Draw a number line from 0 to 25 on the board, and label 0, 5, 10, 15, 20 and 25. Place ticks between the fives to represent the other whole numbers on the number line. Mark the spot for 16 with an X or with a sticky note. Then ask students to determine whether 16 is closer to 15 or 20 (15). Continue with several other examples until students can easily identify the nearest five to every number on the number line.

Learn About

Using Estimation: Closest Number

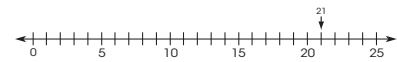
Estimation can be used to find the closest number to another number. To find the number that is closest, count up or count back. See if the number is closer to 5, 10, 15, 20 or 25.

Look at the number line, and then read the reason why each number is the closest.



- The number 4 is closest to 5 because 4 is 1 less than 5 but 6 less than 10.
- The number 8 is closest to 10 because 8 is 2 less than 10 but 3 more than 5.
- The number 11 is closest to 10 because 11 is 1 more than 10 but 4 less than 15.

Kyle is having a birthday party. He counted 21 dinner plates. Is 21 closer to 20 or 25?



The number 21 is 1 more than 20. It is 4 less than 25.
The number 21 is closer to 20 than to 25.



Estimation can be used to find the closest number to another number. To find the number that is closest, count up or count back. See if the number is closer to 5, 10, 15, 20 or 25.

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Organise students in two or three groups of approximately equal size. Ask a volunteer to guess whether each group includes about 5, about 10 or about 15 students. The answer will depend on your class size. Then have students count to determine whether the guess was the best estimate of the number of students in each group. Regroup students so that there is a significantly different number of students in each group. Again, have students estimate the number of students in each group to the nearest five.

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.

Quick-Reference Chart
From Research to Application:
Strategies and Features in *FOCUS on Mathematics*

This Series Uses . . .	Example	Research Says . . .
<p>Annotated Answer Explanation for Students As part of guided instruction, students receive immediate feedback on their answer choices and read the reasoning behind correct and incorrect answers.</p>	<p>Student Book: Lesson Preview</p>	<p>Research (Pashler et al, 2007) has shown that when students receive direct instruction about the reasons why an answer is correct or incorrect, they demonstrate long-term retention and understanding of new learned content.</p>
<p>Balanced Instructional Approach A balanced instructional approach is one that uses both teacher-directed instruction and student-centred instruction.</p>	<p>Student Book: Learn About and Lesson Preview allows for a teacher-directed approach and/or for student-centred learning.</p>	<p>An instructional program should neither be solely teacher-directed nor solely student-centred (NMAP, 2008, p. 45).</p>
<p>Differentiated Instruction This is an instructional approach that allows students of varying abilities to learn the same content.</p>	<p>Teacher Guide: Teachers are directed to use individual, paired or small-group instruction depending on students' abilities.</p>	<p>“ ‘Multiple paths’ does not mean that students are given free rein; it means that teachers must find that sweet spot between structure and choice that makes student learning possible . . . By allowing options that accommodate different thinking patterns, teachers help all students not only achieve planned learning goals but also own these goals in a way that’s all theirs” (Carolan & Guinn, 2007, p. 45).</p>
<p>Explicit Instruction* Explicit instruction is:</p> <ul style="list-style-type: none"> • clear models for solving a problem type using several examples • extensive practice in use of newly learned strategies and skills • opportunities to think aloud • extensive feedback is provided 	<p>Student Book:</p> <ul style="list-style-type: none"> • Learn About section • Lesson Preview offers think-aloud opportunities and the annotated answer explanations provide immediate feedback to student’s answer choices • Student Self-Assessments <p>Teacher Guide:</p> <ul style="list-style-type: none"> • Teacher Assessments • “How Should I Use the <i>FOCUS on Mathematics</i> series in the Classroom?” discussion feature 	<p>“Explicit instruction with students who have mathematical difficulties has shown consistently positive effects on performance with word problems and computation” (NMAP, 2008, <i>xxiii</i>).</p>

* *Explicit Direct Instruction (EDI): The Power of the Well-Crafted, Well-Taught Lesson*, CO9237, Melbourne, Vic: Hawker Brownlow Education

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