

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 Algebra, the Mathematics Strategy featured in this *FOCUS* book?

Algebra is the strand of mathematics that focuses on relationships among quantities and on the different ways to represent these relationships. One such representation uses numbers, symbols and variables. These elements can be combined to describe a mathematical situation. In the earlier years, students learn to use number sentences, which consist of numbers, symbols such as $+$, $-$, \times , \div , $=$ and variables that identify missing information. Variables are typically shown as blanks or boxes in years one and two. Beginning in year three, letter variables are introduced.

As they progress through the year levels, students learn about different kinds of representations of relationships. They write and solve equations, expressions and inequalities. Students learn to translate among different representations, such as equations, tables of values and graphs. These concepts lead to more comprehensive understanding of functions.

Patterns appear frequently in algebra problems. Some patterns appear as a list of sequentially ordered numbers. Other patterns appear as IN and OUT boxes or in tables. Students find missing elements and extend both number and geometric patterns. Patterns are one more way of representing relationships.

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 algebra can help you complete patterns.

Many patterns consist of numbers. Patterns made up of numbers are called number patterns. Some number patterns appear in a sequentially ordered list. Other number patterns are organised in a table or a chart.

Patterns follow rules. Increasing number patterns often follow addition and multiplication rules. Decreasing number patterns often follow subtraction and division rules. Some pattern rules use a combination of operations. For example: 1, 2, 5, 14, 41. The rule for this pattern is **multiply by 3 and subtract 1**.

For example:

$$\begin{aligned}1 \times 3 - 1 &= 2 \\2 \times 3 - 1 &= 5 \\5 \times 3 - 1 &= 14 \\14 \times 3 - 1 &= 41\end{aligned}$$

You can find the rule for a number pattern by comparing the numbers in the pattern. First, determine whether the numbers are increasing or decreasing. Then find the operation or operations used to increase or decrease the numbers. Make sure that this operation works with each given element of the pattern.

For example: 3, 7, 15, 31, 63. The numbers in this pattern are increasing. Each number is multiplied by 2, and then 1 is added to the product. The pattern rule is **multiply by 2 and add 1**.

Learn About

Using Algebra: Patterns

Number patterns follow *rules*. The rules control how the numbers in a pattern increase or decrease. Increasing patterns follow addition or multiplication rules. Decreasing patterns often follow subtraction or division rules. Sometimes there is a missing number in a pattern. The pattern rule can be used to find the missing number.

To find the rule, compare the consecutive numbers in a pattern. Ask these questions:

- Are the numbers increasing or decreasing?
- What operation is being used to increase or decrease the numbers?

Look at the pattern. Try to find the rule and the missing number.

Jack owns a large toy car collection. The missing number in this pattern is the same as the number of cars in Jack's collection. How many toy cars are in Jack's collection?



2, 6, 18, ____, 162

Find the rule. The numbers in the pattern are increasing. Each number is multiplied by the same factor to find the next number. Compare the consecutive numbers to find the pattern rule.

$$2 \times 3 = 6 \quad 6 \times 3 = 18 \quad 18 \times 3 = 54 \quad 54 \times 3 = 162$$

The rule is **multiply by 3**, and the missing number is **54**.



Number patterns follow rules. Most number patterns follow addition, subtraction, multiplication, or division rules. You can compare the consecutive numbers in a pattern to find the rule.

2

Using Algebra Book E, CAS0161 • © 2009 Hawker Brownlow Education

You can use a pattern rule to find a missing number in a pattern. Simply apply the rule to find the missing number. For example: 1, 2, 6, 22, ____, 342. The rule for this pattern is **multiply by 4 and subtract 2**. $22 \times 4 = 88$; $88 - 2 = 86$. The missing number is **86**.

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 Using Algebra, Book E

Lesson 1 (page 6)

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

5. Solution: Joseph's locker number was 267.

Sample Explanation: *Each locker number increases by 2, since the numbers are all odd.*

Because 255 is the first number, you have to add 2 six times to 255 to find the number of the seventh locker in that row.

$$255 + 2 = 257$$

$$257 + 2 = 259$$

$$259 + 2 = 261$$

$$261 + 2 = 263$$

$$263 + 2 = 265$$

$$265 + 2 = 267$$

Lesson 2 (page 8)

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

5. Solution: Marlene's answer was 99.

Sample Explanation: *I examined the relationship between the numbers to find the pattern. To find the next number in the pattern, you start with 6 and add 3. Then continue by adding twice as much each time.*

$$6 + 3 = 9$$

$$9 + (3 \times 2) = 15$$

$$15 + (6 \times 2) = 27$$

$$27 + (12 \times 2) = 51$$

I extended the pattern to find the next number.

$$51 + (24 \times 2) = 99$$

Lesson 3 (page 10)

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

5. Solution: Ms Anderson should purchase the tickets from Bernice.

Sample Explanation: *To find the answer, I divided 30 by the number of tickets in each group, and then I multiplied the quotient by the cost of each group.*

$$\text{Alicia: } (30 \div 2) \times \$3.50 = \$52.50$$

$$\text{Mia: } (30 \div 3) \times \$5.00 = \$50.00$$

$$\text{Bernice: } (30 \div 5) \times \$8.00 = \$48.00$$

Lesson 4 (page 12)

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

5. Solution: Amy and Andrew each earned \$10.30.

Sample Explanation: *First I figured out the total amount of money they received from selling the lemonade.*

$$60 \times \$0.75 = \$45$$

Then I found their profit by subtracting the amount that they paid their parents.

$$\$45 - \$24.40 = \$20.60$$

Finally, I divided by 2 to find the amount each person received.

$$\$20.60 \div 2 = \$10.30$$

Lesson 5 (page 14)

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

5. Solution: The expression is: $1600 - w - x$.

Sample Explanation: *There are $600 - w$ millilitres left in one bottle and $1000 - x$ millilitres left in the other. I wrote and simplified an expression to find the amount left in both bottles combined.*

$$(600 - w) + (1000 - x)$$

$$(1000 + 600) - w - x$$

$$1600 - w - x$$

Lesson 6 (page 16)

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

5. Solution: Joshua scored 23 points in the game.

Sample Explanation: *I wrote and simplified an expression to find the total number of points Joshua scored.*

$$(3 \times 3) + (5 \times 2) + (4 \times 1)$$

$$9 + 10 + 4$$

$$23$$