

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

A proportion is a statement that two ratios are equal. Proportions consist of two ratios written in fraction form. The ratios are separated by an equal sign. For example: $\frac{2}{6} = \frac{4}{12}$.

Many problems can be solved by writing and solving proportions with missing numbers. The missing numbers are represented by letters. For example: $\frac{1}{3} = \frac{x}{21}$.

You can find the missing number in a proportion by cross-multiplying. First, multiply to find the cross products. Then set the cross products equal to each other. Finally, solve for the missing number. For example:

$$\frac{2}{3} = \frac{4}{b}$$

$$3 \times 4$$

$$2 \times b$$

$$2 \times b = 3 \times 4$$

$$2b = 12$$

$$b = 6$$

To find the missing number in a proportion, cross multiply and then set both products equal to one another. If two ratios are equal to one another, then their cross products are equal. Use equivalent ratios (or fractions) to prove this.

You know that $\frac{2}{3}$ and $\frac{4}{6}$ are equivalent fractions.

$$\frac{2}{3} = \frac{4}{6} \text{ Cross products: } 2 \times 6 = 12 \text{ and } 3 \times 4 = 12$$

Here are some more examples.

$$\frac{3}{4} = \frac{9}{12} \text{ Cross products: } 3 \times 12 = 36 \text{ and } 4 \times 9 = 36$$

$$\frac{3}{5} = \frac{6}{10} \text{ Cross products: } 3 \times 10 = 30 \text{ and } 6 \times 5 = 30$$

Learn About

Using Algebra: Proportions

A **proportion** is a statement that two ratios are equal, for example $\frac{2}{3} = \frac{4}{6}$. Many proportions have missing numbers that are represented by letters, such as $\frac{2}{3} = \frac{6}{x}$. Finding the missing number in a proportion is a strategy used to solve some problems.

To find a missing number in a proportion, follow these steps:

- Write the cross products.
- Set the cross products equal to one another.
- Solve for the missing number.

A proportion is used to solve this problem. Find the missing number in the proportion.

Shane crushes aluminium cans before putting them in the recycling bin. He can crush six cans in one minute. At this rate, how many cans will Shane crush in 15 minutes?

$$\frac{1}{6} = \frac{15}{y}$$



Write the cross products and set them equal to one another. Then solve for the missing number.

$$\frac{1}{6} = \frac{15}{y} \quad 6 \times 15 \quad 1 \times y = 6 \times 15$$

$$1 \times y \quad 1 \times y \quad y = 90$$

At this rate, Shane will crush 90 cans in 15 minutes.



A proportion is a statement that two ratios are equal. For example, $\frac{2}{3} = \frac{4}{6}$. To find a missing number in a proportion, write the cross products and set them equal to one another. Then solve for the missing number.

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Proportions can help you understand maps and models. Using a proportion allows you to quickly interpret a map or model's scale. For example: Phil made a model of his house. He used a scale of 1 centimetre = 2 metres. If Phil's model is 11 centimetres wide, how wide is his house?

You can use the proportion $\frac{1}{2} = \frac{11}{f}$ to find the width of Phil's house. The answer is **22 metres**.

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 F

Lesson 1 (page 6)

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

5. Solution: The new toilet saves 83 litres of water in 10 flushes.

Sample Explanation: *First, I wrote an equation to find the number of litres each toilet used in 10 flushes.*

$$\text{old toilet: } 10 \times 14.4 = 144 \text{ litres}$$

$$\text{new toilet: } 10 \times 6.1 = 61 \text{ litres}$$

Then I subtracted to find how much water is saved in 10 flushes of the new toilet.

$$144 \text{ litres} - 61 \text{ litres} = 83 \text{ litres}$$

Lesson 2 (page 8)

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

5. Solution: The pattern for the number of students per page is multiply by 2. The next three numbers in the pattern are 160, 320 and 640. The pattern for the fraction of original pages needed is divide by 2. The next three numbers in the pattern are $\frac{1}{16}$, $\frac{1}{32}$ and $\frac{1}{64}$.

Sample Explanation: *I looked at the numbers in each pattern. The pattern for the number of students per page is multiply by 2.*

$$10 \times 2 = 20$$

$$20 \times 2 = 40$$

$$40 \times 2 = 80$$

$$80 \times 2 = 160$$

$$160 \times 2 = 320$$

$$320 \times 2 = 640$$

The pattern for the fraction of original pages needed is divide by 2.

$$1 \div 2 = \frac{1}{2}$$

$$\frac{1}{2} \div 2 = \frac{1}{4}$$

$$\frac{1}{4} \div 2 = \frac{1}{8}$$

$$\frac{1}{8} \div 2 = \frac{1}{16}$$

$$\frac{1}{16} \div 2 = \frac{1}{32}$$

$$\frac{1}{32} \div 2 = \frac{1}{64}$$

Lesson 3 (page 10)

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

5. Solution: Mia needs 20 cups of uncooked rice for 40 servings.

Sample Explanation: *First, I found the number of cups of cooked rice needed for 40 servings.*

$$1\frac{1}{2} \times 40 = 60 \text{ cups of cooked rice}$$

Then I wrote a proportion to show the ratio of 1 cup uncooked rice to 3 cups cooked rice is equal to x cups uncooked rice to 60 cups of cooked rice.

$$\frac{1}{3} = \frac{x}{60}$$

Finally, I used cross products to solve the proportion.

$$3x = 60$$

$$x = 20$$

Lesson 4 (page 12)

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

5. Solution: The coordinate pair (5, 1) names the fourth vertex. No, this is not one of the Knight family's favourite exhibits.

Sample Explanation: *I compared the locations of points B and M. M is down 3 units and left 1 unit from B. The fourth vertex must be down 3 units and left 1 unit from A. Start at A, go down 3 units, go left 1 unit, and the location is (5, 1). There is not an exhibit marked on the diagram at this location.*

