

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 find patterns to complete a table of values.

Patterns appear in several forms. Some patterns appear as a list of sequentially ordered numbers. Other patterns take the form of an equation. Equations are similar to rules. Equations use variables to represent unknown numbers. Typically, an x represents the input value and y represents the output value.

You can determine the equation to describe a pattern when given a table of values. Look at each pair of numbers and think about what can be done to the x value to result in the y value.

One side of the equation for a table of values will include the output, and the other side shows the input and the operation that is done to the input.

For example, look at the given table of values. Find the equation that describes the relationship.

x	1	2	3	4	5
y	3	5	7	9	11

The y values increase by 2, which indicates the equation must include $2x$. However, 2×1 does not equal 3. Therefore, the equation also includes $+ 1$. To determine if the equation $y = 2x + 1$ is correct, substitute the x values in the table to see if the result matches the corresponding y -values.

$$\begin{aligned}(2 \times 1) + 1 &= 3 \\(2 \times 2) + 1 &= 5 \\(2 \times 3) + 1 &= 7 \\(2 \times 4) + 1 &= 9 \\(2 \times 5) + 1 &= 11\end{aligned}$$

The equation that describes the relationship is $y = 2x + 1$.

Learn About

Using Algebra: Table of Values

A **table of values** shows the relationship between two sets of variables. The relationship between the variables is described by a rule. The rule for a table of values can be represented by an equation. Sometimes there are missing numbers in a table of values. You can use equations to find the missing numbers.

To find a missing number in a table of values, follow these steps:

- Compare each pair of values in the table.
- Write an equation that describes the relationship between the pairs of values.
- Solve the equation to find the missing number.

Look at the table of values. Try to find the missing number.

Cathy made this table in maths class. What is the value of y when x is 4?

x	1	2	3	4	5
y	7	12	17	?	27

Find the missing number. First, write an equation to describe the relationship between each pair of x and y values. Then solve the equation to find the missing number.

$$\begin{aligned}(1 \times 5) + 2 &= 7 & (2 \times 5) + 2 &= 12 & (3 \times 5) + 2 &= 17 \\(5 \times 5) + 2 &= 27\end{aligned}$$

The equation for this table is $y = 5x + 2$.

$$(5 \times 4) + 2 = 22$$

The missing number is 22.



A **table of values** shows the relationship between two sets of variables. The relationship between the variables is described by a rule. The rule can be written as an equation. The equation for a table of values can be used to find missing numbers.

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You can use the equation that describes the pattern of a table of values to determine a missing value.

For example, look at the given table of values. Find the missing number.

x	1	2	3	4	5
y	1	5	9		17

$$\begin{aligned}(1 \times 4) - 3 &= 1 & (2 \times 4) - 3 &= 5 \\(3 \times 4) - 3 &= 9 & (5 \times 4) - 3 &= 17\end{aligned}$$

The equation for this table is: $y = 4x - 3$

$$(4 \times 4) - 3 = 13$$

The missing number is **13**.

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 G

Lesson 1 (page 6)

1. B 2. A 3. B 4. C
 5. Solution: Yes, the girls have enough money.
 Sample Explanation: *A movie ticket before 6 p.m. costs half of \$11.50, which is \$5.75.*

$$\begin{aligned} \text{Total cost} &= 3 \times \$5.75 + 3 \times \$2.25 + \$3.75 \\ &= \$17.25 + \$6.75 + \$3.75 \\ &= \$27.75 \end{aligned}$$

The girls have \$28, which is more than the total cost.

Lesson 2 (page 8)

1. C 2. B 3. B 4. D
 5. Solution: John spent a total of $45\frac{1}{2}$ hours diving during his holiday. This is approximately 27% of his week.

Sample Explanation:

Day	1	2	3	4	5	6	7	Total
Time spent scuba diving	5	$5\frac{1}{2}$	6	$6\frac{1}{2}$	7	$7\frac{1}{2}$	8	$45\frac{1}{2}$

$$\begin{aligned} \text{Total hours in one week} &= 24 \times 7 = 168 \\ \text{Percentage of week} &= (45.5 \div 168) \times 100 \approx 27\% \end{aligned}$$

Lesson 3 (page 10)

1. B 2. A 3. B 4. D
 5. Solution: The butterfly necklaces are 42 centimetres long.
 Sample Explanation: *Each butterfly charm is $1\frac{3}{4}$ centimetres long and there are 24 charms on the necklace.*

$$\text{Total length of necklace} = 1.75 \times 24 = 42 \text{ cm}$$

Lesson 4 (page 12)

1. D 2. B 3. B 4. C
 5. Solution: Brianna needs to buy 8 pizzas for a team with 16 members.
 Sample Explanation: *Looking at the table, the number of pizzas is half the number of team members. I wrote the equation.*

$$p = t \div 2$$

Then I substituted 16 for t.

$$p = 16 \div 2$$

$$p = 8$$

Lesson 5 (page 14)

1. C 2. A 3. D 4. A
 5. Solution: $x > 4$



Sample Explanation: *The temperature is usually greater than 4, and the symbol for greater than is $>$. Since the inequality is strictly greater than, the graph contains an open circle with a line going in the positive direction.*

Lesson 6 (page 16)

1. D 2. D 3. B 4. B
 5. Solution: Tyler bought 4 apples.
 Sample Explanation: *First, I wrote the equation for total cost, c , for a apples and one ham sandwich.*

$$\$1.35 + \$0.25a = c$$

The total cost was \$2.35. Substituting \$2.35 for c and solving for a :

$$\$1.35 + \$0.25a = \$2.35$$

$$\$0.25a = \$1.00$$

$$a = 4$$

Lesson 7 (page 18)

1. D 2. B 3. B 4. C
 5. Solution: There were 4 rabbits born in May and 8 rabbits born in June.

Sample Explanation: *There were a total of 32 rabbits born. The table shows that 20 rabbits were born between January and April and between July and December. I let x represent the number of rabbits born in May and then $2x$ represents the number of rabbits born in June.*

$$20 + x + 2x = 32$$

$$20 + 3x = 32$$

$$3x = 12$$

$$x = 4$$

So, 4 rabbits were born in May.

To find the number of rabbits born in June, I substituted 4 for x .

$$2 \times 4 = 8$$