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 Building Number Sense, the Mathematics Strategy featured in this *FOCUS* book?

Number sense is an understanding of numbers and the relationships between them. As students build number sense, they become familiar with a variety of representations for whole numbers and parts of whole numbers.

Students learn to express numbers in a variety of forms. Three common ways to express numbers are in standard form, in word form and in expanded form. Students in the upper years learn to use exponents, in addition to the other common forms, to express numbers.

Students in years one to three develop counting skills and become familiar with ordinal numbers. They practise counting to identify numbers that come before or after another number. They also learn to use ordinal numbers to identify an item's position in a row or a list.

Students in years four to eight learn several ways to represent the parts of a whole. Students in year four are introduced to fractions. They learn to understand the parts of a fraction and to recognise the quantity represented by a fraction. Students in the upper years examine the relationship between fractions, decimals and percentages. They also learn to perform mathematical operations with fractions and decimals.

Students in year eight are introduced to prime and composite numbers, and they learn to determine a number's prime factorisation. They also practise following the order of operations when solving problems with parentheses, exponents or square roots.

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.

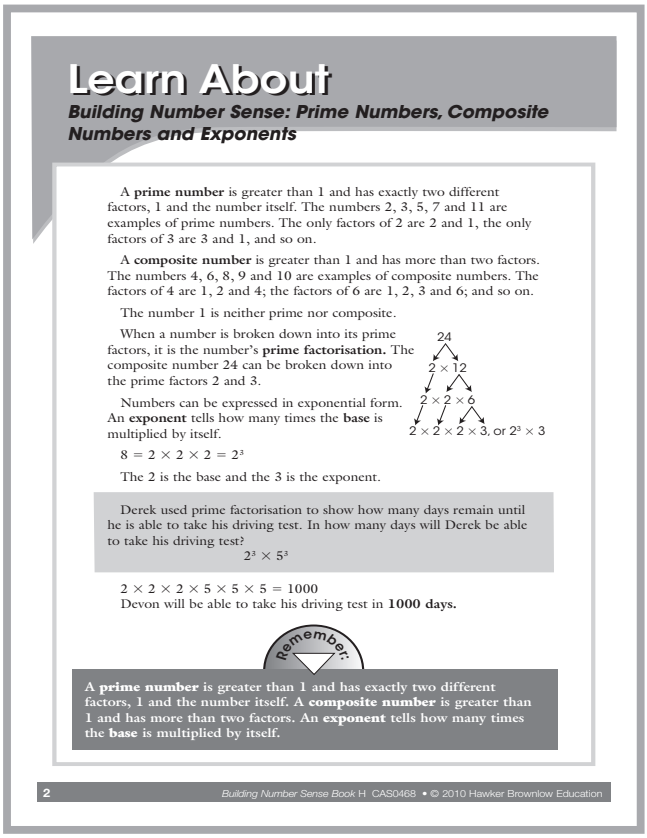
Discussion: When students have finished each group of five lessons, discuss their performance individually or in small groups. When students have finished all twenty lessons, discuss their performance individually or in small groups. Each discussion requires approximately 25 minutes.

MATHEMATICS STRATEGY TIPS FOR THE TEACHER

Number sense can be used to express numbers in different ways.

Every number greater than 1 is either prime or composite. Prime numbers have only one pair of factors – 1 and the number itself. Composite numbers have more than two factors. For example, the factors of the number 9 are 1, 3 and 9. The number 1 is neither prime nor composite because it has only one factor.

Point out to students that every even number is divisible by 2. As a result, all even numbers greater than 2 have at least two pairs of factors. For example, the factors of the number 6 are 1, 2, 3 and 6. The number 2 is the only even number with only one pair of factors (1 and 2). For this reason, the number 2 is the only even prime number.



Learn About

Building Number Sense: Prime Numbers, Composite Numbers and Exponents

A **prime number** is greater than 1 and has exactly two different factors, 1 and the number itself. The numbers 2, 3, 5, 7 and 11 are examples of prime numbers. The only factors of 2 are 2 and 1, the only factors of 3 are 3 and 1, and so on.

A **composite number** is greater than 1 and has more than two factors. The numbers 4, 6, 8, 9 and 10 are examples of composite numbers. The factors of 4 are 1, 2 and 4; the factors of 6 are 1, 2, 3 and 6; and so on.

The number 1 is neither prime nor composite.

When a number is broken down into its prime factors, it is the number's **prime factorisation.** The composite number 24 can be broken down into the prime factors 2 and 3.

24
2×12
$2 \times 2 \times 6$
$2 \times 2 \times 2 \times 3$, or $2^3 \times 3$

Numbers can be expressed in exponential form. An **exponent** tells how many times the **base** is multiplied by itself.

$8 = 2 \times 2 \times 2 = 2^3$

The 2 is the base and the 3 is the exponent.

Derek used prime factorisation to show how many days remain until he is able to take his driving test. In how many days will Derek be able to take his driving test?

$2^3 \times 5^3$

$2 \times 2 \times 2 \times 5 \times 5 \times 5 = 1000$

Devon will be able to take his driving test in **1000 days.**

Remember:

A prime number is greater than 1 and has exactly two different factors, 1 and the number itself. A composite number is greater than 1 and has more than two factors. An exponent tells how many times the base is multiplied by itself.

2 *Building Number Sense Book* H CAS0468 • © 2010 Hawker Brownlow Education

Direct students' attention to the prime factorisation of the number 24 shown in the middle of the Learn About page. Tell students that the first step in determining the prime factorisation of a number is to identify a pair of factors. Explain that it does not matter which pair is selected, as long as the factors are broken down until a row of prime factors forms.

Many students have the misconception that a certain pair of factors is preferred or "correct". Address this misconception by creating a factor tree for 24 that uses the factors 3×8 in the first row. Then create a second factor tree for 24 that uses the factors 4×6 in the first row. Point out that the final row of prime factors ($2^3 \times 3$) is the same in all three factor trees.

Remind students that numbers expressed in exponential form include a base and an exponent. The base is a factor, and the exponent indicates the number of times that the base is multiplied by itself.

Reinforce this concept by asking students to identify the standard form of the following numbers expressed in exponential form: 10^4 (**10,000**), 3^3 (**27**), 5^4 (**625**) and 2^5 (**32**).

Students may have the misunderstanding that switching a base and an exponent yields the same value. Address this by writing the following on the board:

$2^3 = 8$ and $3^2 = 9$

$8 \neq 9$

Challenge students to identify a pair of numbers that defy this rule. (**2 and 4; $2^4 = 4^2$**)

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 Building Number Sense, Book H

Lesson 1 *(page 6)*

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

5. Solution: Nina's third-term average was 84. Her second-term average was 74.

Sample Explanation: *First, I found the square root of 9025.*

$$\sqrt{9025} = 95$$

Then I subtracted 11 from this number to determine Nina's third-term average.

$$95 - 11 = 84$$

Finally, I subtracted 10 from 84 to find her second-term average.

$$84 - 10 = 74$$

Lesson 2 *(page 8)*

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

5. Solution: Sandra's oldest cousin is 40 years old, and her youngest cousin is 4 years old.

Sample Explanation: *To find the age of Sandra's oldest cousin, I multiplied 2 × 2 × 2, and then multiplied that product by 5.*

$$2^3 = 2 \times 2 \times 2 = 8$$

$$8 \times 5 = 40$$

To find the age of her youngest cousin, I added the square roots of 625 and 121. Then I subtracted that sum from the age of Sandra's oldest cousin to find the age of her youngest cousin.

$$\sqrt{625} = 25$$

$$\sqrt{121} = 11$$

$$25 + 11 = 36$$

$$40 - 36 = 4$$

Lesson 3 *(page 10)*

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

5. Solution: The shop had 5 fruit juice sales last month.

Sample Explanation: *First, I found the number of muesli bars, bags of dried fruit and chocolate bars that were sold.*

$$\text{muesli bars: } \sqrt{121} = 11$$

$$\text{dried fruit: } \frac{300}{10} = 30$$

$$\text{chocolate bars: } 8.375 + 1\frac{5}{8} = 8.375 + 1.625 = 10$$

Then I found the sum of those numbers.

$$11 + 30 + 10 = 51$$

Finally, I subtracted the sum from the total number of snacks sold to find the total number of fruit juice sales.

$$56 - 51 = 5$$

Lesson 4 *(page 12)*

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

5. Solution: The total amount of rain that actually fell throughout the week was 4 centimetres. The meteorologist predicted an amount of 4.4 centimetres.

Sample Explanation: *To find the total amount of rain that fell, I changed the fractions to decimals and added.*

$$1.75 + \frac{3}{4} + \frac{3}{2}$$

$$1.75 + 0.75 + 1.5 = 4 \text{ cm}$$

Then I added 0.4 to the sum to find the amount of rain that the meteorologist predicted would fall.

$$4 + 0.4 = 4.4 \text{ cm}$$