

# 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 Geometry, the Mathematics Strategy featured in this *FOCUS* book?

Geometry involves the mathematical study of figures, lines and angles. Students begin their work with geometry by learning to identify common plane figures and solid figures. Most plane figures are polygons. Polygons are identified by their number of sides and angles, and solid figures are identified by their number of faces and edges and the shape of the faces. In the early years, students learn to identify polygons that have lines of symmetry. As students progress through the year levels, they learn to calculate the sum of a polygon's angle measures. They also learn to count the number of visible faces on a solid figure or a group of solid figures.

Students calculate various measures for plane figures and solid figures. They learn to calculate the perimeter, circumference and area of plane figures. Starting in year five, students learn to calculate the volume of solid figures such as rectangular prisms, cylinders and spheres. The figures and the calculations increase in complexity as students move through the year levels.

In years seven and eight, students use the Pythagorean theorem to find missing side lengths on right-angle triangles. They also learn about the relationships between the angles formed by two parallel lines and a transversal. Students use their knowledge of supplementary angles, corresponding angles and vertical angles to identify missing angle measures and to solve problems.

## 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

Recognising figures and learning to calculate perimeter and area can help you apply geometry skills in the real world.

A polygon is a closed plane figure. The prefix of a polygon's name indicates how many sides the closed figure has.

Polygon	Prefix	Related Words
Triangle	Tri-	tricycle, tricolor, trio
Quadrilateral	Quad-	quadrant, quadruple
Pentagon	Penta-	pentameter, pentathlon

Review with students specific types of triangles (right, equilateral, isosceles, scalene) and quadrilaterals (square, rectangle, rhombus, parallelogram, trapezoid).

A solid figure is three-dimensional. The sides of a solid figure are called faces. The faces of a solid figure are plane figures. Two faces of a solid figure meet at an edge.

Direct students' attention to the edges of real-life solid figures in your classroom. Possible examples include the edge of a door, the edge of a desk and the edge of a cabinet. Challenge them to determine the longest edge in your room.

Caution students that using the term *sides* to describe a solid figure can be confusing and that the more precise terms are *faces* and *edges*.

## Learn About

### Using Geometry: Plane Figures and Solid Figures

Plane figures are flat. Polygons are plane figures named for their number of sides. Circles are plane figures, but they are not polygons because they do not have sides or angles.

Polygons				
 3 sides 3 angles	 4 sides 4 angles	 5 sides 5 angles	 6 sides 6 angles	 8 sides 8 angles

Solid figures are not flat. The sides on a solid figure are called faces. Two faces meet at an edge.

Solid Figures						
 0 faces 0 edges	 1 face 0 edges	 2 faces 0 edges	 4 faces 6 edges	 5 faces 9 edges	 6 faces 12 edges	 6 faces 12 edges

Sean has a sign in his room shaped like a pentagon. Which of these figures has the same shape as his sign?



A pentagon has 5 sides. Figure A has 5 sides. **Figure A** is shaped like Sean's sign.



**Plane figures** are flat. **Polygons** are plane figures named for their number of sides. **Solid figures** are not flat. The sides on a solid figure are called **faces**. Two faces meet at an **edge**.

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Reinforce understanding of polygons and solid figures by having students place a real-life rectangular prism, such as a textbook or board eraser, on a sheet of paper. Have them trace the outline of the item onto the paper. Then have them classify the plane figure that was drawn on the paper. Repeat with other classroom items that are solid figures.

# RESEARCH SUMMARY

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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 Geometry, Book E

### Lesson 1 (page 6)

1. D    2. A    3. D    4. B

5. Solution: The tabletop of Table B has an area of 3.14 square metres.

Sample Explanation: *I used  $A = \pi r^2$  to find the area of the circular tabletop.*

$$A = 3.14 \times 1 \times 1 = 3.14 \text{ m}^2$$

### Lesson 2 (page 8)

1. C    2. C    3. D    4. D

5. Solution: Megan will have ridden about 21 metres.

Sample Explanation: *In problem 3, I found the distance travelled after one revolution by calculating the circumference of the bike wheel.*

$$3.14 \times 66 = 207.24 \text{ cm}$$

*Then I multiplied by 10 to find the distance after 10 revolutions.*

$$207.24 \times 10 = 2072.4 \text{ cm}$$

*Finally, I divided by 100 to get the number of metres.*

$$2072.4 \div 100 \approx 21 \text{ m}$$

### Lesson 3 (page 10)

1. C    2. C    3. D    4. D

5. Solution: Mr Billings stained 7 square metres.

Sample Explanation: *First, I found the area of each side.*

$$2 \text{ sides: } 2 \times 1 = 2 \times 2 = 4 \text{ m}^2$$

$$2 \text{ sides: } 1 \times 0.75 = 0.75 \times 2 = 1.5 \text{ m}^2$$

$$\text{bottom: } 2 \times 0.75 = 1.5 \text{ m}^2$$

*Then I added to find the total area of the five sides.*

$$4 + 1.5 + 1.5 = 7 \text{ m}^2$$

### Lesson 4 (page 12)

1. B    2. D    3. C    4. A

5. Solution: The volume of the rubber ball is 113 cubic centimetres.

Sample Explanation: *First, I found the radius of the rubber ball by dividing the diameter by 2.*

$$6 \div 2 = 3 \text{ cm}$$

*Then I used the formula for finding the volume of a sphere.*

$$V = \frac{4}{3} \pi r^3$$

$$\frac{4}{3} \times 3.14 \times (3)^3 \approx 113 \text{ cm}^3$$

### Lesson 5 (page 14)

1. B    2. D    3. C    4. C

5. Solution: Tank A will hold 0.48 cubic metres more water.

Sample Explanation: *In problem 3, I found the volume of Tank A.*

$$2 \times 0.5 \times 1 = 1 \text{ m}^3$$

*Then I found the volume of Tank A.*

$$\frac{4}{3} \times 3.14 \times (0.5)^3 = 0.52 \text{ m}^3$$

*Because  $1 \text{ m}^3 > 0.52 \text{ m}^3$ , Tank B holds more water. Finally, I subtracted to find how much more.*

$$1 - 0.52 = 0.48 \text{ m}^3$$

### Lesson 6 (page 16)

1. D    2. A    3. B    4. C

5. Solution: The total area of Maria's flower garden is 720 square metres.

Sample Explanation: *First, I multiplied the base times the height to find the area of the petunias.*

$$23 \times 24 = 552 \text{ m}^2$$

*From problem 3, I knew that the area of the daffodil section is 168 square metres.*

*Finally, I added to find the total area.*

$$552 + 168 = 720 \text{ m}^2$$

### Lesson 7 (page 18)

1. D    2. C    3. B    4. C

5. Solution: To the nearest tenth, the volume of a large scoop of ice-cream is 523.3 cubic centimetres.

Sample Explanation: *First, I divided the diameter by 2 to find the radius.*

$$10 \div 2 = 5 \text{ cm}$$

*Then I used the formula for the volume of a sphere.*

$$V = \frac{4}{3} \times 3.14 \times (5)^3$$

$$= 523.3\bar{3}$$

$$\approx 523.3 \text{ cm}^3$$