

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.

Plane figures are flat, but solid figures are not flat. Some solid figures have faces that are plane figures. For example, a triangular pyramid is a solid figure that has four faces, and each face is a triangle. A triangular prism has two triangular bases and three rectangular faces. Some students may point out the fact that a ball, or sphere, is a solid figure that has no flat faces.

Plane figures can be identified and compared by their numbers of sides or angles. Solid figures can be identified and compared by their numbers of faces, edges or corners. Help students make a chart that shows each plane figure in the first column and the numbers of sides and corners in the other columns. You may want to include the following: circle, triangle, square, rectangle, trapezoid, pentagon, hexagon, octagon. Then ask students to make a similar chart for solid figures, identifying the numbers of faces, edges and corners. You might want to 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*.

Help students build an understanding of figures and their names by discussing certain shapes commonly found nearby. Ask students to identify circles, triangles, squares and rectangles that they commonly see in the real world, such as triangular give way signs or rectangular billboards. Then have students identify solid figures in the real world, such as buildings that are rectangular prisms or columns that are cylinders.

Learn About

Using Geometry: Plane Figures and Solid Figures

Plane figures are flat. Five kinds of plane figures are shown here.

Plane Figures				
Circle  0 sides 0 angles	Triangle  3 sides 3 angles	Square  4 equal sides 4 right angles	Rectangle  2 pairs of equal sides 4 right angles	Pentagon  5 sides 5 angles

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

Solid Figures				
Triangular Pyramid  4 faces 6 edges	Sphere  0 faces 0 edges	Cylinder  2 faces 0 edges	Cube  6 square faces 12 edges	Rectangular Prism  6 faces 12 edges

Name the figures shown. Which is a plane figure?
Which is a solid figure?



The figures are a **pentagon** and a **cylinder**. The pentagon is a plane figure. The cylinder is a solid figure.



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

2

Using Geometry Book D CAS0086 • © 2009 Hawker Brownlow Education

Have students reach into a box filled with plane and solid figures, select one without looking at it or taking it out of the box, and describe the figure that they feel. Encourage students to describe whether it is flat and whether it will roll or has only flat faces. After students identify at least three attributes, ask them to identify the figure and then take it out of the box to verify or amend their guess. Also, ask other students to identify the figure from the description given prior to the reveal.

How Is *FOCUS on Mathematics* Supported by Research?

FOCUS on Mathematics is supported by research from mathematical researchers and organisations, including the National Math Advisory Panel and National Council of Teachers of Mathematics, both from the US. Much of the research on effective instruction for mathematical students parallels the recommendations of the NMAP (2008). Many of these recommendations are integrated into the *FOCUS on Mathematics* series, including: word-problem focus, explicit instruction with modelling and focused practice.

Word-Problem Focus

Word problems are the proving ground for students to demonstrate their mastery of mathematical fluency and conceptual understanding. Having the ability to transfer what they have learned to new problem-solving situations is one of the major goals for mathematical education (NCTM, 2006; NMAP, 2008). “The issue of transfer, that is, the ability to use skills learned to solve one class of problems, such as similar triangles, to solve another class of problems, such as linear algebra, is a vital part of mathematics learning” (NMAP, 2008, p. 30). And yet, students, on average, have the most difficulty solving word problems.

The *FOCUS on Mathematics* series provides repeated and focused practice of key maths strategies in the context of word problems. With more than 800 word problems in the series, students gain multiple opportunities to practise core maths concepts and strategies.

Explicit Instruction with Modelling

Explicit instruction is a hallmark of effective instruction for struggling and on-level students. Explicit instruction is one of the instructional methods that research has proved to be effective. “By the term *explicit instruction*, it is meant that teachers provide clear models for solving a problem type using an array of examples, that students receive extensive practice in use of newly learned strategies and skills, that students are provided with opportunities to think aloud (i.e. talk through the decisions they make and the steps they take), and that students are provided with extensive feedback” (NMAP, 2008, p. 23). Each of these features, can be found in the *FOCUS on Mathematics* series. With explicit instruction and teacher modelling, skill efficiency is nearly guaranteed by students (Hiebert & Grouws, 2008).

FOCUS on Mathematics uses explicit instruction in the teaching of the mathematical strategies. The explicit instruction occurs in the Learn About section and the Lesson Preview section. Through the Learn About section, students receive explicit instruction consisting of a definition, semi-concrete and visual representations of the maths concepts, and a usage rule for the maths strategy. Additionally, *FOCUS on Mathematics* is a perfect vehicle for struggling students because it does not overwhelm students with the presentation of information. In the Learn About lesson, students initially experience the maths concepts in short presentations, usually three to seven sentences long. A Remember box text feature is a point of reference for students to use while attending to lessons. The Remember box is consistently placed in each book of the series. Struggling or novice maths students usually skip or gloss over text features, which are valuable tools. With repeated exposure and external prompting by the teacher, students learn to pay attention to the text feature.

Focused Practice

One of the major callings from from expert panels and organisations is for deeper learning and practice of mathematical skills and strategies. Focusing on specific key mathematical topics allows “teachers to commit more time each year to topics receiving special emphasis. At the same time, students would have opportunities to explore these topics in depth, in the context of related content and connected applications, thus developing more robust mathematical understandings” (NCTM, 2006, p. 4).

ANSWER KEY

FOCUS on Using Geometry, Book D

Lesson 1 (page 6)

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

5. Solution: The puppy poster has the largest perimeter, while the bear poster and the flower poster both have an identical perimeter.

Sample Explanation: *First, I found the sum of the sides of each poster.*

$$\text{flower poster: } 2 + 2 + 2 + 2 = 8 \text{ m}$$

$$\text{bear poster: } 2 + 2 + 1 + 1 = 6 \text{ m}$$

$$\text{puppy poster: } 3 + 2 + 1 = 6 \text{ m}$$

Then I ordered the sums from greatest to least, discovering that two posters had an identical perimeter.

Lesson 2 (page 8)

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

5. Solution: Richard needs two triangles and three rectangles to make a model of a triangular prism.

Sample Explanation: *First, I made a sketch of a triangular prism.*



Then I counted to find the number of each type of face.

Lesson 3 (page 10)

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

5. Solution: There are more lines of symmetry in a circle than in a square.

Sample Explanation: *I drew a circle and a square on a sheet of paper. I folded both in different ways to see which folds made two matching halves. I counted the number of folds that made matching halves. A square has four lines of symmetry. A circle has many more than this.*

Lesson 4 (page 12)

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

5. Solution: White flowers are planted in 40 square metres of the garden.

Sample Explanation: *First, I found the area of one section.*

$$\text{one section: } 2 \times 10 = 20 \text{ m}^2$$

Then I multiplied the area of one section by two because there were two sections of white flowers.

$$\text{two sections: } 20 \times 2 = 40 \text{ m}^2$$

Lesson 5 (page 14)

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

5. Solution: The total area of all four walls of the tree house is 20 square metres.

Sample Explanation: *First, I found the area of each wall. All four walls are 2 metres tall, so 2 is one factor. The tree house is 2 metres wide, so 2 is the factor for two walls.*

$$2 \times 2 = 4 \text{ m}^2$$

The tree house is 3 metres long, so 3 is the other factor for two walls.

$$3 \times 2 = 6 \text{ m}^2$$

Then I added all four areas to find the total area.

$$4 + 4 + 6 + 6 = 20 \text{ m}^2$$

Lesson 6 (page 16)

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

5. Solution: Meg drew an octagon. It has eight sides.

Sample Explanation: *I counted eight sides on the stop sign. It is an octagon.*

Lesson 7 (page 18)

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

5. Solution: The width is 30 metres.

Sample Explanation: *First, I added 60 + 60 to find the total length of two sides. Then I subtracted the length of two sides from the total metres of fencing.*

$$180 - 120 = 60 \text{ m}$$

Finally, I divided the difference by 2 to find the width of one side.

$$60 \div 2 = 30 \text{ m}$$

Lesson 8 (page 20)

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

5. Solution: Mark used two straws.

Sample Explanation: *First, I made a sketch of a design in the middle of a sheet of paper. Then I folded the paper different ways to form matching halves. I counted the folds.*

