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

Using geometry can help you classify figures and find the measures of angles in triangles and quadrilaterals.

A polygon is a closed plane figure. A triangle is a plane figure with three sides and three angles. The sum of the angle measures of any triangle is 180°.

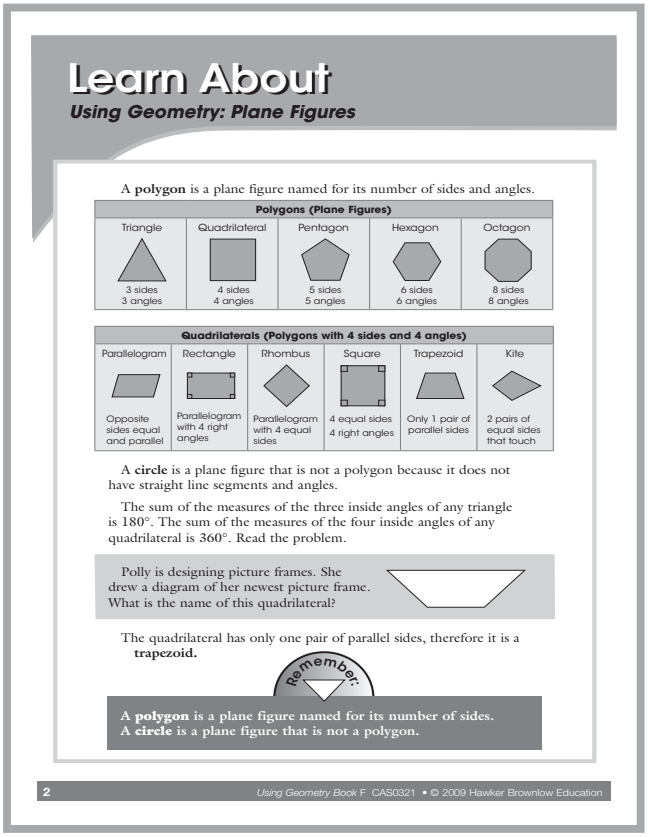
To demonstrate the sum of the angle measures in a triangle, have students cut three identical triangles from a sheet of paper. Challenge students to arrange the three triangles to form a straight angle. You might also use triangles from a pattern block set to complete this activity.

Write the following problem on the board: *Two angles of a triangle have measures of 85° and 23°. What is the measure of the third angle?*

The sum of all three angle measures is 180°. The sum of the two known angle measures is 85° + 23°, or 108°. The difference between 180° and 108° is 72°. The third angle of the triangle has a measure of 72°.

A quadrilateral is a plane figure with four sides and four angles. The sum of the angles of a quadrilateral is 360°.

To demonstrate the sum of the angle measures in any quadrilateral, show students that any quadrilateral can be divided into two equal triangles. Therefore, the sum of the angle measures must be 180° × 2 = 360°.



Learn About

Using Geometry: Plane Figures

A **polygon** is a plane figure named for its number of sides and angles.

Polygons (Plane Figures)

Triangle	Quadrilateral	Pentagon	Hexagon	Octagon
3 sides 3 angles	4 sides 4 angles	5 sides 5 angles	6 sides 6 angles	8 sides 8 angles

Quadrilaterals (Polygons with 4 sides and 4 angles)

Parallelogram	Rectangle	Rhombus	Square	Trapezoid	Kite
Opposite sides equal and parallel	Parallelogram with 4 right angles	Parallelogram with 4 equal sides	4 equal sides 4 right angles	Only 1 pair of parallel sides	2 pairs of equal sides that touch

A **circle** is a plane figure that is not a polygon because it does not have straight line segments and angles.

The sum of the measures of the three inside angles of any triangle is 180°. The sum of the measures of the four inside angles of any quadrilateral is 360°. Read the problem.

Polly is designing picture frames. She drew a diagram of her newest picture frame. What is the name of this quadrilateral?

The quadrilateral has only one pair of parallel sides, therefore it is a **trapezoid.**

Remember:

A polygon is a plane figure named for its number of sides.
A circle is a plane figure that is not a polygon.

2 *Using Geometry Book F* CAS0321 • © 2009 Hawker Brownlow Education

The polygon shown at the bottom of the Learn About page is a trapezoid. A trapezoid is a quadrilateral. The sum of its angle measures is 360°.

Write the following on the board: *Three angles of this trapezoid measure 135°, 45° and 135°. What is the measure of the fourth angle?*

The sum of all four angle measures is 360°. The sum of the three known angle measures is 135° + 45° + 135°, or 315°. The difference between 360° and 315° is 45°. The fourth angle of the trapezoid has a measure of 45°.

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 Geometry, Book F

Lesson 1 *(page 6)*

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

5. Solution: The measure of the fourth angle is 130°.

Sample Explanation: *First, I found the sum of the three angle measures.*

$$130° + 50° + 50° = 230°$$

Then I subtracted 230° from 360°.

$$360° - 230° = 130°$$

Lesson 2 *(page 8)*

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

5. Solution: The volume of the cylinder is 753,600 cubic millimetres.

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

$$80 \div 2 = 40 \text{ mm}$$

Then I used the formula for volume of a cylinder.

$$V = \pi r^2 h$$
$$V = \pi \times 40^2 \times 150$$
$$V = 3.14 \times 1600 \times 150$$
$$V = 753{,}600 \text{ mm}^3$$

Lesson 3 *(page 10)*

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

5. Solution: When the papers are rolled and standing upright, 20 papers will fit in the bag.

Sample Explanation: *First, I divided the width of the bag by the approximate diameter of each rolled paper to find how many papers can fit along the width of the bag.*

$$30 \div 6 = 5$$

Then I divided the length of the bag by the approximate diameter of each rolled paper to find how many papers can fit along the length of the bag.

$$24 \div 6 = 4$$

Finally, I multiplied the number of papers that can fit along the width by the number of papers that can fit along the length.

$$5 \times 4 = 20$$

Lesson 4 *(page 12)*

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

5. Solution: The area of the lot not covered by the building is 0.18 square kilometres (or 180,000 square metres). The city requires 0.10 square kilometres and 0.18 is greater than 0.10.

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

$$0.4 \times 0.6 = 0.24 \text{ km}^2$$

Then I found the area of the planned building.

$$\frac{1}{2} \times 0.3 \times 0.4 = 0.06 \text{ km}^2$$

Finally, I subtracted to find the area of the lot not covered by the building.

$$0.24 - 0.06 = 0.18 \text{ km}^2$$

Lesson 5 *(page 14)*

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

5. Solution: The volume of the canister is approximately 4823 cubic centimetres.

Sample Explanation: *I used the formula for the volume of a cylinder.*

$$V = \pi r^2 h$$
$$V = \pi \times 8^2 \times 24$$
$$V = 3.14 \times 64 \times 24$$
$$V = 4823.04 \text{ cm}^3 \approx 4823 \text{ cm}^3$$

Lesson 6 *(page 16)*

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

5. Solution: The length of each side of the shaded pentagon is 160 metres.

Sample Explanation: *I divided the perimeter of the shaded pentagon by 5 since there are 5 sides.*

$$800 \div 5 = 160 \text{ m}$$