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 identify relationships between lines and determine angle measures.

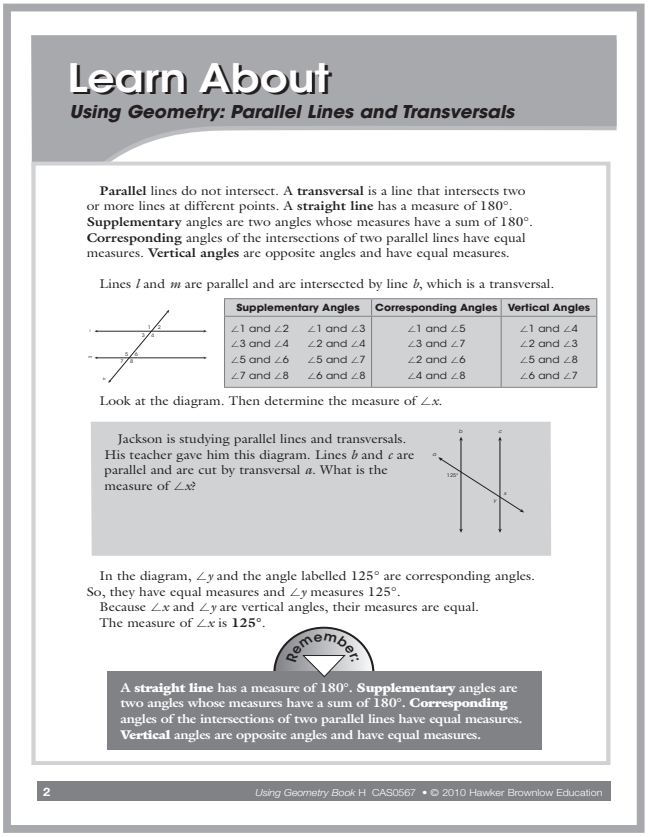
Angles that have a combined measure of 180° are called supplementary angles.

Reinforce the concept of supplementary angles by discussing the word *supplement* or *supplementary* with students. Perhaps they are familiar with dietary supplements such as vitamins. Explain that dietary supplements are combined with the food you eat to form a complete, healthy diet. Then draw a connection between this relationship and the relationship between supplementary angles.

When two parallel lines intersect a transversal, angles form at both intersections. Angles of equal measure that appear in corresponding sections of separate intersections are called corresponding angles. In the figure at the top of the Learn About page, angles 1 and 5 are corresponding angles because they appear in corresponding sections.

Point out that both angle 1 and angle 5 are located to the left of the transversal and above each of the parallel lines. As you name the other corresponding angles in the chart, ask students to describe their location in relation to the transversal and parallel lines. Explain that corresponding angles have equal measures.

Throughout the book, students will be completing problems about the sum of angle measures of different polygons. Review the following formula. Sum of angle measures of any polygon $= (n - 2) \times 180°$, where n equals the number of sides in the polygon.



Learn About

Using Geometry: Parallel Lines and Transversals

Parallel lines do not intersect. A **transversal** is a line that intersects two or more lines at different points. A **straight line** has a measure of 180°. **Supplementary** angles are two angles whose measures have a sum of 180°. **Corresponding** angles of the intersections of two parallel lines have equal measures. **Vertical angles** are opposite angles and have equal measures.

Lines l and m are parallel and are intersected by line b, which is a transversal.

Supplementary Angles		Corresponding Angles	Vertical Angles
∠1 and ∠2	∠1 and ∠3	∠1 and ∠5	∠1 and ∠4
∠3 and ∠4	∠2 and ∠4	∠3 and ∠7	∠2 and ∠3
∠5 and ∠6	∠5 and ∠7	∠2 and ∠6	∠5 and ∠8
∠7 and ∠8	∠6 and ∠8	∠4 and ∠8	∠6 and ∠7

Look at the diagram. Then determine the measure of $\angle x$.

Jackson is studying parallel lines and transversals. His teacher gave him this diagram. Lines b and c are parallel and are cut by transversal a. What is the measure of $\angle x$?

In the diagram, $\angle y$ and the angle labelled 125° are corresponding angles. So, they have equal measures and $\angle y$ measures 125°.
Because $\angle x$ and $\angle y$ are vertical angles, their measures are equal.
The measure of $\angle x$ is **125°**.

Remember:

A **straight line** has a measure of 180°. **Supplementary** angles are two angles whose measures have a sum of 180°. **Corresponding** angles of the intersections of two parallel lines have equal measures. **Vertical** angles are opposite angles and have equal measures.

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The angles formed by parallel lines intersected by a transversal have specific relationships. In the figure in the shaded box on the Learn About page, lines b and c are parallel lines. Line a is a transversal that intersects these parallel lines.

To determine the measure of angle x, you must identify how it is related to other angles in the figure. Angles x and y are formed by the intersection of lines a and c. They sit on opposite sides of the intersection point. They are vertical angles with equal measures.

Angle y and the angle labelled 125° are formed by a transversal that intersects two parallel lines. They are corresponding angles and therefore have equal measures.

The measure of angle y is 125°. The measure of its vertical angle, angle x, must also be 125°.

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.

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ANSWER KEY

FOCUS on Using Geometry, Book H

Lesson 1 *(page 6)*

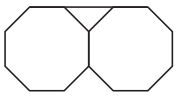
1. B 2. C 3. A 4. C

5. Solution: The measure of ∠A is 90°.

Sample Explanation: *First, I found the sum of the angles in an octagon and the size of each angle in a regular octagon.*

$$180^o(8 - 2) = 1080^o$$
$$1080^o \div 8 = 135^o$$

Then I drew a picture of the tiles, and formed a triangle between them.



The two acute angles in the triangle are supplementary to angles in the octagons. I subtracted the measure of one of the octagon's angles from 180° to find the measure of each of the acute angles in the triangle.

$$180^o - 135^o = 45^o$$

The sum of a triangle's angles is 180°, so I subtracted the measure of both acute angles to find the measure of ∠A.

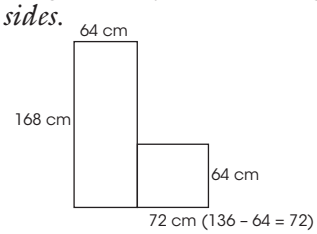
$$180^o - 45^o - 45^o = 90^o$$

Lesson 2 *(page 8)*

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

5. Solution: The couch takes up 15,360 square centimetres on the living room floor.

Sample Explanation: *First, I divided the couch into two rectangles and found the lengths of both rectangles' sides.*



Then I found the area of both rectangles and added the areas together to find the total area of the couch.

$$168 \times 64 = 10{,}752 \text{ cm}^2$$
$$72 \times 64 = 4608 \text{ cm}^2$$
$$10{,}752 + 4608 = 15{,}360 \text{ cm}^2$$

Lesson 3 *(page 10)*

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

5. Solution: Thomas will pour 4 glasses in all.

Sample Explanation: *First, I found the volume of one glass.*

$$3.14 \times (8 \div 2)^2 \times 12$$
$$3.14 \times (4)^2 \times 12$$
$$3.14 \times 16 \times 12$$
$$3.14 \times 192 = 602.88 \text{ cm}^3$$

Then I divided the total volume of the fruit punch by the volume of each glass to find the number of glasses that Thomas will pour.

$$2450 \div 602.88 \approx 4$$

Lesson 4 *(page 12)*

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

5. Solution: The measure of ∠5 is 95°.

Sample Explanation: *The sum of ∠4, ∠5 and ∠6 is 180°. I subtracted the measures of ∠4 and ∠6 from 180° to find the measure of ∠5.*

$$180^o - 35^o - 50^o = 95^o$$

Lesson 5 *(page 14)*

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

5. Solution: The fifth angle measures 85°. The fourth angle measures 110°.

Sample Explanation: *First, I found the sum of a pentagon's angles.*

$$180^o(5 - 2) = 540^o$$

Then I subtracted 345° from 540° to find the sum of the fourth and fifth angles.

$$540^o - 345^o = 195^o$$

Finally, I wrote and solved an equation to find the measures of the fourth and fifth angles.

$$x + (x + 25°) = 195°$$
$$2x + 25° = 195°$$
$$2x = 170$$
$$x = 85°$$
$$\text{fifth angle} = 85°$$
$$\text{fourth angle} = 85° + 25° = 110°$$

Lesson 6 *(page 16)*

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

5. Solution: The area of the triangle is 120 square centimetres.

Sample Explanation: *First, I used the Pythagorean theorem to find the length of the triangle's third side.*

$$10^2 + b^2 = 26^2$$
$$100 + b^2 = 676$$
$$b^2 = 576$$
$$b = 24$$

Then I found the area of the triangle.

$$\frac{1}{2}(24 \times 10)$$
$$\frac{1}{2}(240)$$
$$120 \text{ cm}^2$$

Lesson 7 *(page 18)*

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

5. Solution: The measure of ∠16 is 105°.

Sample Explanation: *∠1 and ∠4 are vertical angles, so the measure of ∠4 is 105°. ∠4 and ∠16 are corresponding angles, so the measure of ∠16 is 105°.*