

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 Interpreting Graphs and Charts, the Mathematics Strategy featured in this *FOCUS* book?

Graphs and charts are used to organise and represent information. There are various types of graphs and charts. Each type is uniquely suited to represent a specific form of information. Students learn to read and interpret increasingly complex types of charts and graphs as they progress through the year levels.

Some graphs and charts are used to represent and compare amounts. Pictographs, which appear primarily in the early years, use pictures and symbols to represent amounts. Bar graphs use bars and numbers to represent amounts, and charts use words and numbers. Circle graphs show how the individual amounts in a group relate to the whole.

Graphs can be used to identify the location of places or items. Coordinate grids have a horizontal x -axis and a vertical y -axis. Numbers on the axes, called coordinates, are used to identify locations on coordinate grids. Maps represent locations and distances. Many maps include a scale, which shows how the distances on a map relate to actual distances.

Graphs can represent changes in amounts over time. Line graphs are commonly used for this purpose. Lines connect the points on a line graph. The lines represent change over time. In the later years, coordinate grids are used to show change over time. These are similar to line graphs, but the points are not connected with a line.

Students learn to interpret and apply the information displayed in graphs and charts. They answer questions that assess their ability to understand and analyse the information.

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 charts and graphs can help you show how many and compare information.

There are many types of charts and graphs. Bar graphs, pictographs and charts are used to compare the numbers of items in a set of data. Bar graphs use bars and numbers to display information. Pictographs use pictures and symbols to display information, and charts use numbers or tally marks.

Bar graphs provide a clear visual comparison of data. The lines of a bar graph are sometimes labelled by ones, twos, fives, tens, or other increments. The bar that is the tallest or longest shows the greatest number. A bar that begins at 0 and ends at the line labelled 15 represents a quantity or value of 15.

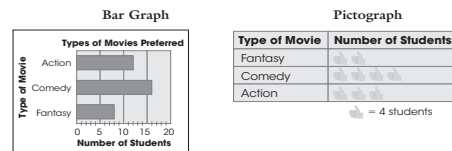
It is important to carefully read all of the labels on a bar graph. A common error in reading bar graphs is to conclude that the values always increase by increments of one. Bar graphs use different increments depending upon the range of the data. Sometimes bar graphs also include dashed lines or ticks to help identify values between the labelled lines. Students should determine the value of the dotted lines when they begin working with a bar graph.

Pictographs use pictures or symbols to compare data. A common error in reading pictographs is to assume that each symbol represents a value of 1. It is important for students to read the key of a pictograph to recognise the number represented by each symbol. Begin a study of pictographs with symbols that represent quantities of 1 to 5. Then show examples of pictographs that contain half-symbols. For example, if each triangle symbol in a pictograph represents 4 students, a row of $3\frac{1}{2}$ triangles represents $(3 \times 4) + (\frac{1}{2} \times 4) = 14$ students.

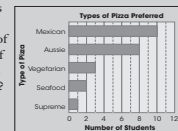
Learn About

Interpreting Graphs and Charts: Bar Graphs and Pictographs

Graphs are used to organise data and information. A **bar graph** uses numbers and bars to show how many. **Pictographs** use pictures or symbols to show how many. The bar graph and the pictograph below each show that 12 students prefer action movies, 16 students prefer comedies and 8 students prefer fantasy movies.



John's favourite meal is pizza. He likes Mexican pizza. John asked the students in his class to name their favourite type of pizza. The bar graph shows the results of John's survey. How many more students prefer Aussie pizza than vegetarian pizza?



Eight students prefer Aussie pizza and three students prefer vegetarian pizza.
 $8 - 3 = 5$

So, **five more students** prefer Aussie pizza than vegetarian pizza.



Bar graphs use numbers and bars to show how many.
Pictographs use pictures or symbols to show how many.

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Interpreting Graphs and Charts Book D CAS0024 • © 2009 Hawker Brownlow Education

Sometimes bar graphs and pictographs can be used to represent the same information. Use the graphs displayed on the Learn About page or have students create their own graphs to compare the same data represented in different ways. Have students discuss when it might be better to use a bar graph or a pictograph and whether they prefer one representation or the other. Then have students explore line graphs and discuss how these represent changes over time.

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 Interpreting Graphs and Charts, Book D

Lesson 1 (page 6)

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

5. Solution: I would add a row to the pictograph and label it "Brown Bat". I would place five circle symbols in this row.

Sample Explanation: *The brown bat sleeps an average of 20 hours a day. Each circle symbol on the graph represents 4 hours. I divided 20 hours by 4 hours to find the number of circle symbols to use.*

$$20 \div 4 = 5$$

Lesson 2 (page 8)

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

5. Solution: There were 450 customers who received free gifts.

Sample Explanation: *I added the number of customers who received each gift to find the total.*

CD holders: 50

key chains: 125

notebooks: 75

pens: 200

$$50 + 125 + 75 + 200 = 450$$

Lesson 3 (page 10)

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

5. Solution: There were 33 more hot lunches chosen than salad plates.

Sample Explanation: *First, I found the total number of hot lunches chosen during the week.*

$$21 + 15 + 22 + 19 + 32 = 109$$

Then I found the number of salad plates chosen during the week.

$$16 + 14 + 13 + 24 + 9 = 76$$

Finally, I found the difference between the totals.

$$109 - 76 = 33$$

Lesson 4 (page 12)

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

5. Solution: There were 235 tickets sold for all four shows.

Sample Explanation: *First, I found the number of tickets sold for each time.*

$$12.30 = 45 \text{ tickets}$$

$$1.45 = 55 \text{ tickets}$$

$$2.30 = 60 \text{ tickets}$$

$$3.15 = 75 \text{ tickets}$$

Then I added the four sales figures to find the total.

$$45 + 55 + 60 + 75 = 235$$

Lesson 5 (page 14)

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

5. Solution: Bree must practise for 25 minutes on the weekend.

Sample Explanation: *First, I added the number of minutes that Bree practised each day to find the total.*

$$30 + 20 + 35 + 45 + 25 = 155$$

Then I multiplied 3 hours by 60 minutes to find the number of minutes in three hours.

$$60 \times 3 = 180$$

Finally, I found the difference between 180 and 155.

$$180 - 155 = 25$$

Lesson 6 (page 16)

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

5. Solution: No, Donna is not correct. Each symbol represents 3 fish, not 1 fish.

Sample Explanation: *I examined the graph and found 1 fish symbol in Thomas's row. Each fish symbol represents 3 fish, not 1 fish.*