

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

You can use charts and stem-and-leaf plots to display information.

The chart and the stem-and-leaf plot at the top of the page display information about the same set of data. The chart shows the number of dogs in certain weight ranges. For example, the first row shows that six dogs have weights from 10 to 19 kilograms.

The stem-and-leaf plot provides a bit more information about these same dogs. By matching the stem with each leaf, an observer can tell exactly what those six weights are. (12, 14, 14, 17, 18, 18)

Reinforce understanding of this difference by asking students to identify three questions that can be answered by observing either visual. (Possible questions: How many dogs are included in the data set? How many dogs weigh less than 30 kilograms? How many dogs weigh more than 19 kilograms?) Then ask students to identify three questions that cannot be answered by observing the chart but can be answered by observing the stem-and-leaf plot. (Possible questions: How many dogs weigh 34 kilograms? What is the mode of the data? What is the median of the data? What is the mean of the data? What is the range of the data?)

Direct students' attention to the map, and explain that it shows the distance between various places.

Learn About

Interpreting Graphs and Charts: Charts, Stem-and-Leaf Plots and Maps

Charts and stem-and-leaf plots use numbers to display information. The chart shows that six dogs at the pet shelter weigh between 10 and 19 kilograms. The stem-and-leaf plot shows that these weights are 12, 14, 14, 17, 18 and 18 kilograms.

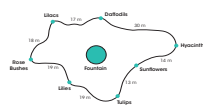
Charts

Dogs at the Pet Shelter	
Weight Range	Number of Dogs
10 kg to 19 kg	6
20 kg to 29 kg	7
30 kg to 39 kg	9
40 kg to 49 kg	3

Stem-and-Leaf Plot

Weights of Dogs (kg)	
Stems	Leaves
1	2, 4, 4, 7, 8, 8
2	1, 3, 6, 8, 8, 8, 9
3	0, 2, 3, 4, 4, 6, 6, 7, 9
4	3, 5, 8

A map is a representation of a location. The distances between points are labelled on the map to the right. The map shows that the distance between the daffodils and the hyacinths is 30 metres.



Look at the stem-and-leaf plot above. How many dogs weigh between 25 kilograms and 35 kilograms?

There are 5 leaves greater than 5 next to the 2-stem.

There are 5 leaves less than 5 next to the 3-stem.

$$5 + 5 = 10$$

There are 10 dogs that weigh between 25 kilograms and 35 kilograms.



Charts and stem-and-leaf plots use numbers to display information. A map is a representation of a location.

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Interpreting Graphs and Charts Book H CAS0505 • © 2010 Hawker Brownlow Education

Have students read the problem at the bottom of the page. Point out that each stem represents a tens digit and each leaf represents a ones digit. Because the question asks about weights between 25 and 35 kilograms, students need to look at the rows that begin with the stems 2 and 3. In stem row 2, there are five leaves greater than 5. In stem row 3, there are five leaves less than 5. So, there are ten dogs with weights between 25 and 35 kilograms.

Extend the activity by asking students to explain how they would find the median of the data presented in the stem-and-leaf plot. (Count off from the beginning of stem row 1 and from the end of stem row 4 to find the middle leaf.) Then have them follow the plan described to identify the median. (29 kilograms)

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 H

Lesson 1 (page 6)

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

5. Solution: The total distance that each boy walked is the same.

Sample Explanation: *First, I found the sum to find the total distance Lance walked.*

$$30 + 15 + 15 + 10 + 10 + 20 + 10 = 110 \text{ m}$$

Then I found the sum to find the total distance Jarrod walked.

$$25 + 35 + 30 + 20 = 110 \text{ m}$$

Lesson 2 (page 8)

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

5. Solution: Lily added 61% of the new flavours to the menu.

Sample Explanation: *Lily is adding 11 flavours to the menu. She tried a total of 18 flavours. I divided 11 by 18, and then moved the decimal two places to the right to convert to a per cent.*

$$11 \div 18 = 0.611 \approx 61\%$$

Lesson 3 (page 10)

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

5. Solution: The ordered pair for point *L* is (4, 3). The ordered pair for point *H* is (6, 9).

Patrick's new assigned seat is at point *G*.

Sample Explanation: *I followed the horizontal and vertical axes of each point. The x-coordinate for point *L* is 4 and the y-coordinate is 3. For point *H*, the x-coordinate is 6, and the y-coordinate is 9. Then I counted 8 units on the horizontal axis and 9 units on the vertical axis to find that the point whose ordered pair is (8, 9) is point *G*.*

Lesson 4 (page 12)

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

5. Solution: Christina improved by 12 kilograms.

Sample Explanation: *I found the difference between the heaviest weight she was able to lift and the lightest weight she was able to lift after the initial 12 sessions.*

$$24 - 12 = 12 \text{ kg}$$

Lesson 5 (page 14)

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

5. Solution: Yogi spent 225 minutes in classes on Monday, Tuesday and Thursday. Yogi spends 150 minutes in classes on Friday.

Sample Explanation: *First, I added the number of minutes spent in class on Monday, Tuesday and Thursday.*

$$75 + 75 + 75 = 225 \text{ min}$$

Then I added the number of minutes spent in each class on Friday.

$$60 + 45 + 45 = 150 \text{ min}$$

Lesson 6 (page 16)

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

5. Solution: The median age of the group members is about 24 years old.

Sample Explanation: *I counted the numbers in the stem-and-leaf plot and then circled the middle numbers.*

Stems	Leaves
1	0, 0, 1, 2, 2, 2, 4, 8, 8
2	0, 0, 1, 1, 2, <u>2, 5</u>
3	7, 8, 8, 9
4	0, 0, 1, 2, 3, 5, 6, 8
5	5, 8

Since there are 2 numbers circled, I found the average of these numbers.

$$(22 + 25) \div 2 = 23.5 \approx 24$$

Lesson 7 (page 18)

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

5. Solution: The distance of the shortest route is 1.4 kilometres.

Sample Explanation: *I looked at the map to find the shortest route from the Park Entrance to the rest area. Then I found the sum of the distances.*

$$0.6 + 0.4 + 0.4 = 1.4 \text{ km}$$

There are two different routes with this distance.