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Maths the Write Way, Teacher Guide Level 5

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HAWKER BROWNLOW
E D U C A T I O N

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Printed in Australia

ISBN 1 86401 743 0
Code #1970

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★ TO THE TEACHER ★

One of the most important aspects of teaching maths is communication. Writing, speaking, explaining, or drawing can help your students internalise what they have learned and clarify their own thinking. Communication can also act as a powerful tool for you to assess the thinking of your students.

Your students should be encouraged to use strategies that foster communication. We have incorporated the following strategies for your students in ***Maths the Write Way***.

- ★ Write your own problems
- ★ Communicate orally
- ★ Identify key words and explain their importance
- ★ Summarise your work
- ★ Investigate to find other ways to solve a problem
- ★ Make predictions and draw conclusions
- ★ Work with a group to share ideas and solve problems

Maths the Write Way contains seven lessons. Each lesson includes four Investigations and two Extensions to the Investigations. Hints are included to provide clues to the solutions. Each lesson also has four Assessments, two with open-ended responses and two with a multiple-choice format. Vocabulary activities, following Lesson 3 and Lesson 7, emphasise the importance of mathematical language. Finally, two minireviews and a Final Review will help you assess the work of your students.

In ***Maths the Write Way***, we have provided a forum for you to instruct as well as assess. We encourage students to look for a variety of ways to solve problems. The process—not just the solution—must be emphasised. Working and sharing ideas in cooperative groups will enhance understanding and communication.

The Teacher Guide includes:

- ★ Listing of lesson objectives and necessary materials
- ★ Key vocabulary and concepts for the lesson
- ★ Suggestions for discussing key mathematical concepts
- ★ Sample solutions to all Investigations, Extensions, and Assessments
- ★ Suggested strategies for solving problems
- ★ Reproducible pages for use with selected activities

We are sure you will find ***Maths the Write Way*** a valuable resource for supplementing and enhancing your mathematics instructional program.

Brian E. Enright
Robert Gyles
Maxine Leonescu
Fred I. Remer

Pages 2–5

Objectives

- ★ To round numbers to the nearest thousand and ten thousand
- ★ To reinforce understanding of number fact families

Vocabulary

Before beginning the lesson, you may wish to review the following maths terms: *range*, *round*, *fact family*.

As students round numbers and give reasonable estimates, they are developing number sense. It is important for students to see that a rounded number represents a range of numbers. Writing the rules for rounding helps students to clarify their thinking. Allow students to work in groups so that they can investigate the thinking of others.

In Part B, the fact families will help students understand the relationships among operations and how different operations affect the size of the number in the answer. You may wish to extend the concepts in this lesson by exploring the order of operations.

Answers to Investigations, Extensions and Assessments will vary. Sample solutions are provided.

Part A

Pages 2–3

Investigation 1

When rounding to the nearest thousand, look at the digit to the right of the thousands place. If the digit is 0, 1, 2, 3 or 4, the thousands-place digit remains the same, and the digits that follow become zeroes. (The number is rounded down to the lower thousand.) If the digit is 5, 6, 7, 8 or 9, the digit in the thousands place becomes one greater, and all digits that follow become zeroes. (The number is rounded up to the next thousand.) For example: $3,445 = 3,000$ to the nearest thousand.

Investigation 2

When rounding to the nearest ten thousand, look at the digit to the right of the ten thousands place. If the digit is 0, 1, 2, 3 or 4, the ten-thousands-place digit remains the same and the digits that follow become zeroes. (The number is rounded down to the lower ten thousand.) If the digit is 5, 6, 7, 8 or 9, the digit in the ten thousands place becomes one greater and all digits that follow become zeroes. (The number is rounded up to the next ten thousand.) For example: $56,972 = 60,000$ to the nearest ten thousand.

Extension

The range of whole numbers that equal 66,000 when rounded to the nearest thousand is 65,500–66,499. First find the lowest number in the range. The lowest number in the range rounds up to 66,000 and 5 is the lowest digit that rounds up. So 65,500 is the lowest number that rounds up to 66,000. Use similar reasoning to find the greatest number that rounds down to 66,000. Since 4 is the largest digit that rounds down, 66,499 is the largest number that rounds down to 66,000.

Assessment 1

A

Assessment 2

145,000–154,999

First find the lowest whole number in the range that rounds up to 150,000. Then find the greatest whole number in the range that rounds down to 150,000.

Part B

Pages 4–5

Investigation 3

- A. $12 + 8 = 20$
- B. $8 + 12 = 20$
- C. $20 - 8 = 12$
- D. $20 - 12 = 8$

Students might describe a strategy that uses trial and error or guess and check. After placing symbols in the circles and testing the answers, students determine if each number fact makes sense. In item A, 20 is greater than 12 and 8, so addition makes the most sense. In item D, 8 is less than 20 and 12, so subtraction makes the most sense.

Investigation 4

- A. $8 \times 3 = 24$
- B. $3 \times 8 = 24$
- C. $24 \div 3 = 8$
- D. $24 \div 8 = 3$

Students may use a similar strategy as in Investigation 3. In items A and B, 24 is greater than both 3 and 8, so multiplication makes the most sense. In items C and D, 3 is less than both 24 and 8, so division makes the most sense.

Extension

- A. $4 \times 4 = 32 \div 2$
- B. $30 - 8 = 11 \times 2$
- C. $9 \times 4 = 12 \times 3$
- D. $12 + 6 = 9 \times 2$
- E. $15 \div 5 = 30 \div 10$ or $15 + 5 = 30 - 10$

Through guess and check, students can explore various possible answers and test to see which ones make sense. When looking at item E, students might quickly see that 15 is divisible by 5 and try division first.

Assessment 1

C

Assessment 2

$12 - 4 - 6 = 2$; $12 - 4 = 6 + 2$; $12 \div 4 = 6 \div 2$;
 $12 = 4 + 6 + 2$; or $12 = 4 \times 6 \div 2$.

Students will likely use a guess and check method to find the answer. They might try the operations with each pair of numbers (12 and 4, 4 and 6, 6 and 2) and then try to make a number sentence with the remaining numbers.

LESSON 2

Data Analysis

Pages 6–9

Objectives

- ★ To collect and record real data
- ★ To describe the results of a survey
- ★ To explore equally likely events and probability
- ★ To explore the concept of arrangements

Materials

- ★ Reproducible 1: *Data Recording Sheet*
- ★ Reproducible 2: *Grid*
- ★ Reproducible 3: *Spinners*

Vocabulary

Before beginning the lesson, you may wish to review the following maths terms: *arrangement, average, data, equally likely, experiment, event, graph, outcome, probability, survey, tally.*

Collecting data and organising it are real-world mathematical applications. You may wish to discuss the purposes for collecting data by giving some real examples (to determine consumer preferences, to determine needs, to compare situations). Help students divide the class into two groups. Distribute copies of Reproducible 1 for Investigation 1 and Reproducible 2 for Investigation 2. You may wish to complete the data collection with the whole class. Ask each student to provide personal data while all class members record the information. As students work on the lesson, emphasise the importance of accuracy in reporting data. As necessary, help students with the setup of the double-bar graph.

For Investigation 3, distribute copies of Reproducible 3. This probability experiment provides a good opportunity for students to explore theoretical and experimental probability. It is important for students to test theoretical probability by actually doing the experiments. They should realise that probability is only an approximation and that test results will vary. You may wish to explain that each section of the spinner represents a possible outcome.

Answers to Investigations, Extensions and Assessments will vary. Sample solutions are provided.

Part A

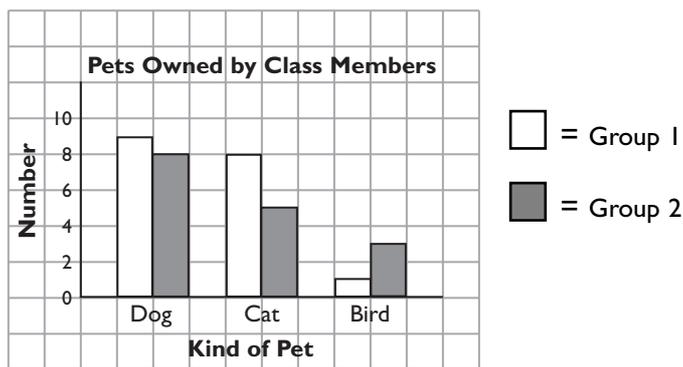
Pages 6–7

Investigation 1

Students' completed recording sheets will vary. Statements should describe the results of the survey. For example: *Group 1 has more pets, but Group 2 has more different kinds of pets.*

Investigation 2

Students' graphs will vary but may look similar to the following:



Statements should describe some element of the graph. For example: *Group 1 has more cats than Group 2.*

Extension

Students' techniques for collecting, recording and displaying data will vary. Statements should describe the results of the survey. For example: *In our class survey, there are only 4 different kinds of pets. In the grade survey, there are 8 different kinds of pets.*

Assessment 1

B

Assessment 2

Possible word problems: What is the total number of books read by the 4 readers? Which reader read the most books? How many more books did Eve read than Kyle?

Part B

Pages 8–9

Investigation 3

On both spinners, the probability of spinning a 1 or a 2 are the same. Julio's spinner: 4 ones + 4 twos = 8 sections. There is a 4 out of 8, or 1 out of 2, chance of spinning a 1 or a 2. Sarah's spinner: 5 ones + 5 twos = 10 sections. There is a 5 out of 10, or 1 out of 2, chance of spinning a 1 or a 2. Students' experiments may vary but should be close to 20 out of 40 for each of the outcomes, 1 and 2.

Investigation 4

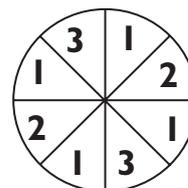
There are 6 possible arrangements:

1. Mike, Lisa, Nita
2. Mike, Nita, Lisa
3. Lisa, Nita, Mike
4. Lisa, Mike, Nita
5. Nita, Lisa, Mike
6. Nita, Mike, Lisa

Students may use a variety of strategies to solve this problem, such as acting it out, drawing a picture, making a tree diagram or making a list.

Extension

Sample spinner is shown below.



What is the probability of spinning a 1, a 2 and a 3 on this spinner? How many times do you think a 1, a 2, and a 3 would come up in 40 spins?

Assessment 1

C

Assessment 2

1. Divide the circle into 8 equal parts.
2. Count the number of RED parts. (3)
3. The probability for RED is 3 out of 8.

LESSON 3

Operations

Pages 10–13

Objectives

- ★ To use patterns to perform mental maths
- ★ To use mental maths to estimate
- ★ To add and subtract money amounts
- ★ To find fractional parts of a whole
- ★ To reinforce number sense through estimation and finding error patterns

Vocabulary

Before beginning the lesson, you may wish to review the following maths terms: *estimate*, *pattern*.

Students are used to following and even memorising rules in maths, sometimes with little understanding of why the rules are used. Through exploration, students create and understand the importance of rules. These rules become more meaningful and easier to apply in different situations. In this lesson, students use what they have learned about patterns in multiplication to estimate prices with mental maths.

Looking for error patterns can be crucial for both teacher and student. Having students assume the role of teacher provides a good model for them to assess their own work on a regular basis. As teachers, identifying error patterns will prevent repetitive mistakes.

Answers to Investigations, Extensions and Assessments will vary. Sample solutions are provided.

Part A

Pages 10–11

Investigation 1

$$\begin{array}{ll} 20,000 \times 3 = 60,000 & 15 \times 30,000 = 450,000 \\ 200,000 \times 3 = 600,000 & 15 \times 300,000 = \\ & 4,500,000 \end{array}$$

First, multiply the non-zero digits in the problem. Next, count the total number of zeroes in the problem and add this number of zeroes to the product. Every time an additional zero is added to one of the factors, the product contains an additional zero.

Investigation 2

I went to Sammy's Sport Shop with \$100 and bought knee pads, a helmet and a basketball: $\$19.95 + \$49.50 + \$27.50 = \96.95 . To find the answer, subtract \$3.05 from \$100 to determine the amount of money spent. $\$100.00 - \$3.05 = \$96.95$. Then use guess and check or a chart to find a combination of items that total \$96.95.

Extension

$$\begin{array}{l} 6 \times 10 = 60 \\ 6 \times 100 = 600 \\ 6 \times 1,000 = ? \\ 6 \times 10,000 = ? \end{array}$$

Assessment 1

B

Assessment 2

Round the prices to find numbers that can be worked with mentally. Rounded to the nearest dollar, a helmet costs \$50 dollars, and a pair of running shoes costs \$60.

$$4 \times \$50 + 3 \times \$60 = \$200 + \$180 = \$380$$

Part B

Pages 12–13

Investigation 3

Mariko would win the race. It would take Mariko 15 minutes and Rae 20 minutes to complete the race.

$$\begin{array}{l} \text{Rae: } \frac{3}{4} \text{ race} = 15 \text{ minutes} \\ \text{So, } \frac{1}{4} \text{ race} = 5 \text{ minutes} \\ \text{and } 100 \text{ metre race} = 20 \text{ minutes} \end{array}$$

$$\begin{array}{l} \text{Mariko: } \frac{2}{3} \text{ race} = 10 \text{ minutes} \\ \text{So, } \frac{1}{3} \text{ race} = 5 \text{ minutes} \\ \text{and } 100 \text{ metre race} = 15 \text{ minutes} \end{array}$$

Investigation 4

The student does not understand regrouping or place value. You may want to show the problems horizontally. Using the distributive property:

$$36 \times 8 = (30 \times 8) + (6 \times 8) = 240 + 48 = 288$$

$$\begin{array}{l} 72 \times 95 = (72 \times 90) + (72 \times 5) = \\ 6,480 + 360 = 6,840 \end{array}$$

The teacher may also want to review place-value concepts with the student.

Extension

Aaron has done 40 problems on his maths test, which means he has completed $\frac{2}{3}$ of the test. Brett has completed $\frac{3}{4}$ of the test or 45 problems. How many total problems are on the test?

Assessment 1

B