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Maths the Write Way, Teacher Guide Level 7

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HAWKER BROWNLOW
EDUCATION

ISBN 1 86401 745 7
Code #1979

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15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

★ TO THE TEACHER ★

One of the most important apsects of teaching Mathematics 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
- ★ Create your own game, puzzle, picture, poem or rap
- ★ Summarise your work
- ★ Investigate to find other ways to solve a problem
- ★ Make predictions and draw conclusions
- ★ Work cooperatively to create and assess your work

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 Lessons 3 and 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 with 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 that you will find ***Maths the Write Way*** a valuable resource that will supplement and enhance your mathematics instructional program.

Brian E. Enright
Robert Gyles
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LESSON 1 Numeration

Pages 2–5

Objectives

- ★ To realise the importance of using exponents in expanded notation
- ★ To explore the use of scientific notation, particularly in real-world situations
- ★ To develop understanding of part/whole relationships through the comparison of fractions and decimals
- ★ To compare integers and understand their use in everyday life

Materials

- ★ Reproducible 1: *Grid Paper*
- ★ newspapers and magazines
- ★ scientific calculator

Vocabulary

Before beginning the lesson, you may wish to review the following maths terms: *exponential notation, exponents, integers, negative numbers, positive numbers, scientific notation*.

In mathematics and science, very large and very small numbers are used on a regular basis. It is important for students to understand the use of exponents and scientific notation in order to deal with these small and large numbers. You may wish to look for examples of scientific notation in science texts and talk about why these numbers are expressed in this form. You may also wish to explore these concepts using a scientific calculator.

Most students will be familiar with positive and negative numbers and understand the relationship of integers to zero. You may find it helpful to review these concepts using a number line.

For Investigation 3, distribute copies of Reproducible 1.

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

Part A

Pages 2–3

Investigation 1

$(2 \times 10^6) + (8 \times 10^5) + (5 \times 10^4) + (2 \times 10^3) + (1 \times 10^2) + (7 \times 10^1) + (8 \times 10^0)$

The exponential form is more efficient because it is quicker. The expanded form requires writing many more zeros, but the exponential form uses a 'shorthand' way, and, therefore, fewer zeros.

Investigation 2

To express a number in scientific notation, use a number that is greater than 1 but less than 10 and is multiplied by some power of 10. For example, 5,300 is 5.3 thousand, which may be expressed in scientific notation as 5.3×10^3. Scientific notation might be used to express long distances; for example, distance between two planets. It might also be used to describe small objects, such as the size of micro-organisms.

Extension

The next two powers:

Power of 10	Value
10^7	10,000,000
10^8	100,000,000

By studying the chart, you can see that the exponent equals the number of zeros in the value.

Assessment 1

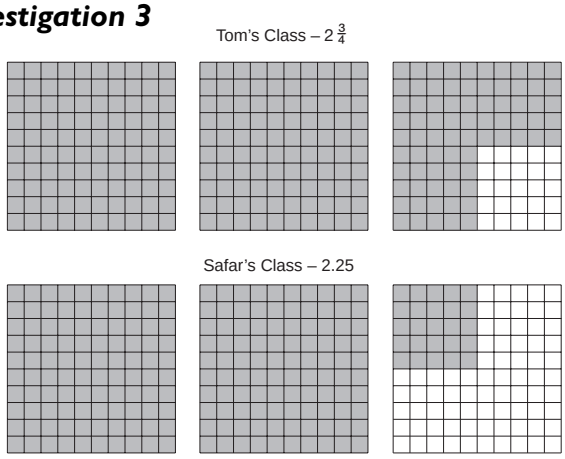
C

Assessment 2

10^3 or 1,000. Multiplying 2.8 by 1,000 is the same as moving the decimal point three places to the right, which results in a product of 2,800.

Part B
Pages 4–5

Investigation 3



If you compare the two pictures, you can see that Tom's class ate more pizzas.

Investigation 4
Tanya is correct in saying that ⁻4 is greater than ⁻5. On the number line, ⁻4 is to the right of ⁻5 and closer to zero. Negative numbers increase in value as they get closer to 0.

Extension
Students might discuss such topics as weather, stocks or business losses. Possible headline: Record Temperature of ⁻12° Reached Tuesday.

Assessment 1
A

Assessment 2
⁻9, ⁻6, 0, 5
Since negative numbers are less than 0, first order the two negative numbers: ⁻9 is less than ⁻6;
0 follows ⁻6 next since it is less than 5.

LESSON 2 Data Analysis
Pages 6–9

Objectives

- ★ To reinforce understanding of the range of any set of data
- ★ To select an appropriate graph to display any set of data
- ★ To make predictions, draw conclusions and defend solutions
- ★ To explore problem-solving strategies in relation to probability and combinations
- ★ To understand the fundamental counting principle
- ★ To use experimental probability in the understanding of dependent events

Materials

- ★ Reproducible 1: *Grid Paper*
- ★ Reproducible 2: *Number Cards*
- ★ calculators
- ★ scissors
- ★ spinners, cards, coins (or other objects to use in exploring concepts involving dependent events)

Vocabulary
Before beginning the lesson, you may wish to review the following maths terms: *dependent events, fundamental counting principle, prediction, probability, range*.

Interpreting data from charts and graphs, as well as determining measures of central tendency help to develop higher-order thinking skills. Students should be made aware of the various real-life applications of mean, median, mode and range. Using the topic of a census, you can discuss the various ways that the data can be analysed and reported.

In this lesson, students also explore the topic of probability. It is important to allow students to experiment using readily available materials. Through experimentation, students will begin to

see the validity of theoretical probability. When students create their own experiments, you can determine if they have a true understanding of the principles of probability.

Distribute copies of Reproducible 1 for Investigation 2 and Reproducible 2 for Investigation 4.

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

Part A

Pages 6–7

Investigation 1

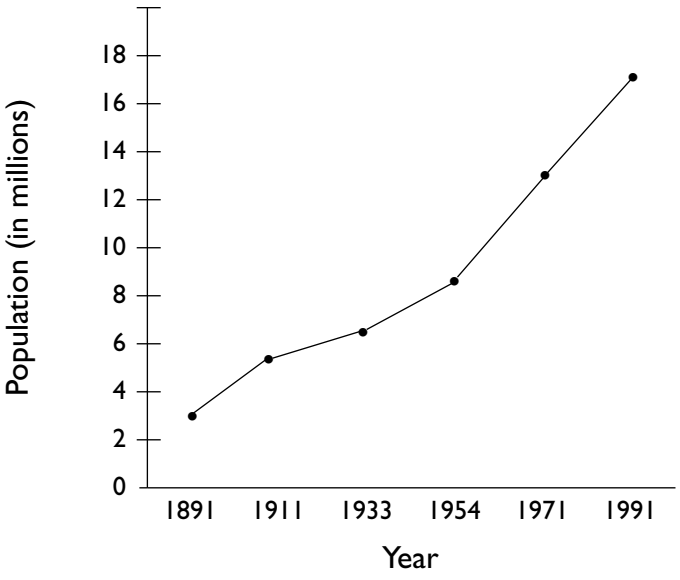
Rounding to the nearest million, what is the range of the population in the Australia from 1891 to 1991 *(17,000,000 – 3,000,000 = 14,000,000)*.

Investigation 2

A line graph or a bar graph would be most appropriate for comparing population changes. A pictograph might be appropriate, but the wide range of numbers in the data would make this graph somewhat cumbersome to make.

Sample graph and question:

Australian Population in Selected Years



In which 37-year period was there the greatest increase in population? *(from 1954 to 1991)*

Extension

The increase in population got increasingly larger in each period. This trend is likely to continue, as there are an increasing number of people that can have children. Another factor that affects population is immigration. More and more people from around the world are coming to Australia to live. The increase from 1954 to 1991 was almost 8,000,000. I would predict an increase of almost 12,000,000, to a population of about 28,000,000 in the year 2030. This increase in population will likely affect every aspect of society and government, from supply of food, to housing, to jobs.

Assessment 1

C

Assessment 2

Sofia has taken 3 maths tests this semester. She got an 80 on the first test, a 94 on the second test and a 96 on the third test. Find the mean of her test scores.

Since the mean of the 3 tests is a number divided by 3, multiply 90 × 3 (270). Find a combination of 3 test scores that have a sum of 270, and the mean will be 90.

Part B

Pages 8–9

Investigation 3

There are 20 different combinations of solid and print fabrics. Students might list such strategies as using the counting principle (5 × 4 = 20), using tree diagrams, making a list, using objects to act it out, and so on. They might also list a combination of strategies. Individual preferences may vary.

Investigation 4

The probability of drawing two 2's in a row is $\frac{1}{6}$, or 1 out of 6.

Sample solution:

P(2) = $\frac{2}{4}$ on first try

P(2) = $\frac{1}{3}$ on second try

P(2, 2) = $\frac{2}{4} \times \frac{1}{3} = \frac{1}{6}$

Extension

The outcome of a second set of dependent events can change, depending upon the outcome of the first set of events. In other words, what happens in one outcome will affect what happens in the outcomes that follow.

Sample Problem:
You have 6 cards, 2 with odd numbers and 4 with even numbers. Suppose you pick an even number and then set the card aside. What is the probability that the next card you choose will be an odd number?

Sample solution:
P(even) = $\frac{4}{6}$ on first pick

P(odd) = $\frac{2}{5}$ on second pick since you now have only 5 cards left and 2 of them are odd

Assessment 1
C

Assessment 2
Using the counting principle, 3 × 5 = 15 different shirt-tie combinations.

LESSON 3 Operations

Pages 10–13

Objectives

- ★ To understand the value of using parentheses in the order of operations
- ★ To realise the importance of the order of operations
- ★ To find estimates of fractions and understand how to use the estimates with operations
- ★ To internalise the meaning of per cent of a number
- ★ To construct rules for addition of integers

Materials

- ★ Reproducible 3: *100 Grid*
- ★ crayons or coloured pens, pencils, markers

Vocabulary
Before beginning the lesson, you may wish to review the following maths terms: *estimate, mixed number, negative numbers, order of operations, per cent, positive numbers*.

The order of operations often causes confusion for students. It is helpful for students to experiment with multiple-operation problems to find out that changing the order of the operations can change the answer. Students can benefit from practice in correctly placing parentheses to discover and to help remember the rules.

Students generally have ample practise using estimation with whole numbers. It is just as important to use estimation when operating with fractions. Finding an approximate value for a fraction helps students gain insights into the meaning and value of the fraction.

Understanding per cents is a vital life skill. Per cents are used in such situations as purchasing, personal and business finance and even sports statistics. Using visual representations of percents will help reinforce percent concepts and emphasise part-whole relationships.

When introducing the set of integers, it can be effective to use the context of everyday life. Whether it be gains and losses at a football game, weather, earning and spending money or weight gain and loss, the somewhat abstract topic of integers is more easily learned in a more concrete context.

Distribute copies of Reproducible 3 for Investigation 3.

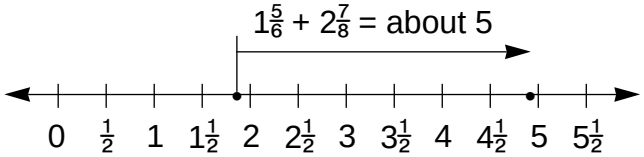
Answers to Investigations, Extensions, and Assessments will vary. Sample solutions are provided.

Part A

Pages 10–11

Investigation 1
Asia is correct. First you multiply (7 × 2); then you add 3. The rule for order of operations states that multiplication and division are performed before addition and subtraction.

Investigation 2



$1\frac{5}{6}$ is *about* 2 ($\frac{1}{6}$ less than 2) and $2\frac{7}{8}$ is *about* 3 ($\frac{1}{8}$ less than 3). Therefore the sum of $1\frac{5}{6}$ and $2\frac{7}{8}$ is *about* 5 ($\frac{7}{24}$ less than 5).