

*Algebra Made Easy* is a maths program designed to help you develop your problem-solving skills with algebra problems. Many of the lessons will ask you to use objects or draw pictures to solve the problems. We think that this will help you better understand how to work with algebra. Each time you solve a problem in this book, try to think of another problem that you could solve the same way. As you work in *Algebra Made Easy*, you will find that problem solving can be enjoyable.

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## INTRODUCTION

'Algebra for all' is being heard across the country and yet many students enter secondary school without the necessary basic prerequisite skills to complete Algebra 1 successfully. One solution many have suggested is to develop these algebra readiness skills in years 4-9. This series is designed to accomplish that goal. The authors believe that algebra readiness should begin in the early years and then develop over a number of years. Likewise, we believe that the learning of new skills and concepts should begin at the concrete level, move to the pictorial or representational level and finally to the verbalisation level. We have been careful to maintain the mathematical integrity of the skills and concepts covered while trying to create a series that will be interesting to and challenging for your students.

## ORGANISATION

This book is made up of ten lessons. Six of the lessons are instructional and three are mixed review. A review lesson follows Lesson 2 and provides mixed practice of the skills in Lessons 1 and 2. A review lesson follows Lesson 4 and provides mixed practice for Lessons 1-4. A review lesson follows Lesson 6 and provides mixed practice for Lessons 1-6. This method ensures that, by the end of the book, students are using all the skills introduced in each lesson. The last lesson is an extension lesson, which incorporates many of the concepts developed in the book and provides additional opportunities for students to work more challenging problems.

## INSTRUCTIONAL LESSON DESIGN

Each of the six instructional lessons focuses on a key concept in algebra. Each lesson has three major parts and can easily be covered in three or four class periods. Some students may move more quickly through the lessons, but be sure to provide enough time so that concept development can occur.

**Part A** of each lesson uses manipulatives to introduce the skill or skills. The manipulatives are items that are commonly found in classrooms. Take time beforehand to be sure that these manipulatives are available.

**Part B** of each lesson helps the student make the transition from the concrete, manipulative level to a pictorial, representational level. Students are asked for a pictorial application of the previous manipulative activity, which helps them internalise the process.

**Part C** of the lesson is the verbalisation, application level. Here students work on problems and may use manipulatives or pictorials if necessary.

## HOW SHOULD ALGEBRA MADE EASY BE USED?

There are many ways to use this book, all of which should be considered supplemental to your existing program.

1. You may choose to use the lessons in place of similar lessons in your maths program.
2. You may choose to present one lesson each month as a change of pace in your approach.
3. You may choose to select a six-week period to have students concentrate on critical prealgebra skills.

What *is* important is that you integrate this book into your mathematics program in a way in which you are comfortable and from which your students will benefit.

# LESSON 1

## Multiplication and Division of Integers

### PART A

Note: Integers are numbers that can be used to represent three situations: direction, a loss or a gain or an opposite relationship.

#### MATERIALS:

- integer chips or two-colour counters (red = negative integers, yellow = positive integers)

### STEP 1: Positive Integers

- Suppose you and a friend were playing a game and you moved your marker 3 spaces for 5 turns in a row. Use positive chips to show the total number of spaces you moved (5 groups of +3). Then write a number sentence and record the product.  

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- Your friend moved a total of 12 spaces in 3 turns and moved the same number of spaces in each turn. Place 12 yellow chips in 3 equal groups. Then write a number sentence and record the quotient.  

---

positive integer  $\times$  positive integer = positive integer

positive integer  $\div$  positive integer = positive integer

### STEP 2: Positive and Negative Integers

- On a cold night, it was  $6^{\circ}\text{C}$ , and the temperature dropped by  $2^{\circ}\text{C}$  every hour. You want to determine the direction the thermometer liquid moved and how far it moved in 4 hours. The drop in temperature each hour can be represented by  $-2$ . Since you want the drop in temperature for 4 hours, show 4 groups of  $-2$ .
- Place 4 groups of 2 negative chips on your desk. This shows  $4 \times -2$ , or  $-2 \times 4$ .

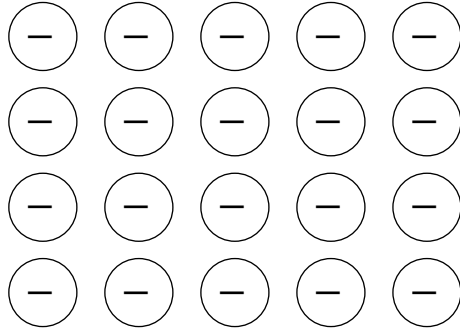


- Count the total number of negative chips and record the product:  $-2 \times 4 = \underline{\hspace{2cm}}$ . The total loss in temperature was  $8^{\circ}$  ( $-8$ ). The thermometer liquid moved in a negative direction.

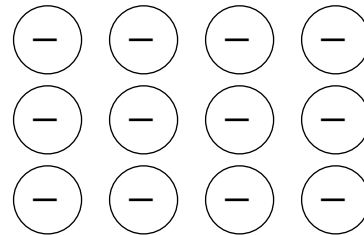
## PART B

Use the drawings to write a number sentence and find the product or quotient. In problems 1 and 3, the circles with the negative sign (–) represent negative integers.

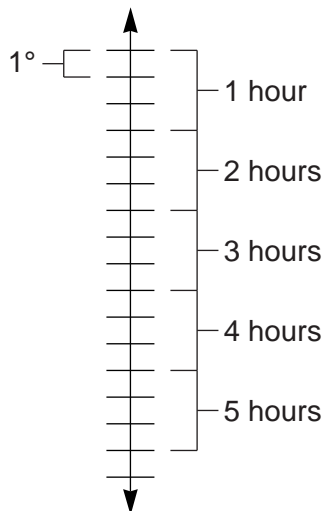
1. You owe 4 friends \$5 each. How much money do you owe in all?



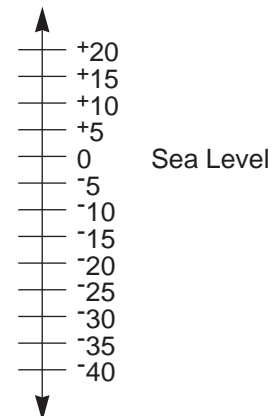
3. You are playing a card game with a friend. When one player loses points, the opponent gains points. Your opponent lost a total of 12 points in 3 plays, losing the same amount each time. How many points did your opponent lose on each play? \_\_\_\_\_ How many points did you gain on each play?



2. The temperature fell steadily during the day. The drawing shows how far it fell in 5 hours. What was the total loss in temperature?



4. Lionel was diving in the ocean off the Great Barrier Reef. He slowly descended below sea level at about 10 metres every 5 minutes. How many metres below sea level would Lionel be after 15 minutes?



Now that you have completed the activities in this lesson, you have discovered the following:

The product or quotient of two positive integers is positive.

The product or quotient of a positive integer and a negative integer is negative.

The product or quotient of two negative integers is positive.

# LESSON 1 Multiplication and Division of Integers

## Pages 1–5

### PART A, pages 1–2

Students may use integer chips or two-colour counters with the yellow side representing positive integers and the red side representing negative integers. Beans with one painted side may also be used as a substitute for integer chips.

It is important that you emphasise the three situations commonly represented by integers:

**Gain/Loss**—including such examples as debts, items on bank statements, changes in temperature and changes in measurements.

**Direction**—including such examples as right/left of zero on the number line, above/below sea level, north/south of the equator and rise/fall in temperature.

**Opposites**—including such examples as relationships among opponents, spending versus savings and additive inverse of positive/negative numbers (+5 and -5).

Before students begin their work, model how to use the integer chips for some of the situations described above. Explain that +3 is represented by 3 yellow chips and -3 is represented by 3 red chips. To show an opposite relationship, you flip the chips over to the other side. Pose this example: Suppose that the opposing team is winning by 4 points. Their position can be shown with 4 yellow chips (+4). Your team's position can be shown by 4 red chips (-4).

#### Step 1

- 5 groups of 3 yellow chips:  $+5 \times +3 = +15$
- $+12 \div +3 = +4$

#### Step 2

- and 2. Students follow the directions given.
- $-2 \times 4 = -8$
- 2 groups of 3 red chips:  $-6 \div 2 = -3$
- Students follow the directions given.

### EXTENSION

Have students use the integer chips to write additional number sentences with positive and negative numbers.

- Every week for 6 weeks, you donate \$2 to charity. At the end of 6 weeks, how much money have you spent? Make 6 groups of 2 red chips each. Write a number sentence.  
( $6 \times -2 = -12$ )
- In 3 months, you have paid \$9 in bank fees for your checking account. The bank fees are the same every month. How much was deducted from your account each month? Put 9 red chips into 3 equal groups. How many are in each group? Write a number sentence.  
( $-9 \div 3 = -3$ )
- Look at the situations in problems 1 and 2. Describe each problem in a different way, writing number sentences that involve dividing two negative integers.
  - total spent  $\div$  amount spent each week = number of weeks donations were made  
( $-12 \div -2 = 6$ )
  - total amount deducted  $\div$  amount deducted each month = number of months  
( $-9 \div -3 = 3$ )