

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

Addition and Subtraction of Integers

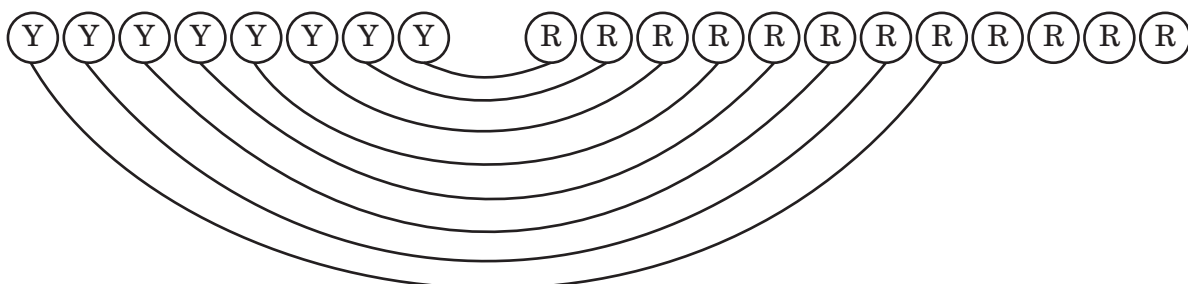
PART A

MATERIALS:

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

STEP 1: Adding Negative and Positive Integers

1. Suppose that Lisa deposited \$8 into her savings account on Monday. Then she withdrew \$12 on Tuesday. How was her savings account affected during these two days? Use the integer chips to describe Lisa's situation.
2. Place 8 yellow chips on your desk to represent Lisa's \$8 deposit, and 12 red chips to represent the \$12 withdrawal. Make pairs of positive and negative chips. (Note: $+1 + -1 = 0$; therefore, 1 positive chip and 1 negative chip cancel out one another.)



3. There are 4 negative chips left over. This means that there is a change of $-\$4$ in Lisa's savings account or she has \$4 less in her savings account. Write the number sentence that describes Lisa's transactions.

STEP 2: Adding Negative Integers

1. Last week, a stock lost 5 points. This week, the stock lost 9 points. Use integer chips to represent the change in stock price last week. Then use integer chips to represent the change in stock price this week.



2. Use the integer chips to find the total change in stock price for this two-week period. Since all the chips are alike—that is, they are all negative—combine the two sets. Write a number sentence that shows the overall change in stock price during the last two weeks.

STEP 3: Subtracting a Positive Integer from a Negative Integer

1. Whitney and André are playing cards. After the first game, Whitney had lost 4 points and André had earned 2 points. Use a toothpick to mark each score on the number line.
2. Which is the lower score? Starting with the lower score (-4), count the number of marks between that point and +2. You can see that -4 is 6 points less (-6) than +2.
3. Subtracting a positive number from a negative number is like adding two negative numbers. Complete these number sentences.

$$-4 - +2 = \underline{\quad} \quad \text{or} \quad -4 + -2 = \underline{\quad}$$

STEP 4: Subtracting a Negative Integer from a Positive Integer

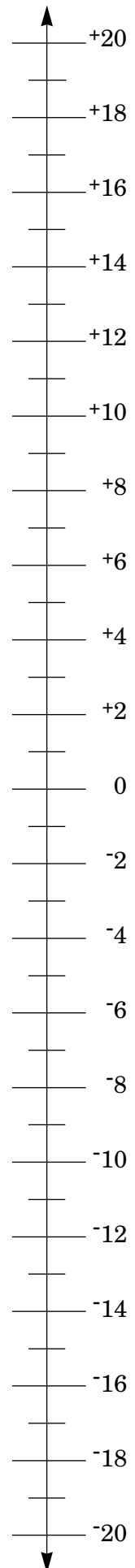
1. On Tuesday night, the low temperature was recorded as +10°C. The next evening, the low temperature was recorded as -5°C. Use the toothpicks to mark these temperatures on the number line.
2. Compare the temperatures. Place < or > in the \bigcirc to complete the number sentence:
 $+10 \bigcirc -5$.
3. Starting with the higher number, count the number of marks between the toothpicks. You can see that +10 is 15 more (+15) than -5. Subtracting a negative number from a positive is like adding two positive numbers. Complete these number sentences.

$$+10 - -5 = \underline{\quad} \quad \text{or} \quad +10 + +5 = \underline{\quad}$$

STEP 5: Subtracting a Negative Integer from a Negative Integer

1. During one play in a rugby game, the Bears lost 10 metres. In a similar play, the Lions lost 15 metres. Use the toothpicks to mark these losses on the number line.
2. How many more is -10 than -15? _____
3. Complete these number sentences.

$$-10 - -15 = \underline{\quad} \quad \text{or} \quad -10 + +15 = \underline{\quad}$$



LESSON 1 Addition and Subtraction of Integers

Pages 1–5

PART A, page 1

For this lesson and other lessons involving integers, students may use integer chips or two-colour counters, with the yellow side representing positive integers and the red side representing negative integers. You may also substitute beans with one painted side.

Remind students that integers are positive and negative numbers (. . . -3, -2, -1, 0, +1, +2, +3. . .). Emphasise the use of integers—to represent direction, opposite relationships and gains or losses.

It is important to model the use of integer chips before students begin working. To model +2, place 2 yellow, positive chips on your desk. To model -3, place 3 red, negative chips on your desk. Students need to understand how to model the integers before they begin adding and subtracting them.

Before students work on the second page of Part A, show them how to use the number line to compare integers.

Step 1

1. and 2. Students show 12 negative (red) chips and 8 positive (yellow) chips.
3. $+8 + -12 = -4$

Step 2

1. Students show 5 negative (red) chips and then 9 negative (red) chips.
2. $-5 + -9 = -14$

PART A, page 2

Step 3

1. Students place toothpicks on -4 and +2 on the number line.
2. -4
3. $-4 - +2 = -6$ or $-4 + -2 = -6$

Step 4

1. Students place toothpicks on +10 and -5 on the number line.
2. $+10 > -5$
3. $+10 - -5 = +15$ or $+10 + +5 = +15$

Step 5

1. Students place toothpicks on -10 and -15 on the number line.
2. +5
3. $-10 - -15 = +5$ or $-10 + +15 = +5$

EXTENSION

1. Have students write their own problems with integers. Suggest topics such as money earned and spent, a rise and fall in temperature, a gain and loss of points, etc.
2. Students can exchange problems with a partner to solve. Allow the use of integer chips and/or number lines.

PART B, page 3

1. $-3 + 5 = 2$; The temperature at noon was 2°C .
2. $10 - 6 = 4$ or $10 + -6 = 4$; Steven had \$4 left, or \$6 less than he started with.
3. $-9 + -6 = -15$; The stock fell a total of 15 points.
4. $-8 - 4 = -12$; The average for January is 12° lower (-12) than the average for February.
5. $-20 - -25 = 5$; Flask A was 5°C warmer.
6. $7 - -2 = 9$; Player A was 9 spaces ahead of Player B.