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Introduction

The design of this book is intended to be used by teachers or parents for a variety of purposes and needs.

The material in this book and its companion *(Maths Challenges— Years 5–9)* offers a wide overview of the ideas and concepts which students should know before they commence a formal study of algebra. Students who are familiar with sequences, functions, order of operations, evaluating expressions, solving simple equations, converting percentages, ratios, multiples, factors, square roots, exponents, scientific notation, and the many other related topics will be comfortable dealing with algebra in later years.
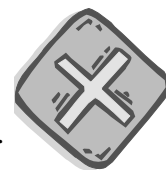
Because there are clear, simple and readable instruction pages for each unit, the book may be used as a formal instruction vehicle for teaching the varied maths topics covered. Capable readers could do the units with little or no maths instruction and only occasional need to clarify a maths concept.

This book could also be used in a whole class with directed teaching instruction from a teacher or parent going page by page through the book. *Maths Challenges — Years 4–6* and its companion *(Years 5–9)* are organised to cover topics sequentially, and by following the organisation of the book, teachers will cover a very wide range of topics in a sensible and workable way.
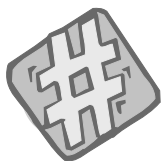
Teachers may choose to select units or concepts where additional help is needed by the class, by a group of students or by individuals. Each unit is capable of standing on its own as an instructional tool for individual topics.
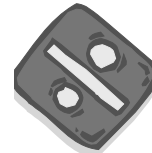
Teachers and parents working with children who are relatively new to the concepts may want to use a more gradual pace. A teacher may want to have two tracks within the class with one track moving at a faster pace and the other at a gradual pace—with the tempo appropriate to the abilities and backgrounds of individual students. The organisation of the text also lends itself to use by a small group doing independent enrichment or advanced maths. It is effective for individual or centre activity.

If students have difficulty with a specific concept or unit within this book, review the material and allow students to redo the pages which were giving them difficulty. Students should be allowed to use the calculator to check the accuracy of their work. This reduces the need for correction and allows the material to be self-corrected if that method works well with the students.
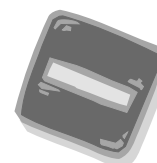
Casting Out Nines ⓵

Facts and Reminders

$$86 \longleftarrow \textbf{quotient}$$
$$\textbf{divisor} \longrightarrow 9\overline{)774} \longleftarrow \textbf{dividend}$$

Some quotients (answers in division) have no remainders. You can tell before you do the problem if a division problem will have a remainder.

Rule: If the divisor is 9 and all of the digits in the dividend add up to 9 or a multiple of 9, there will be no remainder in the quotient.

Examples

1. $9\overline{)63}$ 6 plus 3 equals 9.
   The quotient is 7 with no remainder.

2. $9\overline{)4536}$ Together the digits in the dividend add up to 18 (4 + 5 + 3 + 6), a multiple of 9.
   The quotient is 504 with no remainder.

3. $9\overline{)27\,918}$ Together the digits in the dividend add up to 27, a multiple of 9.
   The quotient is 3102 with no remainder.

4. $9\overline{)15\,318}$ Together the digits add up to 18, a multiple of 9.
   The quotient is 1702 with no remainder.

5. $9\overline{)3617}$ Together the digits add up to 17, which is not a multiple of 9.
   The quotient is 401 with a remainder of 8.

6. $9\overline{)367\_}$ What digit will go in the empty space to make this dividend divisible by 9?
   The answer is 2 because this will make the digit total in the dividend equal 18 which is a multiple of 9.

       $9\overline{)3672}$ The quotient is 408.

Casting Out Nines

Divisibility by 9

> If the divisor is 9 and all of the digits in the dividend add up to 9 or a multiple of 9, there will be no remainder in the quotient.
>
> $9\overline{)4536}$
>
> The sum of the digits in the dividend, 4 + 5 + 3 + 6, equals 18 and is a multiple of 9. The quotient is 504 with no remainder.

Directions: Complete these problems. Determine if there is a remainder. Calculate the remainder if there is one.

1. $9\overline{)279}$ R__

2. $9\overline{)6399}$ R__

3. $9\overline{)4581}$ R__

4. $9\overline{)9045}$ R__

5. $9\overline{)3618}$ R__

6. $9\overline{)81\ 189}$ R__

7. $9\overline{)7217}$ R__

8. $9\overline{)8019}$ R__

9. $9\overline{)5455}$ R__

10. $9\overline{)4419}$ R__

11. $9\overline{)6374}$ R__

12. $9\overline{)4566}$ R__

13. $9\overline{)9279}$ R__

14. $9\overline{)2759}$ R__

15. $9\overline{)1881}$ R__

16. $9\overline{)9144}$ R__

17. $9\overline{)3429}$ R__

18. $9\overline{)13\ 329}$ R__

Casting Out Nines

Word Problems

Directions: Use the system for dividing by nine to help you compute these answers.

1. You and your friends found a chest filled with 1233 coins. You are going to split the coins evenly among the 9 of you. How many coins will each of you receive? _____ Will any coins be left over? _____

2. Your mother wants you and your friends to paint a fence at your house which has 126 square metres. If the 9 of you divide the job evenly, how many square metres will each of you have to paint? _____

3. Your teacher gives 9 boys a huge bag containing 22 143 jelly beans. They decide to divide them evenly before they eat them. You get any leftover jelly beans. How many jelly beans does each boy receive? _____ How many leftover jelly beans do you receive? _____

4. A family of 9 children has decided to evenly divide the job of painting the outside of their house which covers 342 square metres of surface area. How many square metres must each child paint? _____

5. Nine girls in your class are going to evenly divide a huge bag containing 34 372 kernels of unpopped popcorn. You get the remainder. How many kernels does each girl have? _____ How many kernels do you get? _____

6. You deal a deck of 52 cards to yourself and 8 friends for a game of snap. Any leftover cards will be placed in the centre for the first match. How many cards are placed in the centre? _____ How many cards does each player get? _____

7. You win a huge bag of 76 329 marbles in a contest sponsored by Marbles R Us. You split them evenly among 8 of your friends and yourself. How many marbles does each person receive? _____

8. You have a gigantic roll of kite string which is 221 814 centimetres long. If you divide the string among 9 of your best friends, how many centimetres will each friend receive? _____

9. How many dollars would each person receive if $111 111 111 were divided evenly among 9 friends? _____