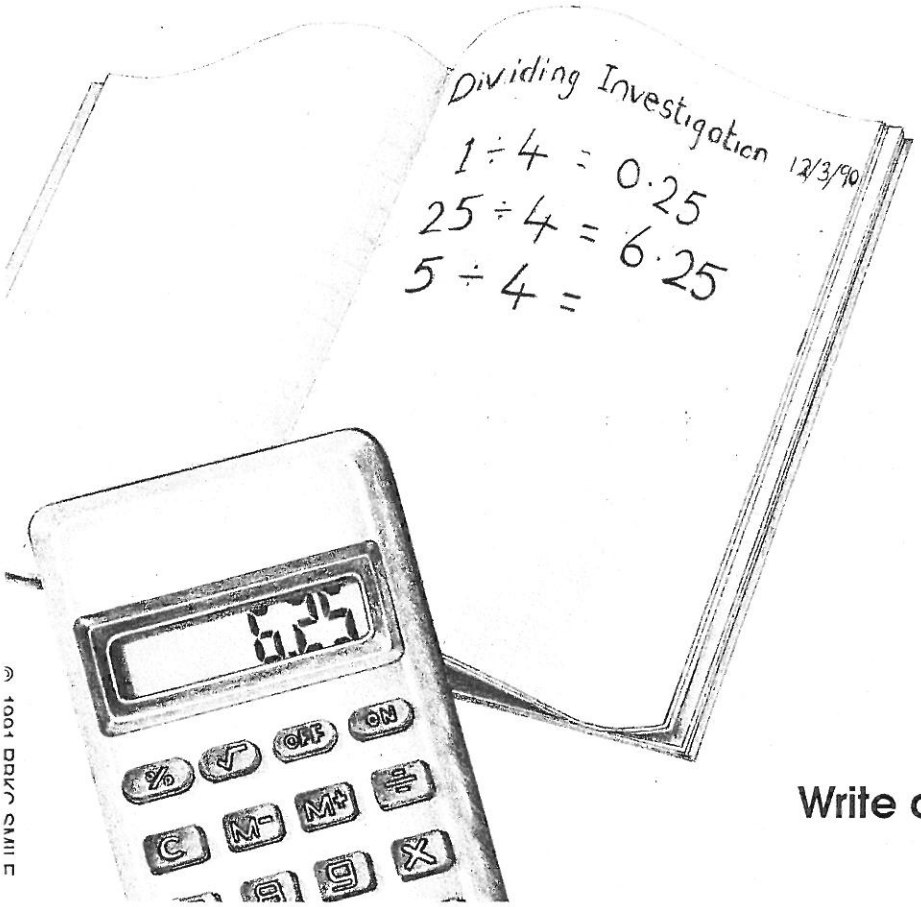
SMILE WORKCARDS

Division Pack Two

Contents

Dividing Investigation



Which other numbers give answers ending in .25 when you divide them by 4?

Try dividing by some other numbers: 5, or 8, or 3 . . .

Write about what you have found.

Dividing pairs

- games for two players.

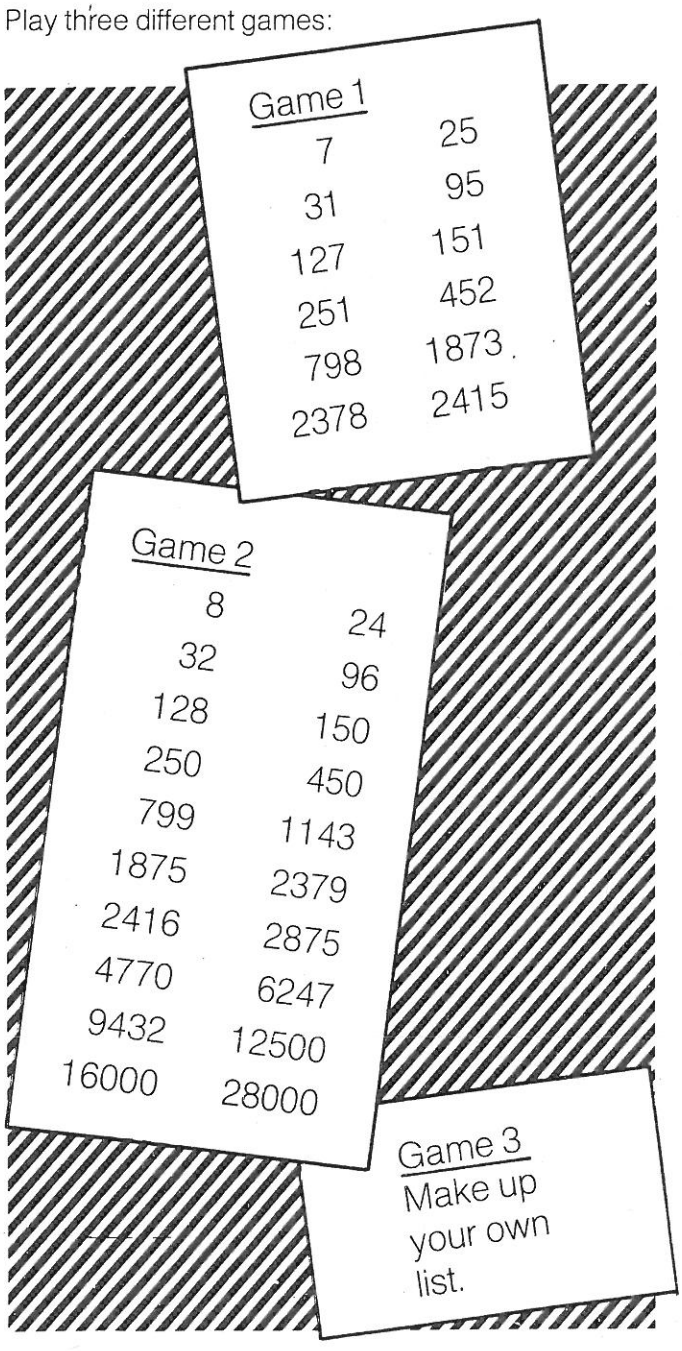
Each player in turn picks two numbers from the list.

To find your score divide one number by the other.

Your answer	Score
Between 0 and 1	1 point
Between 1 and 10	2 points
Between 10 and 100	3 points
Over 100	1 point

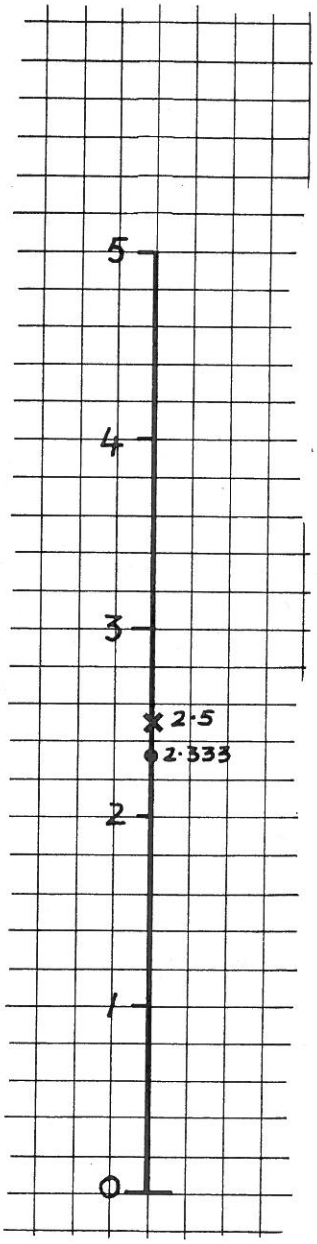
Carry on until you have used all the numbers.
Highest score wins.

Play three different games:

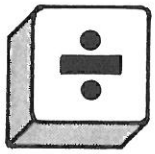


TRI-UMPH

— a game for 2 players.



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



Make a number line from 0 to 5 on ½cm squared paper.

The first player chooses any two numbers from the table and divides,

eg. $5 \div 2 = 2.5$

She marks 2.5 on the number line with ✖

The second player chooses two numbers from the table and divides,

eg. $7 \div 3 = 2.333333$

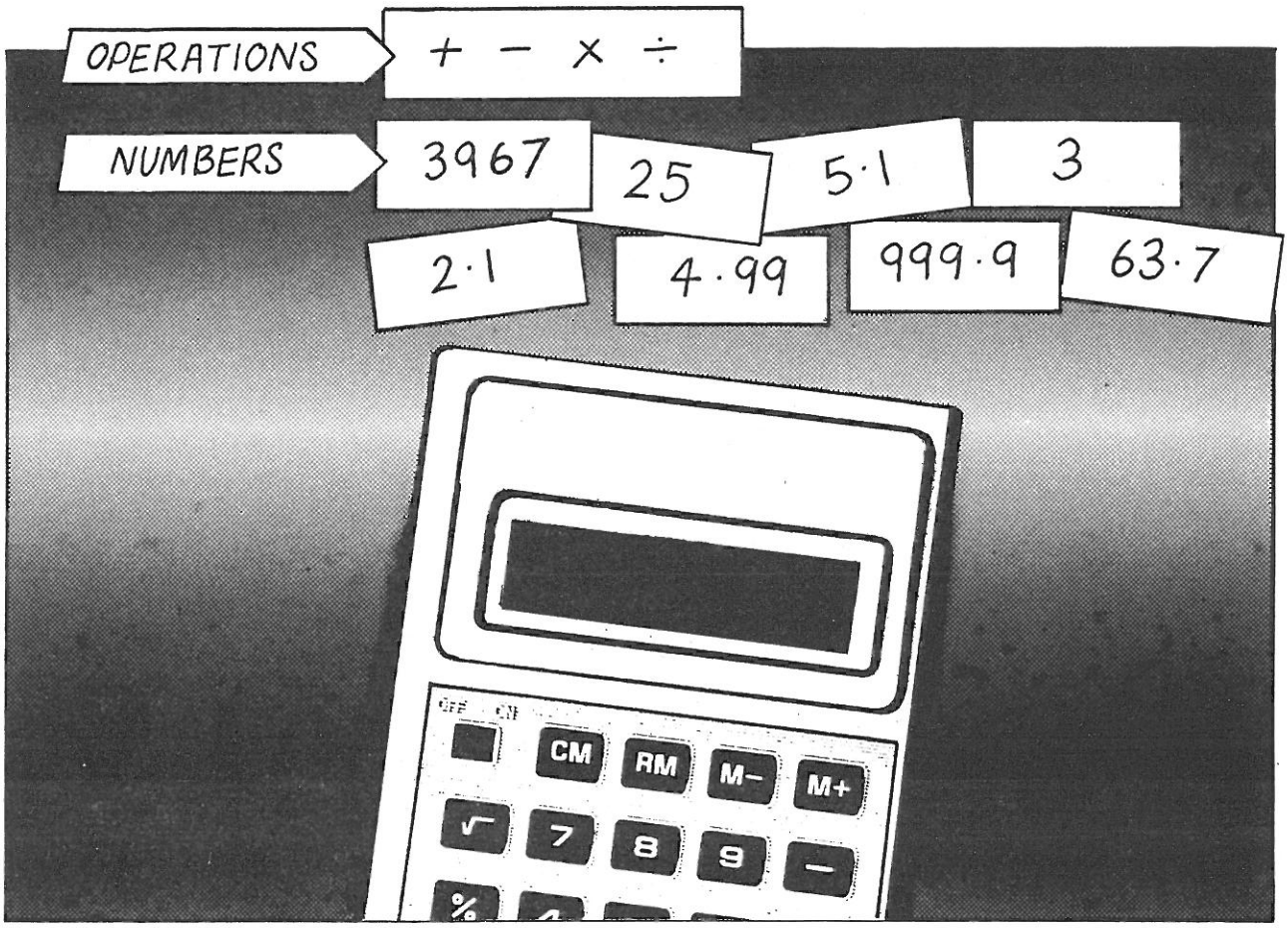
This is marked on the line with ●

If the number found is outside the range, then the player misses a turn.

The first player to get 3 marks in a row, without any of the opponent's marks in between, is the winner.

Getting closer

A game for 2-3 players with a calculator between them.



One player chooses 2 numbers and another chooses the operation.

This gives a calculation,

e.g. 2 5 ÷ 5 · 1

and the object of the game is to estimate the answer.

Each player must write down an estimate within 5 seconds of the calculation being set.

The answer which is closest to the calculator answer scores a point.

The winner is the first player to score 10 points.

The Lost Divide

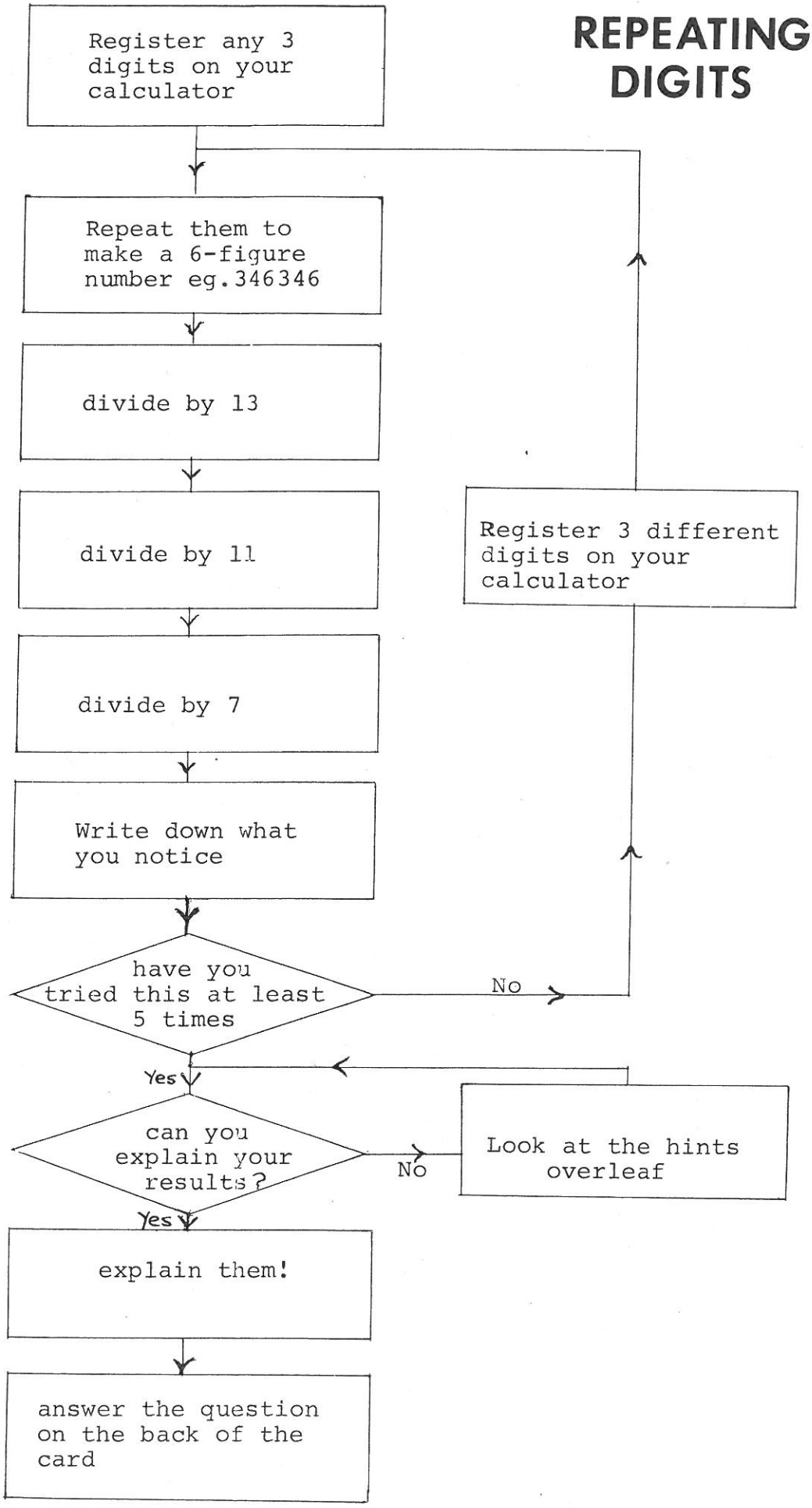
Using my calculator, I divided two whole numbers under 20 and found the answer was 0·2352941.
I now cannot remember which two numbers they were.
Can you find them?

0752

SMILE

You will need: electronic calculator

REPEATING DIGITS



— turn over —

Hints

(1) Multiply any 3-digit number by 7, then 11, then 13. What do you get?

(2) What is 7 x 11 x 13?

Question

Make up another flow chart based on the same idea which uses:

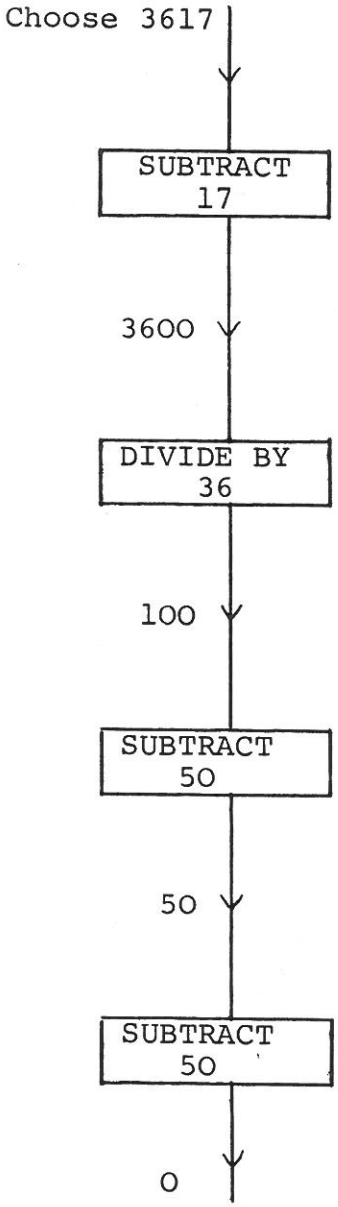
10001 = 73 x 137

0760

SMILE

You may need: electronic calculator

Reduce to Zero



Choose any number with 4 digits.

You have to reduce the number to zero in 4 steps.
At each step you may add, subtract, multiply or divide by any number with 2 digits.

(1) Try several different starting numbers (with 4 digits).
Can you always reduce to zero in 4 steps?

(2) Start with 5 digit numbers.
How many stops do you need? Why?

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0 5 0 0 2 4 5 8 2	3	Computers in Action	1·62	4	86
5 5 0 1 0 2 0 7 8	4	Chambers 20th Century Dictionary	3·50	14	—
7 1 4 2 0 3 0 0 9	1	Dictionary of Maths.	0·70	0	70
7 1 4 8 1 8 1 4 3	10	Inventions of Leonardo da Vinci	5·50	55	—
0 7 1 3 7 3 4 8 5 X	1	Railways & Rail Transport	0·80	0	80
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... amount must be entered.

ISBN

Every book which is published now has an International Standard Book Number (ISBN), which identifies the book. Opposite is the form which can be used by London schools for ordering books.

The number is a combination of digits to indicate the language of the country of publication, the publisher, the book itself and a check digit.

eg.

0	571	09978	5
Language	*Publisher's number*	*Book number*	*Check digit*

Every ISBN consists of exactly 10 digits.
Some very large publishers need 6 digits to code all their books and so only 2 digits are used for the publisher's number.

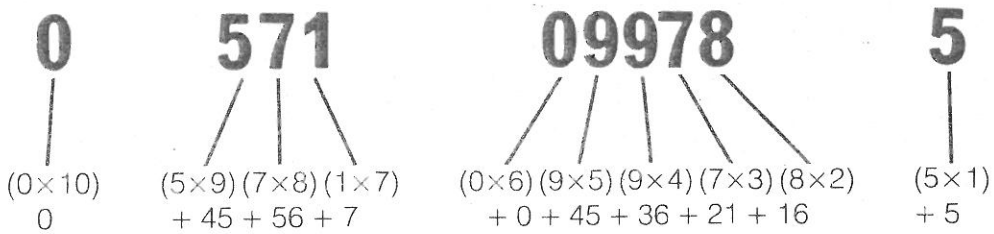
eg.

0	05	002458	2
Language	*Publisher:*	*Book:*	*Check digit*
English	***Oliver & Boyd***	***Computers in Action***	

Check Digit

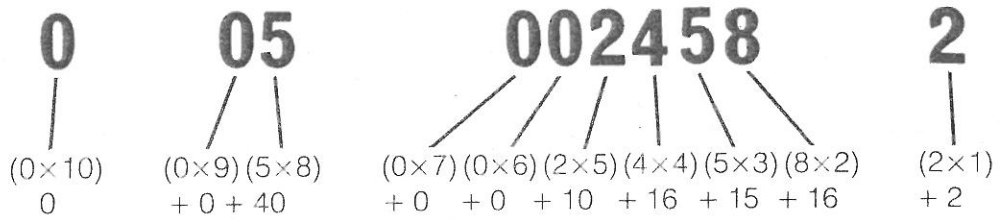
When the order is received, the ISBN for each book is fed into a computer. The other information, ie. the title of the book, will only be used if there is an error. It is very important that the computer is able to detect errors in the ISBN so that wrong books are not delivered . . .

The computer is programmed to multiply the first digit by 10, the second digit by 9, the third by 8 and so on. These products are added and the total is divided by 11. If the ISBN is correct, THE REMAINDER IS ALWAYS ZERO.



= 231

231 ÷ 11 = 21 remainder 0



= 99

99 ÷ 11 = 9 remainder 0

If the remainder is not zero, there must be an error and the computer will reject the order.

1. In the following order, two ISBN's are correct and the other two contain errors. Find which two are wrong.

Standard Book Number (9 digits only)	Quantity Required	DO NOT PUNCH Title	Price	Amount £	Amount p
Many publishers are now printing ISBN'S (international SBN's) in their catalogues. The ISBN consists of Ten digits, the first of which is always '0' and is therefore pre-printed on this demand note form.					
0 1 7 4 3 8 0 5 4 2	5	YOUR WAGE PACKET	2·29	11	45
0 1 4 0 0 5 7 1 4 4	10	PENGUIN BOOK OF NAT WORLD	0·95	9	50
0 7 1 3 7 3 4 9 8 1	1	TOWNS & TOWN LIFE	1—	1	—
0 2 9 8 7 0 5 5 7 6	1	FOOTBALL FOR FANS	6·33	6	33

2. The check digit is chosen to ensure that the remainder ***is*** zero.

   Work out the check digits for these ISBN'S:

   (a) 0 304 93666 ■

   (b) 0 19 914207 ■

   (c) 0 521 08161 ■

3. The ISBN for Oxford Comprehensive Mathematics, Book 5 (blue cover) is 0 19 914205 X.

   (a) Work out the check digit to find what the symbol X stands for.

   (b) Why is the symbol X used?

Errors

When someone is copying a long list of large numbers it is easy to make mistakes. Below are the four main types of error, with an example of each one.

	Correct number	0 571 09978 5
Transcription error	one number mis-read	0 **3**71 09978 5
Transposition error	two adjacent numbers swapped	0 571 099**87** 5
Double transposition error	any two numbers swapped	0 571 09**879** 5
Random error	no explanation	0 571 **08371 4**

4. Which type of error is each of these?

	Number	Error
(a)	0 7214 0015 9	0 7124 0015 9
(b)	0 14 050075 8	0 14 143061 X
(c)	0 510 12411 9	0 510 72411 9
(d)	0 85985 051 X	0 85985 150 X

Weighted Modulo 11 Check

This check, which computers use, is called a 'weighted modulo 11' test; weighted because each digit is multiplied by a different value or weight; modulo 11 because the total is divided by 11 to find the remainder as in modular arithmetic. The weighted modulo 11 test is designed to detect more errors than other simple checks can.

For the ISBN 0 85985 051 X,

$$(10\times0) + (9\times8) + (8\times5) + (7\times9) + (6\times8) + (5\times5) + (4\times0) + (3\times5) + (2\times1) + (1\times10)$$
$$= 0 + 72 + 40 + 63 + 48 + 25 + 0 + 15 + 2 + 10$$

$$= 275$$

275 ÷ 11 = 25 remainder 0

For the transcription error 0 85985 057 X

$$(10\times0) + (9\times8) + (8\times5) + (7\times9) + (6\times8) + (5\times5) + (4\times0) + (3\times5) + (2\times7) + (1\times10)$$
$$= 0 + 72 + 40 + 63 + 48 + 25 + 0 + 15 + 14 + 10$$

$$= 287$$

287 ÷ 11 = 26 remainder 1

The remainder is not 0 and so the transcription error is detected by the weighted modulo 11 test.

5. Complete the table for the ISBN 0 85985 051 X to find out which sorts of error are detected by the weighted modulo 11 test.

		Remainder	Will weighted modulo 11 test detect error?
Correct number	0 85985 051 X	0	—
Transcription error	0 85985 057 X	1	Yes
Transposition error			
Double transp. error			
Random error			

6. Make a similar table for the ISBN 0 435 19213 2.

7. (a) Which sorts of error do you think will ***always*** be detected?

   (b) Which errors will ***sometimes*** be detected?

   (c) Can you outwit the computer? Find an error which this computer will not detect.

The weighted modulo 11 test detects most common errors when numbers are listed. It is a very popular test which is used on cheques and Giro. Like ISBN's these are usually computerised and so the tedious calculations are all done by machine.

The Great Divide

Using my calculator I divided two whole numbers under 100 and found the answer was 0·7671232.
I now cannot remember which two numbers they were.
Can you find them?