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# Introduction

## About the series

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**Cosmic Maths** is a series written by teachers to develop core mathematical knowledge and skills using a guided three-step process to help children understand, apply and practise mathematical concepts.

The series covers the Key Objectives set out in the new *National Curriculum* for each year group and focuses on Place value, Number, Fractions and Statistics and the use and practical application of the four operations: adding, subtracting, multiplying and dividing.

Intended for Key Stage 2 children, with many activities also suitable for lower Key Stage 3, the series comprises four books and CDs:

**Cosmic Maths – Year 3 (Ages 7-8)**

**Cosmic Maths – Year 4 (Ages 8-9)**

**Cosmic Maths – Year 5 (Ages 9-10)**

**Cosmic Maths – Year 6 (Ages 10-11)**

## About the books

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Each book contains at least 18 lesson plans with teachers' notes and a definition of key vocabulary and mathematical terms. Each lesson plan uses a guided three-step process as follows:

### Prepare to launch

A **short mental activity** is given to help prepare your learners launch into the guided activity.

### Lift off

The **guided activity** then supports and encourages the children as they explore numbers through a range of exciting and fun activities.\*

### Into orbit and safe landing

This is then followed up with an **independent** and an **assessment activity** that allow children to practise what they have learnt, as well as providing evidence of the level of each pupil's understanding. They also offer an opportunity for teacher-pupil assessment to take place.

A further **extension activity** for use in class or as homework is also included, in order to give essential practice when embedding core mathematical skills and knowledge associated with each lesson. This provides a valuable stimulus for further discussion and class work in the future.

It is important to note that a wide range of practical problem solving activities is covered, many of which are cross-curricular, in order to give learners a wider view of how maths, especially number, can be used and applied in the 'real' world.

*\*Answers to all activities are given in full at the back of each book.*

## The CD

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Each book includes a CD that contains **differentiated** lessons and activities for higher and lower abilities as well as an **assessment test** (also in the book) and a **skills report**.

**Cosmic Maths** helps make the teaching and learning of mathematics both meaningful and fun, allowing each and every learner to rocket towards success!

# National Curriculum Objectives: Year Five

<b>Number and place value</b>	Read, write, order and compare numbers to at least 1000000 and determine the value of each digit.
	Count forwards and backwards in steps of powers of 10 for any given number up to 1000000.
	Interpret negative numbers in context, count forwards and backwards with positive and negative numbers through zero.
	Round any number up to 1000000 to the nearest 10, 100, 1000, 10000 and 100000.
	Solve number problems and practical problems that involve all the above.
	Read Roman numerals to 1000 (M) and recognise years written in Roman numerals.
<b>Addition and subtraction</b>	Add/subtract whole numbers with more than 4 digits including using formal written methods.
	Add/subtract numbers mentally with increasingly large numbers.
	Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.
	Solve addition/subtraction multi-step problems in contexts, deciding which operations and methods to use and why.
<b>Multiplication and division</b>	Identify multiples and factors, including finding all factor pairs of a number and common factors of two numbers.
	Know and use vocabulary of prime numbers, prime factors and composite (non-prime) numbers. Establish whether a number up to 100 is prime and recall prime numbers up to 19.
	Multiply numbers up to 4 digits by a 1 or 2-digit number using formal written methods including long multiplication for 2-digit numbers.
	Multiply and divide numbers mentally drawing upon known facts.
	Divide numbers up to 4 digits by a 1-digit number using the formal written method of short division and interpret remainders appropriate for the context.
	Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000.
	Recognise and use square numbers and cube numbers and the notation of squared ( <sup>2</sup> ) and cubed ( <sup>3</sup> ).
	Solve problems involving addition, subtraction, multiplication and division and a combination of these including understanding the meaning of the equals sign.
<b>Fractions, decimals and percentages</b>	Compare and order fractions whose denominators are all multiples of the same number.
	Identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths.
	Recognise mixed numbers and improper fractions and convert from one to the other and write mathematical statements $> 1$ as a mixed number e.g. $2/5 + 4/5 = 6/5 = 1 \frac{1}{5}$ .
	Add/subtract fractions with the same denominators and multiples of the same number.
	Multiply proper fractions and mixed numbers by whole numbers supported by materials and diagrams.
	Read and write decimal numbers as fractions e.g. $0.71 = 71/100$ .
	Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents.
	Round decimals with two decimal places to the nearest whole number and to one decimal place.
	Read, write, order and compare numbers with up to three decimal places. Solve problems involving numbers up to three decimal places.
	Recognise the <b>per cent</b> symbol (%) and understand that <b>per cent</b> relates to 'number of parts per hundred', and write % as a fraction with the denominator 100 and as a decimal fraction.
	Solve problems that require knowing % and decimal equivalents of $1/2$ , $1/4$ , $1/5$ , $2/5$ , $4/5$ and those with a denominator of a multiple of 10 or 25.
<b>Statistics</b>	Solve comparison, sum and difference problems using information presented in a line graph.
	Complete, read and interpret information in tables including timetables.

## Code book

### National Curriculum Objective:

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Read, write, order and compare numbers to at least 1000000 and determine the value of each digit.

### Teachers' notes:

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Ensure that pupils' knowledge of five and six-digit numbers is secure before completing these tasks. An abacus marked with the headings 1000000 (M), 100000 (HTh), 10000 (TTh), 1000 (Th) etc. may prove useful for some pupils. Time will be needed to explain the value of zero in such numbers as 103259, 432054, 957306, 704308 etc.

### Key vocabulary:

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Recap on the spelling of words like **thousand**, **ten thousand**, **one hundred thousand** and **million**. Words and phrases connected with the number system may also be useful. These include **place value**, **place holder**, **abacus** and **digit**. Remind pupils that **partitioning** or **expanded notation** means breaking a number down into its component parts. For example:  $2\ 345\ 271 = 2000000 + 300000 + 40000 + 5000 + 200 + 70 + 1$ .

### Prepare to launch: (Warm up activity)

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Ask pupils to work in pairs with a set of card boards (number flips) showing all the digits 0 to 9 separately. Challenge one pupil to make a five or six-digit number using the number flips and the other pupil has to say the number (as it would be written in words, not just the individual digits). Then ask the pair to switch over. Later change the activity so that the pupils take it in turns to say five or six-digit numbers in words that have to be shown in numerals on the number flips chart.

### Lift off: (Guided activity)

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Show pupils a seven-line abacus on the IWB. Identify the hundred thousand column and explain that to the left of it will be the million column. Ask pupils to name the column headings, going up in size from the right-hand side of the abacus and multiplying by 10 each time: 1, 10, 100, 1000, 10000, 100000, 1000000. Repeat the process coming down from the left-hand side, this time dividing by 10 each time: 1000000, 100000, 10000, 1000, 100, 10, 1. Then write some seven-digit numbers on the IWB and ring some of the digits in them in colour for pupils to identify. Try some of the following, numbers ringed in brackets: 135792 (5), 148231 (2), 2854706 (2), 4965004 (9), 3125064 (6), 5273924 (5, 9 and 4).

### Into orbit: (Independent activity)

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Explain to pupils that writing numbers in full, using a method known as partitioning or expanded notation, can also be used to show the value of each digit in a large number. Go through some examples of six and seven-digit numbers with them on the IWB. For example  $523419 = 500000 + 20000 + 3000 + 400 + 10 + 9$ ;  $1542197 = 1000000 + 500000 + 40000 + 2000 + 100 + 90 + 7$  and  $2035640 = 2000000 + 30000 + 5000 + 600 + 40$ .

Finally, check that pupils can read numbers of this size in words and vice versa. For example: three million two hundred and seventeen thousand nine hundred and forty six is 3217946 and 5698204 is written as five million six hundred and ninety eight thousand two hundred and four.

- ★ Lead into and complete the independent activity  
**Into orbit: Code book** on page 9.

### Safe landing: (Assessment activity)

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Provide pupils with a set of seven digit cards; 5, 2, 7, 3, 9, 6 and 1. Ask these questions: What is the smallest number that can be made using all seven cards? What is the largest number that can be made using all seven cards? Then challenge them to make ten other seven-digit numbers and place them in order of size. They should also be able to say the numbers in words.

- ★ Lead into and complete assessment activity  
**Safe landing: Code book** on page 10.

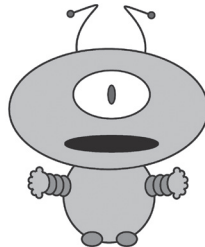
### Extension opportunity/homework:

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Devise activities using really big numbers associated with the distance certain planets are from the Sun. Practise writing them in both numbers and words and arrange the numbers in order of size. Here is some information to get you started. Venus 100000000km, Earth 150000000km, Mercury 90000000km, Saturn 140000000km, Jupiter 770000000km, Mars 230000000.

# Code book

Name: \_\_\_\_\_ Date: \_\_\_\_\_



Learn more about six and seven-digit numbers by cracking the code.

5	Eight thousand	Seven ones	Ten thousand	Nine ones	Three million
4	Six hundred thousand	Two million	Three hundred	Five tens	Five thousand
3	Two hundred thousand	Five ones	Four million	One hundred thousand	Five hundred
2	Three hundred thousand	Nine hundred	Forty thousand	Nine tens	Twenty thousand
1	Seven tens	Thirty thousand	Two thousand	Six hundred thousand	One million
	A	B	C	D	E

Here is a number code: A2, E2, C1, B2, D2, B3.  
This is  $300000 + 20000 + 2000 + 900 + 90 + 5 = 322995$ .

Find the number for these codes.

1. A2, C2, E4, B2, A1, B3
2. A4, C5, A5, E3, D4, D5
3. E1, A4, E2, C1, C4, A1, B3
4. C3, A3, E2, A5, B2, D2, D5
5. B4, D1, C5, C1, E3, D4, B5

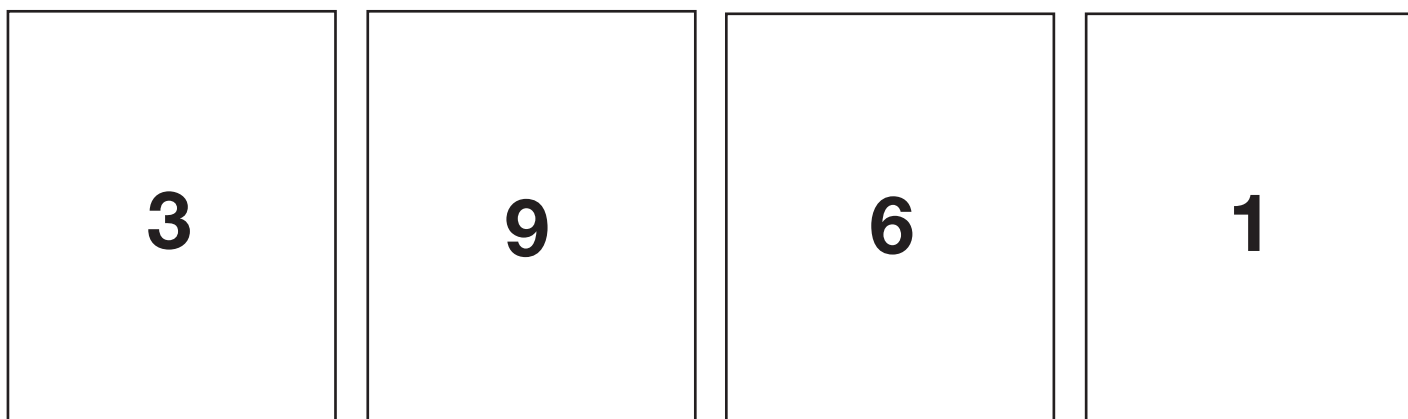
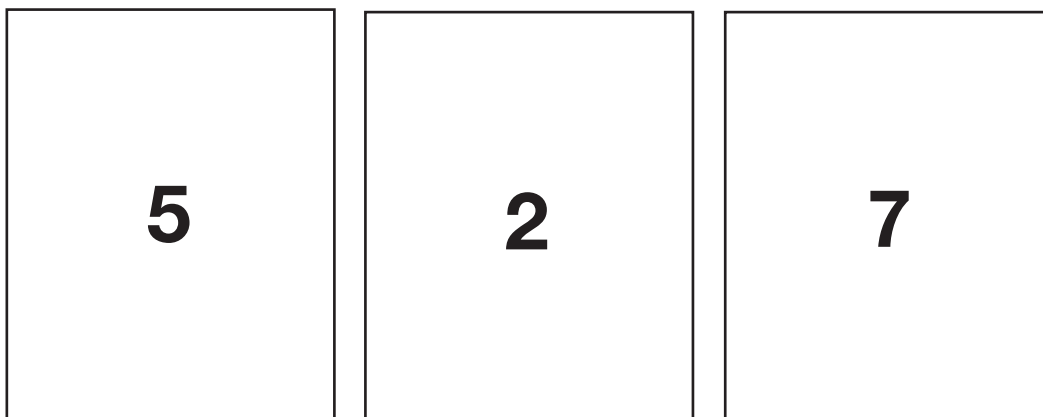
Find the codes for these numbers.

6. Three hundred and twenty two thousand five hundred and seventy five.
7. One million, two hundred and thirty five thousand nine hundred and ninety nine.
8. Four million, three hundred and eighteen thousand three hundred and fifty five.

## Code book

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Here is a set of seven digit cards.



What is the smallest number that can be made using all seven cards?

What is the largest number that can be made using all seven cards?

Make ten other seven-digit numbers of your own and then place them in order of size, smallest first.

You should be able to say all these numbers in both words and numbers.

# Code book

Name: \_\_\_\_\_ Date: \_\_\_\_\_

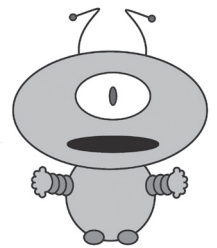
**Learning objective:**

Read, write, order and compare numbers to at least 1000000 and determine the value of each digit.

**Self assessment**

- I found this hard and would like help. (red)
- I could do some of this but would like more practice. (yellow)
- I found this easy and am ready to go to the next step. (green)

Colour my home planet  
**red, yellow or green**  
depending on how well you  
think you did this task.



**Teacher's notes:**

