

# Introduction

## What is mastery?

The definition of mastery used in this book is:

*A deep understanding of a topic\* and its relationship with other topics.*

The activities in this book will help pupils to work at greater depth within the national expectation.

Three factors affect mastery:

- 1) Initial understanding of the topic
- 2) Growing depth of understanding over time
- 3) Behaviours

Immersion in a topic over a short space of time should provide pupils with an initial understanding of the topic. Whilst this is important, it is not sufficient for mastery. Mastery requires frequent and regular re-visits to the topic along with increasingly demanding cognitive tasks. These tasks require a gradual movement from lower to higher order thinking skills. Mastery also requires a growing understanding of the inter-connections between one topic and another. For example, if a topic such as reading and using numbers to *10000000* were thought of in an interconnected way, one might ask pupils, 'Counting back from ten million, what would be the first three triangular numbers?' or 'True or false: one hundred squared multiplied by one thousand is greater than ten million?' These questions are both higher order and promote interconnected thinking.

*\*topic means the teaching of knowledge, concepts or skills.*

## To add and subtract – methods

Mastery involves a deep understanding of the concepts of addition and subtraction rather than procedures.

Give frequent opportunities to calculate using addition and subtraction in a wide variety of contexts, using lots of different ways to represent quantities.

Link to games and problem-solving activities wherever possible.



**True or false?**

$$64 + 50 = 113$$

**What are the possibilities?**

$$[ \ ] + [ \ ] + [ \ ] = 29$$

**What are the possibilities?**

I have 2 even numbers  $< 50$  that have a difference of 4. What could they be?

**True or false?**

$$78 - 18 = 50$$

**What are the possibilities?**

$$6[ \ ] - 3[ \ ] = 34$$

**What are the possibilities?**

$$50 - [ \ ] - [ \ ] - [ \ ] = 26$$

**True or false?**

$$46 + 88 = 134$$

To add and subtract – methods continued overleaf.

## 9. Bake off

You have reached the finals of a baking competition. The winner must make a cake that weighs exactly 98g. You must use equal weights of sugar and flour.

Complete the table to show how much you will measure out for the three sizes of egg available.

Sugar:			
Flour:			
Eggs:	17g	21g	26g
	Small	Medium	Large



## To multiply and divide – methods

Multiply and divide in a wide range of contexts, practising formal written methods.

Draw upon known facts to improve the speed of calculation.

Link to work on multiplying and dividing decimal fractions.



## Prove it!

Add a figure in the box to make the calculation work:

- $3 \boxed{\phantom{0}} \times 5 = 155$

## What else do you know?

$6 \times 8 = 48$ , so ...

- $48 =$
- $6 =$

## Use known facts

$56 = 7 \times 8$ , so ...

- $112 \div 8 =$
- $224 \div 7 =$

## Use known facts

$2 \times 4 = 8$ , so ...

- $20 \times 4 =$
- $21 \times 4 =$
- $22 \times 4 =$

## Use known facts

$180 = 15 \times 12$ , so  
...(use factors of 12)

- $180 = 15 \times 3 \times 4$
- $180 =$

## Try to refine

Use the digits 2, 3 and 6:

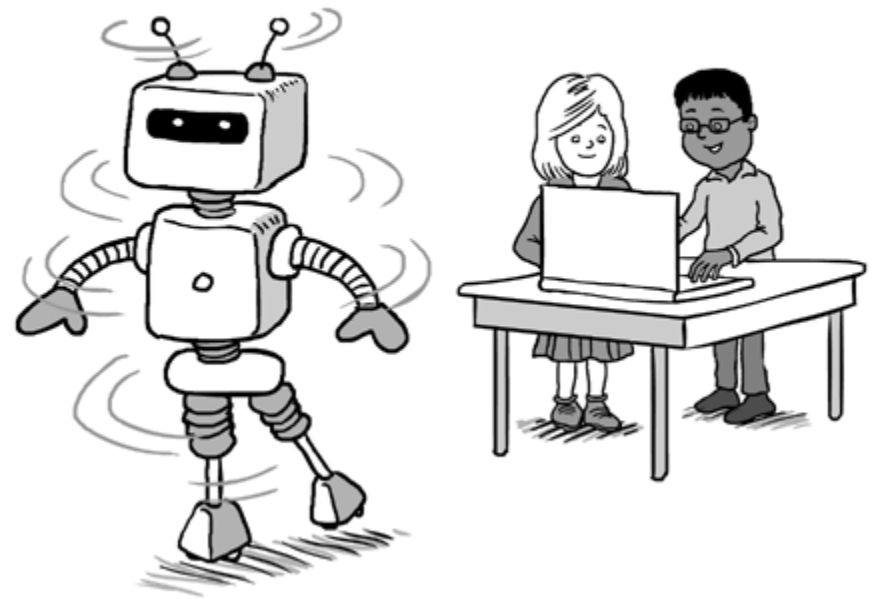
- Try to get closest to 5000
- $\boxed{\phantom{0}}\boxed{\phantom{0}}\boxed{\phantom{0}}\boxed{\phantom{0}} \times 8$
- What is the highest product?
- What is the lowest product?



## 12. Confused robot

You and your friends have built a robot that follows your commands via a computer. Fill in the table below to help you give the correct instructions.

Turn in degrees	Turn as a fraction
	$\frac{1}{4}$
	$\frac{1}{2}$
$270^\circ$	
$360^\circ$	
	$1\frac{1}{2}$



### True or false?

- The robot will face the same way after one and a half turns as it would after turning  $180^\circ$ .

## To understand the properties of shapes

Handle shapes frequently and use key vocabulary each time. Make sure language is embedded and fully understood by linking to areas of the curriculum such as art, design and technology. Construct 3-D shapes when appropriate.

**Fluency**





## Visualise

A cube constructed from 64 smaller cubes that have a face area of  $4\text{cm}^2$ . What is the total area of the large cube's faces?

## Visualise

Three turns of  $90^\circ$ . How many more degrees to make a complete  $360^\circ$  turn?

## Visualise

An isosceles triangle cut in half to form two equal triangles. Describe the triangles.

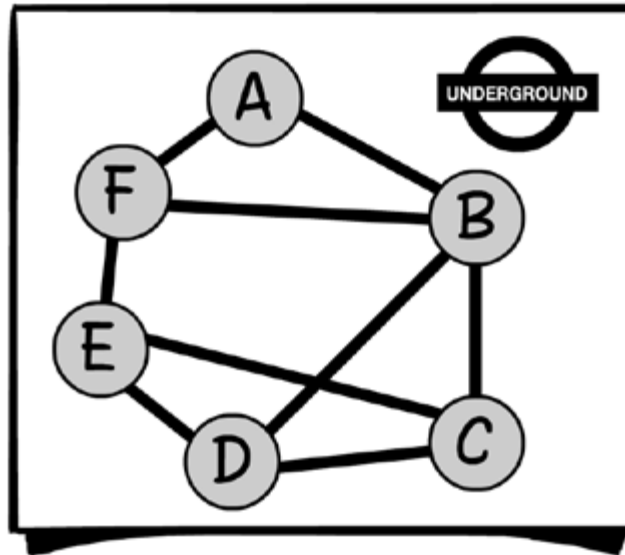
## Visualise

A circle with a radius of  $25\text{cm}$ . What would its diameter be?

## Always, sometimes or never?

All angles in a triangle total  $180^\circ$ .

## 12. Tube trips



There are 6 stations on the tube train map. Here are the fares:

A to B	B to C	C to D	D to E	E to F	F to A	B to D	B to F	C to E	C to F
£4	£3	£4	£4	£3	£4	£5	£3	£2	£2

Which route from A back to A is cheapest?