Year 5

# Calculation policy

Updated September 2024



### **Guidance for teachers**

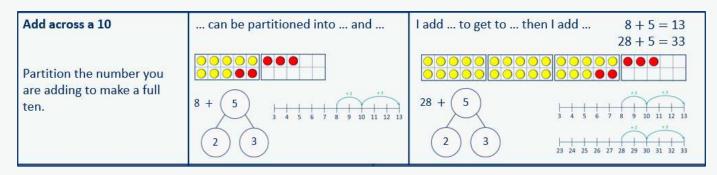


The calculation policy is divided into four sections: addition, subtraction, multiplication and division. At the start of each section, you will find an overview of the progression of skills. Calculations involving decimal numbers and fractions are included.

The calculation policy follows the same concrete, pictorial, abstract approach as our main schemes of learning. Where appropriate, sentence stems and key questions are included alongside the key representations.

Where skills are divided into more than one section across the page, there is a progression in the level of difficulty from left to right.

For example, when adding across a 10, children need to be able to add across 10 itself, before making links with related facts.



## Progression of skills – Addition



Year 4	Year 5	Year 6
<ul> <li>Add 1s, 10s and 100s to a 4-digit number</li> <li>Add up to two 4-digit numbers</li> <li>Add decimal numbers in the context of money</li> <li>Add fractions and mixed numbers with the same denominator beyond 1 whole</li> </ul>	<ul> <li>Add using mental strategies</li> <li>Add whole numbers with more than 4 digits</li> <li>Add decimals with up to 2 decimal places</li> <li>Complements to 1</li> <li>Add fractions with denominators that are a multiple of one another</li> </ul>	<ul> <li>Add integers up to 10 million</li> <li>Add decimals with up to 3 decimal places</li> <li>Order of operations</li> <li>Negative numbers</li> <li>Add fractions</li> </ul>

### **Addition**



Year 5	<ul> <li>Add whole numbers with more than 4 digits, including using formal written methods.</li> <li>Add numbers mentally with increasingly large numbers.</li> <li>Add decimals, including a mix of whole numbers and decimals, decimals with different numbers of decimal places, and complements of 1</li> <li>Add fractions with the same denominator, and denominators that are multiples of the same number.</li> </ul>
Progression of skills	Key representations
Add using mental strategies  Add 1s, 10s, 100s, etc. to any number.  Use number bonds and related facts.	TTh Th H T O
Add whole numbers with more than 4 digits  Encourage children to estimate and use inverse operations to check answers to calculations.	I can exchange 10 for 1  The property of the content of th

### **Addition**



#### **Progression of skills Key representations** Add decimals with up to 2 I do/do not need to make an exchange because ... decimal places I can exchange 10 ... for 1 ... Thth Tth Hth 1 . 2 8 1 001 001 000 Progress from the same + 2 - 5 4 **600 600** number of decimal places to 0.01 Tenths Hundredths Ones a different number of **600** 4 • 4 5 0.01 0.01 decimal places, and from no 0.01 0.01 3 • 2 1 10 000 001 exchange to exchange. 000 0.01 **600 Complements to 1** 0.3 +0.35 +Pairs of numbers with up to 3 decimal places which total 1 1 0.44 0.444 0.4 Encourage children to make links with bonds to 10 and 0.4 + 0.6 = 14 + 6 = 10complements to 100 and 71 0.71 44 + 56 = 1000.44 + 0.56 = 11,000 100 444 + 556 = 1,0000.444 + 0.556 = 1

### **Addition**



Progression of skills	Key representations	
Add fractions with denominators that are a multiple of one another	The denominator has been multiplied by, so the numerator needs to be multiplied by for the fractions to be equivalent.	
Encourage children to convert fractions to the same denominator before adding.	$\frac{1}{2} + \frac{1}{8} = \frac{4}{8} + \frac{1}{8} = \frac{5}{8}$	
Progress from adding fractions within 1 whole to adding fractions beyond 1 whole.	$\frac{1}{4} + \frac{3}{8} = \frac{2}{8} + \frac{3}{8} = \frac{5}{8}$	$\frac{3}{4} + \frac{5}{8} = \frac{6}{8} + \frac{5}{8} = \frac{11}{8} = 1\frac{3}{8}$

## **Progression of skills - Subtraction**



Year 4	Year 5	Year 6
<ul> <li>Subtract 1s, 10s, 100s and 1,000s from a 4-digit number</li> </ul>	<ul> <li>Subtract whole numbers with more than 4 digits</li> </ul>	Subtract integers up to 10 million
Subtract up to two 4-digit numbers	<ul> <li>Subtract using mental strategies</li> </ul>	Subtract decimals with up to 3 decimal places
<ul> <li>Subtract decimal numbers in the context of money</li> <li>Subtract fractions and mixed numbers with the same denominator</li> </ul>	<ul> <li>Subtract decimals with up to 2 decimal places</li> <li>Complements to 1</li> <li>Subtract fractions with denominators that are a multiple of one another</li> </ul>	<ul> <li>Order of operations</li> <li>Negative numbers</li> <li>Subtract fractions</li> </ul>

### **Subtraction**



Year 5	<ul> <li>Subtract whole numbers with more than 4 digits.</li> <li>Subtract numbers mentally with increasingly large numbers.</li> <li>Subtract decimals, including a mix of whole numbers and decimals, decimals with different numbers of decimal places, and complements of 1</li> <li>Subtract fractions with the same denominator, and denominators that are multiples of the same number.</li> </ul>
Progression of skills	Key representations
Subtract whole numbers with more than 4 digits  Encourage children to estimate and use inverse operations to check answers to calculations.	I can exchange 1 for 10  TTh Th H T 0  2 3 11 45 13 4  - 3 2 7 4  2 8 2 6 0  2 8 5 8
Subtract using mental strategies  Subtract 1s, 10s, 100s etc from any number. Use number bonds and related facts.	TTh Th H T O Subtract, I can subtract then add  48,650 - 300 = 48,650 - 30,000 = 48,650 - 30 = 6,458 6,459  6,458 6,459  6,558

### **Subtraction**



#### **Progression of skills**

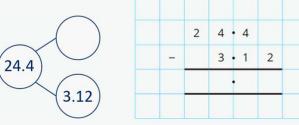
#### Subtract decimals with up to 2 decimal places

Progress from the same number of decimal places to a different number of decimal places and from no exchange to exchange.

#### **Key representations**



	The Control of the Co
3.12	?

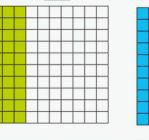


#### **Complements to 1**

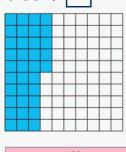
Encourage children to make links with bonds to 10 and complements to 100 and 1,000 when finding a missing part or subtracting from 1



0.3



0.35 +   = 1	+ = 1
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35

0.35

10		1		,
10	_	4	=	t

0.4

$$1 - 0.4 = 0.6$$

0.44

$$100 - 44 = 56$$

$$1 - 0.44 = 0.56$$

$$1,000 - 444 = 556$$
  $1 - 0.444 = 0.556$ 

$$1 - 0.444 = 0.556$$

0.444

?

### **Subtraction**



#### Progression of skills Key representations

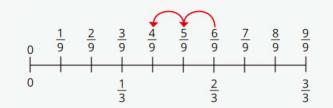
Subtract fractions with denominators that are a multiple of one another

Convert fractions to the same denominator before subtracting. Progress from subtracting fractions within 1 whole to subtracting from a mixed number.

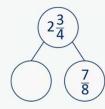
The denominator has been multiplied by ..., so the numerator needs to be multiplied by... for the fractions to be equivalent.



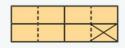
$$\frac{1}{3} - \frac{1}{15} = \frac{5}{15} - \frac{1}{15} = \frac{4}{15}$$



$$\frac{2}{3} - \frac{2}{9} = \frac{6}{9} - \frac{2}{9} = \frac{4}{9}$$









## Progression of skills – Multiplication



Year 4	Year 5	Year 6
• Times-table facts to $12 \times 12$	Multiples and factors	Multiply numbers up to 4     digits by a 2-digit number
<ul><li>Multiply by 1 and 0</li><li>Multiply 3 numbers</li></ul>	<ul> <li>Square and cube numbers</li> <li>Multiply numbers up to 4 digits by a 1-digit number</li> </ul>	<ul> <li>Multiply by 10, 100 and 1,000</li> <li>Order of operations</li> </ul>
<ul><li>Factor pairs</li><li>Multiply by 10 and 100</li></ul>	<ul> <li>Multiply numbers up to 4 digits by a 2-digit number</li> </ul>	<ul> <li>Multiply decimals by integers</li> <li>Multiply fractions by fractions</li> </ul>
<ul><li>Related facts</li><li>Mental strategies</li></ul>	<ul><li>Multiply by 10, 100 and 1,000</li><li>Mental strategies</li></ul>	Find the whole
<ul> <li>Multiply a 2 or 3-digit number by a 1-digit number</li> </ul>	<ul> <li>Multiply fractions by a whole number</li> </ul>	Calculations involving ratio
<ul><li>Scaling</li><li>Correspondence problems</li></ul>	<ul> <li>Multiply mixed numbers by a whole number</li> </ul>	
	Find the whole	



Year 5	<ul> <li>Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers</li> <li>Recognise and use square numbers and cube numbers, and the notation for squared (²) and cubed (³)</li> <li>Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers.</li> <li>Multiply numbers mentally drawing upon known facts.</li> <li>Multiply whole numbers and those involving decimals by 10, 100 and 1000</li> <li>Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams.</li> </ul>		
Progression of skills	Key representations		
Multiples and factors  Encourage children to notice patterns and make links with known facts.	is a multiple of because × =  1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	is a factor of because × =  1 × 8  2 × 4  1, 2, 4 and 8 are factors of 8	The common factors of and are  Factors of 20 Factors of 12  5 1 2 3 6 12
Square and cube numbers	squared means $\times$ 1 × 1 2 × 2 3 × 3  1 <sup>2</sup> = 1 2 <sup>2</sup> = 4 3 <sup>2</sup> = 9	cubed means $4 \times 4$ $4^2 = 16$ $1 \times 1 \times 1$ $2 \times 2$ $1^3 = 1$ $2^3 = 1$	2 × 2 3 × 3 × 3



Progression of skills	Key representations	
Multiply numbers up to 4 digits by a 1-digit number  This builds on the short multiplication method introduced in Y4	To multiply a 4-digit number by , I mul by and the thousands by	tiply the ones by , the tens by , the hundreds  Th H T O 1 1 1 5 2
Multiply numbers up to 4 digits by a 2-digit number  Numbers are first partitioned using an area model then long multiplication is introduced for the first time.	I can partition into and $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	First, I multiply by the Then I multiply by the    X   10   3     3   2     3   2



Progression of skills	Key representations		
Multiply by 10, 100 and 1,000	To multiply by 10/100/1,000, I move all the di is 10/100/1,000 times the size of	To multiply by 10/100/1,000, I move all the digits places to the left is 10/100/1,000 times the size of	
Some children may over- generalise that multiplying by a power of 10 always results in adding zeros. This will cause issues later when multiplying decimals.	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	
Mental strategies  Children continue to use efficient mental strategies such as partitioning and knowledge of factor pairs and related facts to multiply.	The most efficient strategy to calculate $\times$ To calculate $\times$ 12, I can do $\times$ $\times$ For example: 121 $\times$ 12 I could calculate 100 $\times$ 12 plus 20 $\times$ 12 plus 1 I could calculate 121 $\times$ 10 plus 121 $\times$ 2 I could calculate 121 $\times$ 6 $\times$ 2 I could calculate 121 $\times$ 4 $\times$ 3		



Progression of skills	Key representations		
Multiply fractions by a whole number	To multiply a fraction by an integer, I multiply the numerator by the integer and the denominator remains the same.		
Make links with repeated addition. E.g. $\frac{1}{5} \times 4 = \frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5}$	$\frac{1}{7} \frac{1}{7} \frac{1}{7} \frac{1}{7} \frac{1}{7} \frac{1}{7}$ $\frac{1}{7} \times 5 = \frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{1}{7} = \frac{5}{7}$ $\frac{2}{7} \times 3 = \frac{2}{7} + \frac{2}{7} + \frac{2}{7} = \frac{6}{7}$		
	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		
	$\frac{1}{5} \times 6 = \frac{6}{5} = 1\frac{1}{5}$ $\frac{2}{5} \times 3 = \frac{6}{5} = 1\frac{1}{5}$		
Multiply mixed numbers by a whole number	I can partition		
	$2\frac{2}{3} \times 3$ $2 \times 3 = 6$ $2 \times 3 = 6$ $2 \times 3 = 6$		
	$2\frac{2}{3} \times 3 = 6 + 2 = 8$		



Progression of skills	Key representations			
Find the whole	If $\frac{1}{\Box}$ is, then the whole is $\times$		If $\frac{\square}{\square}$ is, then $\frac{1}{\square}$ is and the whole is $\times$	
Children multiply to find the whole from a given part.				
and a great part	$\frac{1}{5}$ of = 6		$\frac{4}{7}$ of = 24	$\frac{1}{7} = 24 \div 4 = 6$
	?	$5 \times 6 = 30$	?	$7 \times 6 = 42$
	6 6 6 6 6	$\frac{1}{5}$ of <b>30</b> = 6	24	$\frac{4}{7}$ of <b>42</b> = 24

## Progression of skills – Division



Year 4	Year 5	Year 6
• Division facts to 12 × 12	Mental strategies	Short division
Divide a number by 1 and itself	<ul> <li>Divide numbers up to 4 digits by a 1-digit number</li> </ul>	Mental strategies     Long division
Related facts	• Divide by 10, 100 and 1,000	<ul><li>Long division</li><li>Order of operations</li></ul>
<ul> <li>Divide a 2 or 3-digit number</li> <li>by a 1-digit number</li> </ul>	Fraction of an amount	• Divide by 10, 100 and 1,000
Divide by 10 and 100		Divide decimals by integers
		Decimal and fraction equivalents
		Divide a fraction by an integer
		Fraction of an amount
		Calculate percentages
		Calculations involving ratio

### **Division**



Year 5	<ul> <li>Divide numbers mentally drawing upon known facts.</li> <li>Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context.</li> <li>Divide whole numbers and those involving decimals by 10, 100 and 1,000</li> </ul>			
Progression of skills	Key representations			
Mental strategies	I can partition into and to help me to divide more easily. $436 \div 4$ $400 \div 4$ $36 \div 4$	I can show groups of on a number line.	To divide by, I can divide by and then divide the result by $436 \div 4 = 436 \div 2 \div 2$ $436 \div 2 = 218$ $218 \div 2 = 109$	
Divide numbers up to 4 digits by a 1-digit number  The short division method is introduced for the first time.		reds/tens/ones/ in  2 0 5 r2 3 6 1 17	1 2 2 3 r2 4 4 8 9 4 1	

### **Division**



#### **Progression of skills**

#### **Key representations**

#### Divide by 10, 100 and 1,000

Encourage children to notice that dividing by 100 is the same as dividing by 10 twice, and that dividing by 1,000 is the same as dividing by 10 three times.

To divide by 10/100/1,000, I move all the digits ... places to the right.

... is one-tenth/one-hundredth/one-thousandth the size of ...

Th	Н	Т	0 (	Tth	Hth
		00		•	
Th	Н	Т	0	Tth	Hth
				•	
Th	Н	Т	0 (	Tth	Hth
Th	Н	Т	0	Tth	Hth

$$120 \div 10 = 12$$

$$120 \div 100 = 1.2$$

$$120 \div 1,000 = 0.12$$

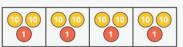
#### Fraction of an amount

Bar models support children to understand that to find a fraction of an amount, we divide by the denominator and multiply by the numerator.

To find  $\models$  of ..., I need to divide by ... and multiply by ...







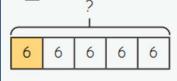


$$\frac{1}{4}$$
 of 84 =

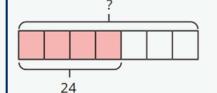
$$\frac{3}{5}$$
 of 20 =

$$\frac{3}{4}$$
 of 84 =

If  $\stackrel{\perp}{=}$  is ..., then the whole is ...  $\times$  ...







$$\frac{4}{7}$$
 of \_\_\_ = 24