

# Mathematics

## Progression in Number Facts KS1 & KS2

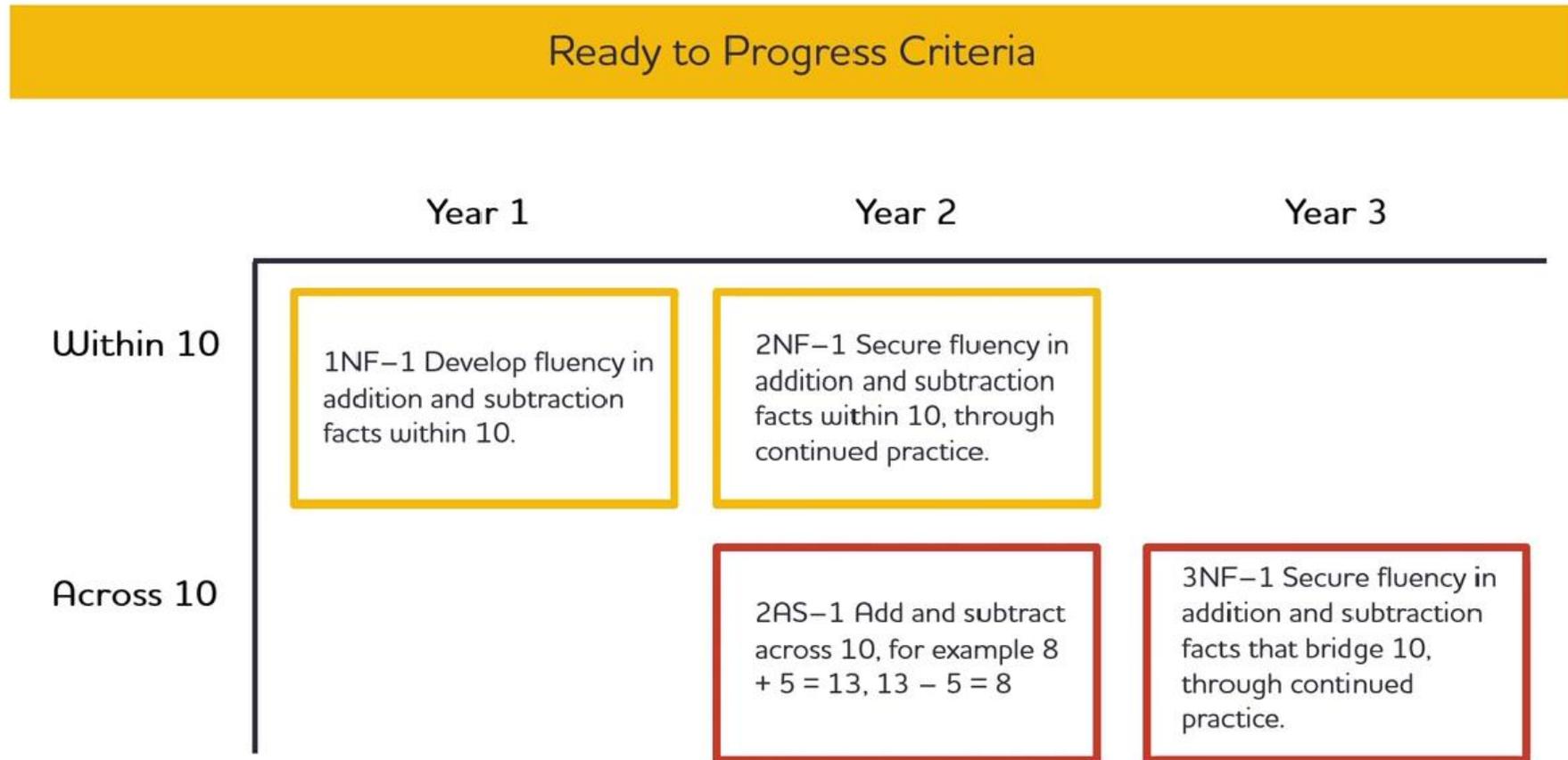


- Number Sense Fluency Scheme (Addition and Subtraction)
  - Multiplication
    - Year 2-6 Number Facts (Further)

<b>NF</b>	<p><b>1NF-1</b> Develop fluency in addition and subtraction facts within 10.</p> <p style="text-align: right;">→</p>	<p><b>2NF-1</b> Secure fluency in addition and subtraction facts within 10, through continued practice.</p> <p style="text-align: right;">→</p>	<p><b>3NF-1</b> Secure fluency in addition and subtraction facts that bridge 10, through continued practice.</p>			
	<p><b>1NF-2</b> Count forwards and backwards in multiples of 2, 5 and 10, up to 10 multiples, beginning with any multiple, and count forwards and backwards through the odd numbers.</p> <p style="text-align: right;">→</p>		<p><b>3NF-2</b> Recall multiplication facts, and corresponding division facts, in the 10, 5, 2, 4 and 8 multiplication tables, and recognise products in these multiplication tables as multiples of the corresponding number.</p> <p style="text-align: right;">→</p>	<p><b>4NF-1</b> Recall multiplication and division facts up to <math>12 \times 12</math>, and recognise products in multiplication tables as multiples of the corresponding number.</p> <p style="text-align: right;">→</p>	<p><b>5NF-1</b> Secure fluency in multiplication table facts, and corresponding division facts, through continued practice.</p>	
				<p><b>4NF-2</b> Solve division problems, with two-digit dividends and one-digit divisors, that involve remainders, and interpret remainders appropriately according to the context.</p>		
			<p><b>3NF-3</b> Apply place-value knowledge to known additive and multiplicative number facts (scaling facts by 10).</p> <p style="text-align: right;">→</p>	<p><b>4NF-3</b> Apply place-value knowledge to known additive and multiplicative number facts (scaling facts by 100)</p> <p style="text-align: right;">→</p>	<p><b>5NF-2</b> Apply place-value knowledge to known additive and multiplicative number facts (scaling facts by 1 tenth or 1 hundredth).</p>	

## Number Sense Fluency Scheme (Addition and Subtraction)

How does the scheme link with the Ready to Progress Criteria?



## How does the scheme link with White Rose Maths?

### NSM and White Rose Maths

	White Rose Maths		Number Sense Maths
Y1 Autumn	+ and - within 10	Y1 Autumn	+ and - within 10
Y1 Spring	+ and - within 20	Y1 Spring	
Y1 Summer		Y1 Summer	
Y2 Autumn		Y2 Autumn	+ and - across 10
Y2 Spring		Y2 Spring	
Y2 Summer		Y2 Summer	
		Year 3	Consolidate + and - within 20

### In summary

- Both are mastery programmes, with very similar pedagogy.
- White Rose refers to derived fact strategies through the programme.
- White Rose teaches counting on and back on a number line. NSM doesn't.
- White Rose is aligned with the suggested year groups in the National Curriculum, and therefore content is introduced earlier than in NSM. Don't try to 'match up' WRM and NSM.

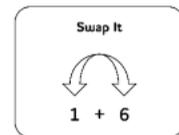
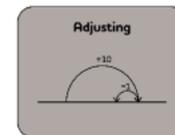
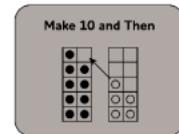
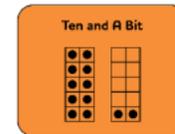
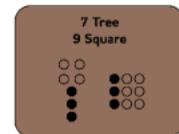
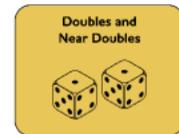
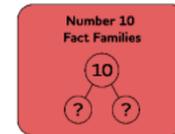
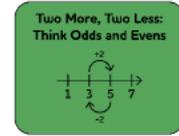
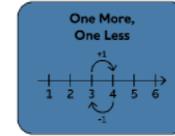
## Addition Grid Facts

+	0	1	2	3	4	5	6	7	8	9	10
0	0+0	0+1	0+2	0+3	0+4	0+5	0+6	0+7	0+8	0+9	0+10
1	1+0	1+1	1+2	1+3	1+4	1+5	1+6	1+7	1+8	1+9	1+10
2	2+0	2+1	2+2	2+3	2+4	2+5	2+6	2+7	2+8	2+9	2+10
3	3+0	3+1	3+2	3+3	3+4	3+5	3+6	3+7	3+8	3+9	3+10
4	4+0	4+1	4+2	4+3	4+4	4+5	4+6	4+7	4+8	4+9	4+10
5	5+0	5+1	5+2	5+3	5+4	5+5	5+6	5+7	5+8	5+9	5+10
6	6+0	6+1	6+2	6+3	6+4	6+5	6+6	6+7	6+8	6+9	6+10
7	7+0	7+1	7+2	7+3	7+4	7+5	7+6	7+7	7+8	7+9	7+10
8	8+0	8+1	8+2	8+3	8+4	8+5	8+6	8+7	8+8	8+9	8+10
9	9+0	9+1	9+2	9+3	9+4	9+5	9+6	9+7	9+8	9+9	9+10
10	10+0	10+1	10+2	10+3	10+4	10+5	10+6	10+7	10+8	10+9	10+10

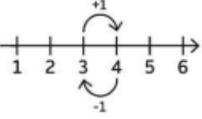
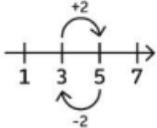
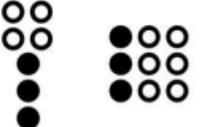
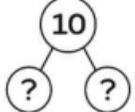
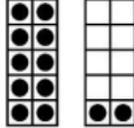
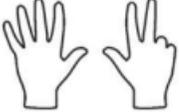
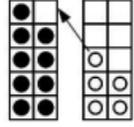
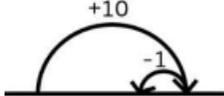
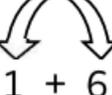
## Subtraction Grid Facts

-	0	1	2	3	4	5	6	7	8	9	10
0	0-0										
1	1-0	1-1									
2	2-0	2-1	2-2								
3	3-0	3-1	3-2	3-3							
4	4-0	4-1	4-2	4-3	4-4						
5	5-0	5-1	5-2	5-3	5-4	5-5					
6	6-0	6-1	6-2	6-3	6-4	6-5	6-6				
7	7-0	7-1	7-2	7-3	7-4	7-5	7-6	7-7			
8	8-0	8-1	8-2	8-3	8-4	8-5	8-6	8-7	8-8		
9	9-0	9-1	9-2	9-3	9-4	9-5	9-6	9-7	9-8	9-9	
10	10-0	10-1	10-2	10-3	10-4	10-5	10-6	10-7	10-8	10-9	10-10
11		11-1	11-2	11-3	11-4	11-5	11-6	11-7	11-8	11-9	11-10
12			12-2	12-3	12-4	12-5	12-6	12-7	12-8	12-9	12-10
13				13-3	13-4	13-5	13-6	13-7	13-8	13-9	13-10
14					14-4	14-5	14-6	14-7	14-8	14-9	14-10
15						15-5	15-6	15-7	15-8	15-9	15-10
16							16-6	16-7	16-8	16-9	16-10
17								17-7	17-8	17-9	17-10
18									18-8	18-9	18-10
19										19-9	19-10
20											20-10

## Calculation Strategies



## NSM Number Facts Calculation Strategies

<p><b>One More, One Less</b></p> 	<p>When we add one, we get the next counting number. When we subtract one, we get the previous counting number (e.g. <math>5 - 1 = 4</math>).</p>	<p><b>Number Neighbours: Spot the Difference</b></p> 	<p>Adjacent numbers have a difference of 1. Adjacent odds and evens have a difference of 2.</p> <p>Spot number neighbours (adjacent, odds or evens) to solve subtractions of adjacent numbers (e.g. <math>5 - 4 = 1</math>), of adjacent odds (e.g. <math>9 - 7 = 2</math>) or adjacent evens (e.g. <math>6 - 4 = 2</math>)</p>
<p><b>Two More, Two Less: Think Odds and Evens</b></p> 	<p>If we add two to a number, we go from odd to next odd or even to next even. If we subtract two from a number, we go from odd to previous odd or even to previous even.</p>	<p><b>7 Tree and 9 Square</b></p> 	<p>Use these visual images to remember addition and subtractions fact families that children can find tricky. For example, visualising the 7 tree helps remember that <math>7 - 3 = 4</math>. Visualising the 9 square helps remember that <math>3 + 6 = 9</math>.</p>
<p><b>Number 10 Fact Families</b></p> 	<p>Go beyond just recalling the pairs of numbers that add to 10. Make sure that we can also spot additions and subtractions which we can use number bonds to 10 to solve.</p>	<p><b>Ten and A Bit</b></p> 	<p>The numbers 11 – 20 are made up of 'Ten and a Bit'. Recognising and understanding the 'Ten and a Bit' structure of these numbers enables addition and subtraction facts involving their constituent parts (e.g. <math>3 + 10 = 13</math>, <math>17 - 7 = 10</math>, <math>12 - 10 = 2</math>).</p>
<p><b>Five and A Bit</b></p> 	<p>The numbers 6, 7, 8 and 9 are made up of 'five and a bit'. This can be shown on hands, and supports decomposition of these numbers into their five and a bit parts (e.g. <math>5 + 3 = 8</math>, <math>9 - 5 = 4</math>).</p>	<p><b>Make Ten and Then...</b></p> 	<p>Additions which cross the 10 boundary can be calculated by 'Making Ten' first, and then adding on the remaining amount (e.g. <math>8 + 6</math> can be calculated by thinking '<math>8 + 2 = 10</math> and 4 more makes 14'). The same strategy can be applied to subtractions through 10.</p>
<p><b>Know about 0</b></p> 	<p>When we add 0 to or subtract 0 from another number, the total remains the same. If we subtract a number from itself, the difference is 0.</p>	<p><b>Adjust It</b></p> 	<p>Any addition and subtraction can be calculated by adjusting from a fact you know already, (e.g. <math>6 + 9</math> is one less than <math>6 + 10</math>).</p>
<p><b>Doubles and Near Doubles</b></p> 	<p>Memorise doubles of numbers to 10, using a visual approach. Then use these known double facts to calculate near doubles and hidden doubles. Once we know <math>6 + 6 = 12</math> then <math>6 + 7</math> and <math>5 + 7</math> is easy.</p>	<p><b>Swap It</b></p> 	<p>When the order of two numbers being added (addends) is exchanged the total remains the same. E.g. <math>1 + 8 = 8 + 1</math>. Sometimes reversing the order of the two addends makes addition easier to think about conceptually.</p>

	Stage	Teaching Step									
1	Visual Number Foundations	Subitising 1-5	Subitising 6-10	Subitising 1-10							
2	Make and Break Numbers to 10	Make and Break 5	Make and Break 4,3&2	Make and Break 10	Make and Break 6	Make and Break 7	Make and Break 8	Make and Break 9			
3	Facts and Strategies Within 10	One More, One Less	Two More, Two Less: Think Odds and Evens	Number 10 Fact Families	Five and A Bit	Know About Zero	Doubles and Near Doubles	Number Neighbours: Spot the Difference	7 Tree and 9 Square	Strategy Selection Practice	
4	Ten and A Bit Facts and Strategy	Ten and A Bit									
5	Facts and Strategies Across 10	Make 10 and Then: Addition	Make 10 and Then: Subtraction	More Doubles and Near Doubles	Adjusting	Strategy Selection Practice					
6	Extending Facts and Strategies	Calculating with Multiples of 10	Two-Digit Numbers: Calculating with Ones	Two-Digit Numbers: Calculating with Tens	Make the Next 10 and Then	Make the Previous 10 and Then					

Stage	Year	Focus of stage
Stage 1 Visual Number Foundations	Year 1	<ul style="list-style-type: none"> <li>Building a deep and visual understanding of numbers 1-10</li> <li>Subitising quantities 1 – 5, and subitising structured arrangements for quantities 6-10</li> <li>Recognising quantities 1-10 twos-wise and fives-wise on tens frames</li> </ul>
Assessment check point		
Stage 2 Make and Break Numbers to 10		<ul style="list-style-type: none"> <li>Exploring the different ways that every number to 10 can be broken into parts and put back together</li> <li>Starting to remember some facts</li> <li>Introducing addition and subtraction equations</li> </ul>
Stage 3 Facts and Strategies within 10		<ul style="list-style-type: none"> <li>Learning calculation strategies for adding and subtracting within 10</li> <li>Learning to use what you know to work out what you don't yet know</li> <li>Achieving fluency in addition and subtraction facts within 10</li> </ul>
Assessment check point		
Stage 4 Ten and A Bit	Year 2	<ul style="list-style-type: none"> <li>Building a deep and visual understanding of the numbers and quantities 11 to 20</li> <li>Understanding the concept of place value</li> <li>Learning the Ten and a Bit calculation strategy</li> </ul>
Assessment check point		
Stage 5 Facts and Strategies across 10		<ul style="list-style-type: none"> <li>Learning the remaining calculation strategies</li> <li>Practicing strategy selection to promote efficient and flexible thinking</li> <li>Achieving fluency in addition and subtraction facts across 10</li> </ul>
Assessment check point		
Stage 6 Extending Facts and Strategies		<ul style="list-style-type: none"> <li>Learning to extend and apply key facts and strategies to addition and subtraction calculations involving 2-digit numbers</li> </ul>

\*See specific year group plans for further break down of progression in facts.

## Multiplication

- White Rose Maths
- Times Table Rockstars

The full set of multiplication calculations that pupils need to be able to solve by automatic recall are shown in the table below. Pupils must also have automatic recall of the corresponding division facts.

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

Pupils must be fluent in these facts by the end of year 4, and this is assessed in the multiplication tables check. Pupils should continue with regular practice through year 5 to secure and maintain fluency.

The 36 most important facts are highlighted in the table. Fluency in these facts should be prioritised because, when coupled with an understanding of commutativity and fluency in the formal written method for multiplication, they enable pupils to multiply any pair of numbers.

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# Year 2-6 Number Facts (Further)

## Number Facts: Year 2

**\*see progression within Number Sense Maths Fluency for further number facts related to Year 2**

### Number Facts: Measure

- 100p = £1      50p+50p= £1
- 100 cm = 1metre
- One hour = 60 minutes
- $\frac{1}{2}$  an hour = 30 minutes
- $\frac{1}{4}$  of an hour = 15 minutes
- $\frac{3}{4}$  of an hour = 45 minutes
- There are 24 hours in a day
- Recite the months of the year in the correct order

### Number Facts: Fractions

- $\frac{1}{3} + \frac{1}{3} + \frac{1}{3} = 1$  whole
- $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{3}{4}$
- 1 whole  $-\frac{1}{4} = \frac{3}{4}$
- $\frac{2}{4} = \frac{1}{2}$
- Halve all even numbers to 20

## Number Facts: Year 3

### Number and place value

Pupils should be taught to:

- count from 0 in multiples of 4, 8, 50 and 100
- find 10 or 100 more or less than a given number up to 1000

### Addition and subtraction

Pupils should be taught to:

- derive complements to 100
- add and subtract numbers mentally, including:
  - a three-digit number and ones
  - a three-digit number and tens
  - a three-digit number and hundreds

### Multiplication and division

Pupils should be taught to:

- recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods

### Fractions

Pupils should be taught to:

- count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10
- recognise and show, using diagrams, equivalent fractions with small denominators
- add and subtract fractions with the same denominator within one whole (e.g.  $\frac{5}{7} + \frac{1}{7} = \frac{6}{7}$ )

### Measurement

Pupils should be taught to:

- measure, compare, add and subtract lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml)
- know the number of seconds in a minute and the number of days in each month, year, and leap year

#### Number Facts: Number and place value

- Know the sequence of counting in 50's.
- Know the sequence of counting in 100's

#### Number Facts: Measure

- 60 seconds = 1 minute
- How many days in each month / year / leap year.
- Find complements to 60.
- 50p x 2 = £1.00    £50 x 2 = £100
- 25p x 4 = £1.00    £25 x 4 = £100
- 20p x 5 = £1.00    £20 x 5 = £100
- 1000 g = 1kg    1000ml = 1l
- 1000 m = 1km
- 1000 ÷ 2 = 500    1000 ÷ 4 = 250
- $\frac{1}{2}$  l/kg/km = 500
- $\frac{1}{4}$  l/kg/km = 250
- $\frac{3}{4}$  l/kg/km = 750

#### Number Facts: Fractions

- $\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{5}{10}$
- $\frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} = \frac{5}{5} = 1$  whole
- $\frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} = \frac{6}{6} = 1$  whole
- $\frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{1}{7} = \frac{7}{7} = 1$  whole
- $\frac{1}{8} + \frac{1}{8} = \frac{8}{8} = 1$  whole
- $\frac{1}{9} + \frac{1}{9} = \frac{9}{9} = 1$  whole
- $\frac{1}{10} + \frac{1}{10} = \frac{10}{10} = 1$  whole
- Understand fraction facts related to whole number facts
- $1 + 5 = 6$  (Year 1) linked to  $\frac{1}{6} + \frac{5}{6} = \frac{6}{6} = 1$  (Year 3)

#### Number facts: Addition and subtraction

- Know or derive all the complements to 100  
 $x + y = 100$  ;  $x = ?$  and  $y = ?$
- Know pairs of multiples of 100 that total 1000  
 $1 + 9 = 10$  (Year 1)  
 $10 + 90 = 100$  (Year 2)  
 $100 + 900 = 1000$  (Year 3)
- Add and subtract numbers with up to 3 digits (e.g.  $253 + 75 = 328$ )

#### Number Facts: Multiplication and division

- Know the 3x, 4x and 8x table and the related division facts
- Understand that doubling means x 2
- Understand that halving means ÷ 2
- Know that...  
 $50 \times 2 = 100$  ;  $25 \times 4 = 100$  ;  $20 \times 5 = 100$

## Number Facts: Year 4

### Number and place value

Pupils should be taught to:

- count from 0 in multiples of 6, 7, 9, 25 and 1000
- find 100 or 1000 more or less than a given number up to 10,000

### Addition and subtraction

Pupils should be taught to:

- order and compare numbers beyond 1000
- add and subtract numbers with up to 4 digits

### Multiplication and division

Pupils should be taught to:

- recall and use multiplication and division facts for multiplication tables up to 12 x 12
- multiply two-digit and three-digit numbers by a one-digit number

### Fractions

Pupils should be taught to:

- count up and down in hundredths; recognise that hundredths arise from dividing an object into 100 equal parts and in dividing tenths by 10
- recognise and write decimal equivalents of  $\frac{1}{4}$ ,  $\frac{1}{2}$  and  $\frac{3}{4}$

### Measurement

Pupils should be taught to:

- convert between different units of measure (e.g. kilometres to metres, hours to minutes)

#### Number Facts: Number and place value

- Know the sequence of counting in multiples of 25.

#### Number Facts: Measure

- £5.00 x 2 = £10.00  
£50 x 2 = £100  
£500 x 2 = £1000  
£2.50 x 4 = £10.00  
£25 x 4 = £100  
£250 x 4 = £1000  
£2.00 x 5 = £10.00  
£20 x 5 = £100  
£200 x 5 = £1000
- $10\text{cm} = \frac{1}{10}\text{m}$        $1\text{cm} = \frac{1}{100}\text{m}$
- $100\text{g} = \frac{1}{10}\text{kg}$   
 $1.1\text{kg} = 1\text{kg}$     $100\text{g} = 1\text{kg} + \frac{1}{10}\text{kg}$
- 48 hours = 2 days  
120 minutes = 2 hours  
90 minutes =  $1\frac{1}{2}$  hours

#### Number Facts: Fractions

- $100 \div 10 = 10$        $1000 \div 10 = 100$   
 $10 \div 10 = 1$        $1 \div 10 = \frac{1}{10}$
- $1 \div 10 = \frac{1}{10} = 0.1$        $2 \div 10 = \frac{2}{10} = 0.2$
- $3 \div 10 = \frac{3}{10} = 0.3$        $4 \div 10 = \frac{4}{10} = 0.4$
- $5 \div 10 = \frac{5}{10} = 0.5$        $6 \div 10 = \frac{6}{10} = 0.6$
- $7 \div 10 = \frac{7}{10} = 0.7$        $8 \div 10 = \frac{8}{10} = 0.8$
- $9 \div 10 = \frac{9}{10} = 0.9$        $10 \div 10 = \frac{10}{10} = 1.0$
- $\frac{1}{4} = 0.25$        $\frac{1}{2} = 0.5$
- $\frac{3}{4} = 0.75$

#### Number facts: Addition and subtraction

- Know or derive all the complements to 10,000 using multiples of 1000 and related subtraction facts  
 $x + y = 10,000$  ;  $x = ?$  and  $y = ?$   
  
 $1 + 9 = 10$  (Year 1)  
 $10 + 90 = 100$  (Year 2)  
 $100 + 900 = 1000$  (Year 3)  
 $1000 + 9000 = 10,000$  (Year 4)
- Mentally add and subtract numbers with up to 2 digits reliably

#### Number Facts: Multiplication and division

- Know the 6x, 7x, 9x, 11x, and 12x tables and the related division facts
- Know that...  
 $500 \times 2 = 1000$        $1000 \div 2 = 500$   
 $250 \times 4 = 1000$        $1000 \div 4 = 250$   
 $200 \times 5 = 1000$        $1000 \div 5 = 200$

## Number Facts: Year 5

### Addition and subtraction

#### Multiplication and division

Pupils should be taught to:

- add and subtract with more than four digits and with decimals (informal and formal methods)
- recall prime numbers to 19
- multiply and divide mentally using known facts
- multiply and divide whole and decimal numbers by 10, 100 and 1000
- recognise and use square numbers

### Fractions, decimals and percentages

Pupils should be taught to:

- read and write decimal numbers as fractions (e.g.  $0.8 = \frac{8}{10}$ )
- recognise and use thousandths, relating them to tenths, hundredths, and decimal equivalents
- recognise the per cent symbol (%) and know that per cent relate to the number of parts per hundred
- write percentages as a fractions with a denominator of 100 and as a decimal fraction (e.g.  $0.71 = \frac{71}{100} = 71\%$ )

### Measurement

Pupils should be taught to:

- convert between different units of metric measure such as kilometre to metre, centimetre to metre, centimetre and millimetre, gram and kilogram, litre and millilitre
- know and use equivalences between metric units and common imperial units such as inches, pounds and pints

### Geometry

Pupils should be taught to:

- identify angles at a point (one whole turn) as  $360^\circ$
- identify angles at a point on a straight line (half a turn) as  $180^\circ$
- identify angles in a right angle (quarter of a turn) as  $90^\circ$
- recognise multiples of  $90^\circ$
- know the sum of the angles in any triangle is  $180^\circ$
- know the sum of the angles in any quadrilateral is  $360^\circ$

### Number facts: Addition and subtraction; multiplication and division

- Derive new facts from known facts:

For example:

$12 \times 5 = 60$	$60 \div 5 = 12$
$5.2 \times 5 = 6.0$	$6 \div 5 = 1.2$
$5 \times 7 = 35$	$5 \times 0.7 = 3.5$
$5 \times 0.07 = 0.35$	

- Square numbers:  
1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144
- Prime numbers:  
2, 3, 5, 7, 11, 13, 17, 19
- Associated facts  
 $10,000 = 9500 + 500$   
 $10,000 = 5000 + 5000$   
 $10,000 = 2500 + 2500 + 2500 + 2500$   
 $10,000 \div 2 = 5000$   
 $10,000 \div 4 = 2500$   
 $10,000 \div 5 = 2000$   
 $10,000 \div 10 = 1000$   
 $10,000 \div 100 = 100$

### Number Facts: Fractions

- $1 \div 100 = \frac{1}{100} = 0.01$        $2 \div 100 = \frac{2}{100} = 0.02$
- $3 \div 100 = \frac{3}{100} = 0.03$        $4 \div 100 = \frac{4}{100} = 0.04$
- $5 \div 100 = \frac{5}{100} = 0.05$        $6 \div 100 = \frac{6}{100} = 0.06$
- $7 \div 100 = \frac{7}{100} = 0.07$        $8 \div 100 = \frac{8}{100} = 0.08$
- $9 \div 100 = \frac{9}{100} = 0.09$        $10 \div 100 = \frac{10}{100} = \frac{1}{10} = 0.1$
- $10\% = 0.1 = \frac{1}{10} = \frac{10}{100} = \frac{100}{1000}$
- $50\% = 0.5 = \frac{1}{2} = \frac{5}{10} = \frac{50}{100}$
- $25\% = 0.25 = \frac{1}{4} = \frac{25}{100}$
- $75\% = 0.75 = \frac{3}{4} = \frac{75}{100}$
- $20\% = 0.2 = \frac{1}{5} = \frac{2}{10} = \frac{20}{100}$
- $40\% = 0.4 = \frac{2}{5} = \frac{4}{10} = \frac{40}{100}$

### Number Facts: Measure

- $1\text{mm} = \frac{1}{10}\text{cm}$
- $1\text{mm} = \frac{1}{1000}\text{m}$
- $1\text{kg} \approx 2.2\text{lbs}$
- $1\text{L} \approx 1.76\text{pints}$
- $1\text{m} \approx 39.4\text{inches}$
- $1\text{cm} \approx 2.54\text{inches}$

$\approx$  means 'approximately equal to'

### Number Facts: Geometry

- $360 \div 4 = 90$        $\frac{1}{4}$  of  $360 = 90$
- $360 \div 2 = 180$        $\frac{1}{2}$  of  $360 = 180$
- $\frac{3}{4}$  of  $360 = 270$
- complements such as  
 $70 + 110 = 180$   
 $95 + 85 = 180$
- multiples:  $90, 180, 270, 360, 450, 540$

## Number Facts: Year 6

### Ratio and proportion

Pupils should be taught to:

- solve problems involving the calculation of percentages of quantities such as 15% of 360 and then use their solutions for comparison
- represent fractions sums such as  $\frac{1}{4} + \frac{3}{4}$  in ratio form (a:b) as 1:3
- simplify ratios such as 2:6 to their simplest form (1:3 in this case) using common factors

### Fractions, decimals, and percentages

Pupils should be taught to:

- associate a fraction with division and calculate decimal fraction equivalents for a vulgar fraction (e.g.  $0.375 = \frac{3}{8}$ )
- recall and use equivalences between vulgar fractions, decimals, and percentages
- use common factors to simplify fractions
- add and subtract fractions with different denominators and mixed numbers
- multiply simple pair of proper fractions
- multiply one-digit numbers with up to two decimal places by whole numbers (e.g.  $1.37 \times 5$ )
- divide numbers where the quotient has up to two decimal places (e.g.  $145 \div 4 = 3.75$ )

### Measurement

Pupils should be taught to:

- convert between common imperial and metric units of measure. (e.g. miles and kilometres)
- recognise when it is possible to use formulae for the area and volume of shapes.
- know and use formulae for the area of a triangle, the area of a rectangle, the area of a parallelogram, the volume of a cuboid and the diameter of a circle (diameter = 2 x radius)

### Geometry

Pupils should be taught to:

- illustrate and name parts of circles, including the radius, diameter, and circumference.
- know and use the relationship between the diameter and the radius (diameter = 2 x radius)
- know that vertically opposite angles are equal and use this to calculate missing angles around a point

### Number facts: Ratio and proportion

- Derive new % facts from known facts:  
For example:  
1% doubled will give 2% of a quantity  
10% halved will give 5% of a quantity  
100% is the whole amount, so twice as much is the same as 200%
- Fluency with multiplication and division facts up to 12 x 12 and derive others beyond known facts.
- For example:  
24 : 48 simplifies to 1:2 with a common factor of 24  
(24 x 1 and 24 x 2)

### Number Facts: Fractions

- $12.5\% = 0.125 = \frac{1}{8}$        $25\% = 0.25 = \frac{2}{8} = \frac{1}{4}$
- $37.5\% = 0.375 = \frac{3}{8}$        $50\% = 0.5 = \frac{4}{8} = \frac{1}{2}$
- $62.5\% = 0.625 = \frac{5}{8}$        $75\% = 0.75 = \frac{6}{8} = \frac{3}{4}$
- $82.5\% = 0.825 = \frac{7}{8}$        $100\% = 1.0 = \frac{8}{8}$
- $112.5\% = 1.125 = \frac{9}{8}$        $125\% = 1.25 = \frac{10}{8}$
- $33.\dot{3}\% = 0.333\dots = \frac{1}{3}$
- $66.\dot{6}\% = 0.666\dots = \frac{2}{3}$
- $100\% = 1.0 = \frac{3}{3}$
- $133.\dot{3}\% = 1.333\dots = \frac{4}{3}$
- $266.\dot{6}\% = 2.666\dots = \frac{8}{3}$

$0.\dot{3} = 0.333333\dots$  a recurring decimal continually repeats and does not terminate

### Number Facts: Measure

- $1 \text{ km} \approx \frac{5}{8} \text{ mile}$
- $1 \text{ mile} \approx \frac{8}{5} \text{ km}$  (or 1.6 km)
- Area of a triangle =  $\frac{1}{2} \times \text{base} \times \text{height}$
- Area of a rectangle = length x width
- Area of a parallelogram = length x perpendicular height
- Volume of a cuboid = length x width x height

$\approx$  means 'approximately equal to'

### Number Facts: Geometry

- Diameter = 2 x radius
- Radius =  $\frac{1}{2}$  x diameter