National Centre for Excellence in the Teaching of Mathematics

Number: Fractions (including Decimals and Percentages) Reasoning

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
COUNTING IN FRACTIONAL STEPS					
	Pupils should count in fractions up to 10, starting from any number and using the1/2 and 2/4 equivalence on the number line (Non Statutory Guidance)	count up and down in tenths	count up and down in hundredths		
	Spot the mistake 7, 7 ½ , 8, 9, 10 8 ½, 8, 7, 6 ½, … and correct it **What comes next?** 5 ½, 6 ½ , 7 ½ , …., …. 9 ½, 9, 8 ½, ……, …..	**Spot the mistake** six tenths, seven tenths, eight tenths, nine tenths, eleven tenths … and correct it. **What comes next?** 6/10, 7/10, 8/10, ….., …. 12/10, 11/10, ….., ….., …..	**Spot the mistake** sixty tenths, seventy tenths, eighty tenths, ninety tenths, twenty tenths … and correct it. **What comes next?** 83/100, 82/100, 81/100, ….., ….., ….. 31/100, 41/100, 51/100, ….., …..,	**Spot the mistake** 0.088, 0.089, 1.0 **What comes next?** 1.173, 1.183, 1.193	**Spot the mistake** Identify and explain mistakes when counting in more complex fractional steps

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RECOGNISING FRACTIONS					
recognise, find and name a half as one of two equal parts of an object, shape or quantity	recognise, find, name and write fractions $^{1}/_{3}$, $^{1}/_{4}$, $^{2}/_{4}$ and $^{3}/_{4}$ of a length, shape, set of objects or quantity	recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators recognise that tenths arise from dividing an object into 10 equal parts and in dividing one – digit numbers or quantities by 10.	recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten	recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents (appears also in Equivalence)	
What do you notice? Choose a number of counters. Place them onto 2 plates so that there is the same number on each half. When can you do this and when can't you? What do you notice?	**What do you notice?** ¼ of 4 = 1 ¼ of 8 = 2 ¼ of 12 = 3 Continue the pattern What do you notice?	**What do you notice?** 1/10 of 10 = 1 2/10 of 10 = 2 3/10 of 10 = 3 Continue the pattern. What do you notice? What about 1/10 of 20? Use this to work out 2/10 of 20, etc.	**What do you notice?** 1/10 of 100 = 10 1/100 of 100 = 1 2/10 of 100 = 20 2/100 of 100 = 2 How can you use this to work out 6/10 of 200? 6/100 of 200?	**What do you notice?** One tenth of £41 One hundredth of £41 One thousandth of £41 Continue the pattern What do you notice? 0.085 + 0.015 = 0.1 0.075 + 0.025 = 0.1 0.065 + 0.035 = 0.1 Continue the pattern for the next five number sentences.	**What do you notice?** One thousandth of my money is 31p. How much do I have?

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recognise, find and name a quarter as one of four equal parts of an object, shape or quantity		recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators			
True or false? Sharing 8 apples between 4 children means each child has 1 apple.	**True or false?** Half of 20cm = 5cm ¾ of 12cm = 9cm	**True or false?** 2/10 of 20cm = 2cm 4/10 of 40cm = 4cm 3/5 of 20cm = 12cm	**True or false?** 1/20 of a metre= 20cm 4/100 of 2 metres = 40cm	**True or false?** 0.1 of a kilometre is 1m. 0.2 of 2 kilometres is 2m. 0.3 of 3 Kilometres is 3m 0.25 of 3m is 500cm. 2/5 of £2 is 20p	**True or false?** 25% of 23km is longer than 0.2 of 20km. Convince me.

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COMPARING FRACTIONS					
		compare and order unit fractions, and fractions with the same denominators		compare and order fractions whose denominators are all multiples of the same number	compare and order fractions, including fractions >1
		Give an example of a fraction that is less than a half. Now another example that no one else will think of. Explain how you know the fraction is less than a half. (draw an image) Ben put these fractions in order starting with the smallest. Are they in the correct order? One fifth, one seventh, one sixth	Give an example of a fraction that is more than a half but less than a whole. Now another example that no one else will think of. Explain how you know the fraction is more than a half but less than a whole. (draw an image)	Give an example of a fraction that is more than three quarters. Now another example that no one else will think of. Explain how you know the fraction is more than three quarters. Imran put these fractions in order starting with the smallest. Are they in the correct order? Two fifths, three tenths, four twentieths How do you know?	Give an example of a **fraction** that is greater than 1.1 and less than 1.5. Now another example that no one will think of. Explain how you know. Sam put these fractions in order starting with the smallest. Are they in the correct order? Thirty three fifths Twenty three thirds Forty five sevenths How do you know?

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COMPARING DECIMALS					
			compare numbers with the same number of decimal places up to two decimal places	read, write, order and compare numbers with up to three decimal places	identify the value of each digit in numbers given to three decimal places
			Missing symbol Put the correct symbol < or > in each box 3.03 ☐ 3.33 0.37 ☐ 0.32 What needs to be added to 3.23 to give 3.53? What needs to be added to 3.16 to give 3.2?	**Missing symbol** Put the correct symbol < or > in each box 4.627 ☐ 4.06 12.317 ☐ 12.31 What needs tobe added to 3.63 to give 3.13? What needs to be added to 4.652 to give 4.1?	**True or false?** In all of the numbers below, the digit 6 is worth <u>more than</u> 6 hundredths. 3.6 3.063 3.006 6.23 7.761 3.076 Is this true or false? Change some numbers so that it is true. What needs tobe adde3d to 6.543 to give 7? What needs to be added to 3.582 to give 5? Circle the two decimals which are closest in value to each other. 0.9 0.09 0.99 0.1 0.01

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ROUNDING INCLUDING DECIMALS					
			round decimals with one decimal place to the nearest whole number	round decimals with two decimal places to the nearest whole number and to one decimal place	solve problems which require answers to be rounded to specified degrees of accuracy
			Do, then explain Circle each decimal which when rounded to the nearest whole number is 5. 5.3 5.7 5.2 5.8 Explain your reasoning **Top tips** Explain how to round numbers to one decimal place? *Also see rounding in place value*	**Do, then explain** Circle each decimal which when rounded to one decimal place is 6.2. 6.32 6.23 6.27 6.17 Explain your reasoning **Top tips** Explain how to round decimal numbers to one decimal place? *Also see rounding in place value*	**Do, then explain** Write the answer of each calculation rounded to the nearest whole number 75.7 × 59 7734 ÷ 60 772.4 × 9.7 20.34 × (7.9 – 5.4) **What's the same, what's different?** … when you round numbers to one decimal place and two decimal places? *Also see rounding in place value*

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EQUIVALENCE (INCLUDING FRACTIONS, DECIMALS AND PERCENTAGES)					
	write simple fractions e.g. $^1/_2$ of 6 = 3 and recognise the equivalence of $^2/_4$ and $^1/_2$.	recognise and show, using diagrams, equivalent fractions with small denominators	recognise and show, using diagrams, families of common equivalent fractions	identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths	use common factors to simplify fractions; use common multiples to express fractions in the same denomination
	Odd one out. Which is the odd one out in this trio: ½ 2/4 ¼ Why? **What do you notice?** Find ½ of 8. Find 2/4 of 8 What do you notice?	**Odd one out**. Which is the odd one out in each of these trios ½ 3/6 5/8 3/9 2/6 4/9 Why? **What do you notice?** Find 2/5 of 10 Find 4/10 of 10. What do you notice? Can you write any other similar statements?	**Odd one out.** Which is the odd one out in each of these trio s¾ 9/12 4/6 9/12 10/15 2/3 Why? **What do you notice?** Find 4/6 of 24 Find 2/3 of 24 What do you notice? Can you write any other similar statements?	**Odd one out.** Which is the odd one out in each of these collections of 4 fractions 6/10 3/5 18/20 9/15 30/100 3/10 6/20 3/9 Why? **What do you notice?** Find 30/100 of 200 Find 3/10 of 200 What do you notice? Can you write any other similar statements?	**Odd one out**. Which is the odd one out in each of these collections of 4 fraction s¾ 9/12 26/36 18/24 4/20 1/5 6/25 6/30 Why? **What do you notice?** 8/5 of 25 = 40 5/4 of 16 = 20 7/6 of 36 - 42 Can you write similar statements?
			recognise and write decimal equivalents of any number of tenths or hundredths	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	associate a fraction with division and calculate decimal fraction equivalents (e.g. 0.375) for a simple fraction (e.g. $^3/_8$)

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<table>
<tr>
<td></td>
<td></td>
<td></td>
<td>Complete the pattern by filling in the blank cells in this table:
<table>
<tr><td>$\frac{1}{10}$</td><td>$\frac{2}{10}$</td><td>$\frac{3}{10}$</td><td></td></tr>
<tr><td>$\frac{10}{100}$</td><td>$\frac{20}{100}$</td><td></td><td>$\frac{40}{100}$</td></tr>
<tr><td>0.1</td><td></td><td>0.3</td><td></td></tr>
</table>
Another and another
Write a decimal numbers (to one decimal place) which lies between a half and three quarters?
… and another, … and another, …</td>
<td>Complete the pattern
<table>
<tr><td>$\frac{71}{100}$</td><td>$\frac{??}{100}$</td><td>$\frac{??}{100}$</td><td>$\frac{??}{100}$</td></tr>
<tr><td>0.71</td><td>0.81</td><td>???</td><td>???</td></tr>
</table>
Complete the table.

Another and another
Write a fraction with a denominator of one hundred which has a value of more than 0.75?
… and another, … and another, …</td>
<td>Complete the pattern
<table>
<tr><td>$\frac{1}{8}$</td><td>$\frac{2}{8}$</td><td>$\frac{3}{8}$</td><td>$\frac{4}{8}$</td></tr>
<tr><td>0.375</td><td>???</td><td>???</td><td>???</td></tr>
</table>
Complete the table.

Another and another
Write a unit fraction which has a value of less than 0.5?
… and another, … and another, …</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>recognise and write decimal equivalents to $^1/_4$; $^1/_2$; $^3/_4$</td>
<td>recognise the per cent symbol (%) and understand that per cent relates to “number of parts per hundred”, and write percentages as a fraction with denominator 100 as a decimal fraction</td>
<td>recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.</td>
</tr>
<tr>
<td></td>
<td>Ordering

Put these fractions in the correct order, starting with the smallest.
½ ¼ 1/3</td>
<td>Ordering

Put these fractions in the correct order, starting with the smallest.
4/8 ¾ 1/4</td>
<td>Ordering
Put these numbers in the correct order, starting with the smallest.
¼ 0.75 5/10
Explain your thinking</td>
<td>Ordering

Put these numbers in the correct order, starting with the largest.
7/10, 0.73, 7/100, 0.073
71%</td>
<td>Ordering

Which is larger, $^1/_3$ or $^2/_5$?
Explain how you know.

Put the following amounts in order,</td>
</tr>
</table>

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				Explain your thinking Which is more: 20% of 200 or 25% of 180? Explain your reasoning.	starting with the largest. 23%, 5/8, 3/5, 0.8
ADDITION AND SUBTRACTION OF FRACTIONS					
		add and subtract fractions with the same denominator within one whole (e.g. $^{5}/_{7} + {}^{1}/_{7} = {}^{6}/_{7}$)	add and subtract fractions with the same denominator	add and subtract fractions with the same denominator and multiples of the same number recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number (e.g. $^{2}/_{5} + {}^{4}/_{5} = {}^{6}/_{5} = 1\,{}^{1}/_{5}$)	add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions
		What do you notice? 1/10 + 9/10 = 1 2/10 + 8/10 = 1 3/10 + 7/10 = 1	**What do you notice?** 5/5 – 1/5 = 4/5 4/5 – 1/5 = 3/5	**What do you notice?** ¾ and ¼ = 4/4 = 1 4/4 and ¼ = 5/4 = 1 ¼ 5/4 and ¼ = 6/4 = 1 ½	**Another and another** Write down two fractions which have a difference of 1 2/… and another, … and another, …

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		Continue the pattern Can you make up a similar pattern for eighths? The answer is 5/10, what is the question? (involving fractions / operations)	**Continue the pattern** Can you make up a similar pattern for addition? The answer is 3/5, what is the question? What do you notice? 11/100 + 89/100 = 1 12/100 + 88/100 = 1 13/100 + 87/100 = 1 Continue the pattern for the next five number sentences	Continue the pattern up to the total of 2. Can you make up a similar pattern for subtraction? The answer is 1 2/5 , what is the question	**Another and another** Write down 2 fractionswith a total of 3 4/5. … and another, … and another, …
MULTIPLICATION AND DIVISION OF FRACTIONS					
				multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams	multiply simple pairs of proper fractions, writing the answer in its simplest form (e.g. $^1/_4 \times {}^1/_2 = {}^1/_8$)
					multiply one-digit numbers with up to two decimal places by whole numbers
					divide proper fractions by whole numbers (e.g. $^1/_3 \div 2 = {}^1/_6$)

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				Continue the pattern ¼ x 3 = ¼ x 4 = ¼ x 5 = Continue the pattern for five more number sentences. How many steps will it take to get to 3? 5/3 of 24 = 40 Write a similar sentence where the answer is 56. The answer is 2 ¼ , what is the question Give your top tips for multiplying fractions.	**Continue the pattern** 1/3 ÷ 2 = 1/6 1/6 ÷ 2 = 1/12 1/12 ÷ 2 = 1/24 What do you notice? ½ x ¼ = The answer is 1/8 , what is the question (involving fractions / operations) Give your top tips for dividing fractions.
MULTIPLICATION AND DIVISION OF DECIMALS					
					multiply one-digit numbers with up to two decimal places by whole numbers
			find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths		multiply and divide numbers by 10, 100 and 1000 where the answers are up to three decimal places
					identify the value of each digit to three decimal

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					places and multiply and divide numbers by 10, 100 and 1000 where the answers are up to three decimal places
					associate a fraction with division and calculate decimal fraction equivalents (e.g. 0.375) for a simple fraction (e.g. $^{3}/_{8}$)
					use written division methods in cases where the answer has up to two decimal places
			Undoing I divide a number by 100 and the answer is 0.3. What number did I start with? **Another and another** Write down a number with one decimal place which when multiplied by 10 gives an answer between 120 and 130. ... and another, … and another, …	**Undoing** I divide a number by 100 and the answer is 0.33 What number did I start with? **Another and another** Write down a number with two decimal places which when multiplied by 100 gives an answer between 33 and 38. ... and another, … and another, …	**Undoing** I multiply a number with three decimal places by a multiple of 10. The answer is approximately 3.21 What was my number and what did I multiply buy? When I divide a number by 1000 the resulting number has the digit 6 in the units and tenths and the other digits are 3 and 2 in the tens and

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					hundreds columns. What could my number have been?
PROBLEM SOLVING					
		solve problems that involve all of the above	solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number	solve problems involving numbers up to three decimal places	
			solve simple measure and money problems involving fractions and decimals to two decimal places.	solve problems which require knowing percentage 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.	