# Year 6 Maths

| Counting | |
|---|---|
| Objectives | use negative numbers in context, and calculate intervals across zero |
| Reasoning | **Spot the mistake**:<br>-80,-40,10,50<br>What is wrong with this sequence of numbers? |
| | **True or False?**<br>When I count backwards in 50s from 10 I will say<br>-200 |
| | **True or False?**<br>The temperature is -3. It gets 2 degrees warmer. The new temperature is -5? |
| Vocabulary | integer |
| Resources / models | Empty number lines (if required) |

| Comparing numbers | |
|---|---|
| Objectives | read, write, order and compare numbers up to<br>10 000 000 and determine the value of each digit (appears also in Reading and Writing Numbers) |
| Reasoning | **Do, then explain**<br>Find out the populations in five countries.<br>Order the populations starting with the largest. Explain how you ordered the countries and their populations. |
| Vocabulary | Inequality<br>integer |

| **READING AND WRITING NUMBERS**<br>(including Roman Numerals) | |
|---|---|
| Objectives | read, write, order and compare numbers up to<br>10 000 000 and determine the value of each digit<br>(appears also in Understanding Place Value) |

| **UNDERSTANDING PLACE VALUE** | |
|---|---|
| Objectives | read, write, order and compare numbers up to<br>10 000 000 and determine the value of each digit (appears also in Reading and Writing Numbers) |

| | |
|---|---|
| | *identify the value of each digit to three decimal places and multiply and divide numbers by 10, 100 and 1000 where the answers are up to three decimal places* (copied from Fractions) |
| Reasoning | **Do, then explain**<br>Show the value of the digit 6 in these numbers?<br>6787555 95467754<br>Explain how you know. |
| | **Make up an example** Create seven digit numbers where the digit sum is six and the tens of thousands digit is two.<br>Eg 4020000<br>What is the largest/smallest number? |

| **ROUNDING** | |
|---|---|
| Objectives | round any whole number to a required degree of accuracy |
| | *solve problems which require answers to be rounded to specified degrees of accuracy* (copied from Fractions) |
| Reasoning | **Possible answers**<br>Two numbers each with two decimal places round to 23.1 to one decimal place. The total of the numbers is 46.2. What could the numbers be? |
| | **What do you notice?**<br>Give an example of a six digit number which rounds to the same number when rounded to the nearest 10000 and 100000 |
| Objective – Problem Solving | solve number and practical problems that involve all of the above |

| **Addition and Subtraction** | |
|---|---|
| Objectives – Mental Calculation | perform mental calculations, including with mixed operations and large numbers |
| | use their knowledge of the order of operations to carry out calculations involving the four operations |
| Reasoning | **True or false?**<br>Are these number sentences true or false?<br>6.32 + □ = 8<br>□ = 1.68<br><br>Give your reasons. |

| | |
|---|---|
| | **Hard and easy questions**<br>Which questions are easy / hard?<br><br>213323 - 70 =<br>512893 + 37 =<br>8193.54 - 5.9 =<br>Explain why you think the hard questions are hard? |
| | **Missing symbols**<br>Write the missing signs<br>( + - x ÷) in this number sentence:<br><br>6 ○ 12.3 = 61.9 ○ 11.9 |
| | **What else do you know?**<br>If you know this:<br>86.7 + 13.3 = 100<br>what other facts do you know? |
| Vocabulary | |
| Resources/ models | |
| Objectives - **WRITTEN METHODS** | |
| Reasoning | **Convince me**<br>Three four digit numbers total 12435.<br>What could they be?<br>Convince me |
| Vocabulary - addition | add, more, plus, and, make, altogether, total, equal to,, equals, double, most, count on, number line, sum, tens, ones, partition, addition, column ,tens boundary, hundreds boundary, increase, vertical, 'carry', expanded, compact, thousands, hundreds, digits, inverse<br>decimal places, decimal point, tenths, hundredths, thousandths |
| Resources / models | |

<table>
<tr>
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<table>
<tr><td></td><td>2</td><td>0</td><td>5</td><td>5</td><td>1</td></tr>
<tr><td></td><td>8</td><td>1</td><td>0</td><td>5</td><td>9</td></tr>
<tr><td></td><td></td><td>3</td><td>6</td><td>6</td><td>8</td></tr>
<tr><td>+</td><td>1</td><td>5</td><td>3</td><td>0</td><td>1</td></tr>
<tr><td>1</td><td>2</td><td>0</td><td>5</td><td>7</td><td>9</td></tr>
<tr><td></td><td>1</td><td>1</td><td>1</td><td>1</td><td></td></tr>
</table>
</td>
<td>When the children show a good understanding of number they will move on to the compact column method with carrying. The carried over number is written below the line. Also they can add a different number of digits together.</td>
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<table>
<tr><td></td><td>£</td><td>2</td><td>3.</td><td>5</td><td>9</td></tr>
<tr><td>+</td><td>£</td><td></td><td>7.</td><td>5</td><td>5</td></tr>
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<tr><td></td><td></td><td></td><td>1</td><td>1</td><td>1</td></tr>
</table>
</td>
<td>Children can add different amounts of money together. Remind them to keep the decimal points lined up.</td>
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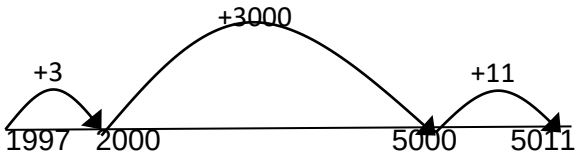
<table>
<tr><td></td><td>2</td><td>3.</td><td>3</td><td>6</td><td>1</td></tr>
<tr><td></td><td></td><td>9.</td><td>0</td><td>8</td><td>0</td></tr>
<tr><td></td><td>5</td><td>9.</td><td>7</td><td>7</td><td>0</td></tr>
<tr><td>+</td><td></td><td>1.</td><td>3</td><td>0</td><td>0</td></tr>
<tr><td></td><td>9</td><td>3.</td><td>5</td><td>1</td><td>1</td></tr>
<tr><td></td><td></td><td>2</td><td>1</td><td>2</td><td></td></tr>
</table>
</td>
<td>Children will add more than two decimal numbers with different numbers of digits. A zero is added to help to keep all the digits in the right columns.</td>
</tr>
<tr>
<td>Vocabulary - Subtraction</td>
<td colspan="2">equal to, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, most, least, count back, how many left, how much less is__?, difference, count on, strategy, partition, tens, units, exchange, decrease, hundreds, value, digit, inverse<br>tenths, hundredths, decimal point, decimal</td>
</tr>
<tr>
<td></td>
<td>5011 – 1997 = 3014<br> 
</td>
<td>Counting on. If the numbers in a calculation are close together or near to a multiple of 10, 100 etc. children can use the counting on method. Starting from the smallest number and counting up to the largest number. Finding out how many are in between.</td>
</tr>
</table>

| | | |
|---|---|---|
| | 0 9<br>14 ~~10~~ 16<br>~~1~~ ~~5~~ ~~0~~ ~~6~~ 9 9<br>8 9 9 4 9<br>6 0 7 5 0 | Children will use **column subtraction (decomposition).** Children will exchange (borrow). They will subtract numbers with differing numbers of digits. |
| | 0 10 14 13 11<br>~~1~~ ~~0~~ ~~5~~•~~4~~ ~~1~~ 9 kg<br>- 3 6•0 8 kg<br>7 9•3 3 9 kg | |
| Objective | use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy. | |
| Reasoning | **Making an estimate**<br>Circle the number that is the best estimate to<br>932.6 - 931.05<br><br>1.3 1.5 1.7 1.9 | |
| | **Always, sometimes, never**<br>Is it always, sometimes or never true that the sum of two consecutive triangular numbers is a square number | |
| Objective – Problem Solving | solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why | |
| | Solve problems involving addition, subtraction, multiplication and division | |

| MULTIPLICATION & DIVISION FACTS | |
|---|---|
| Reasoning | **Missing numbers**<br><br>2.4 ÷ 0.3 = ☐ x 1.25<br><br>Which number could be written in the box?<br>**Making links** |
| | |

| MULTIPLICATION & DIVISION Mental calculations | |
|---|---|
| Objectives | perform mental calculations, including with mixed operations and large numbers |
| | *associate a fraction with division and calculate decimal fraction equivalents (e.g. 0.375) for a simple fraction (e.g. $^{3}/_{8}$)*<br>(copied from Fractions) |
| Reasoning | **Use a fact**<br><br>12 x 1.1 = 13.2<br>Use this fact to work out<br>15.4 ÷ 1.1 =<br>27.5 ÷ 1.1 = |
| | **Making links**<br><br>0.7 x 8 = 5.6<br>How can you use this fact to solve these calculations?<br>0.7 x 0.08 =<br>0.56 ÷ 8 = |

| MULTIPLICATION & DIVISION Written Calculations | |
|---|---|
| Objectives | multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication |
| Reasoning | **Prove It**<br>What goes in the missing box?<br><br>18□ 4 ÷ 12 = 157<br><br>38□ 5 ÷ 18 = 212.5<br><br>33□ 2 ÷ 8 = 421.5<br><br>38 x □.7 = 178.6<br><br>Prove it. |
| | **Can you find?**<br>Can you find the smallest number that can be added to or subtracted from 87.6 to make it exactly divisible by 8/7/18? |

<table>
<tr><td>Vocabulary</td><td colspan="2">groups of, lots of, times, array, altogether, multiply, total, count up in, multiplied by, column, row, repeated addition, commutative, sets of, equal groups, _ times as big as, once, twice, three times etc. partition, grid method, multiple, product, tens, units, value square, factor, integer, decimal, short / long multiplication, 'carry'</td></tr>
<tr><td rowspan="4">Resources / Models</td><td>
x 3000 400 60 4<br>
9 | 27000 | 3600 | 540 | 36 | = 31176
</td><td>The grid method develops children's understanding of the values of the numbers involved.</td></tr>
<tr><td>
x 3000 400 60 4<br>
9 | 27000 | 3600 | 540 | 36 | = 31176<br>
3 | 9000 | 1200 | 180 | 12 | = 10392<br>
41568<br>
1
</td><td>The grid can be extended for the number of digits required. Again showing the value of each digit in the number.<br>This method can also be used with decimal numbers.</td></tr>
<tr><td>
23<br>
X 8<br>
24<br>
+ 160<br>
184
</td><td>The grid method moves onto a long multiplication layout.</td></tr>
<tr><td></td></tr>
<tr><td rowspan="2"></td><td>
23<br>
X 8<br>
184<br>
2<br>
Children need reminding here that they are working out 20 x 8, not 2 x 8.
</td><td>Which quickly moves onto the short multiplication method as the children understand what is happening with the numbers.</td></tr>
<tr><td>
72<br>
X 38<br>
16<br>
560<br>
60<br>
2 100<br>
2 736<br>
1<br><br>
7 2<br>
x 3 8<br>
5 7 6<br>
5 1<br>
2 1 6 0<br>
2 7 3 6<br>
1
</td><td>For calculations with TU x TU or HTU x TU children should use the long multiplication method.</td></tr>
<tr><td rowspan="3">Objective</td><td colspan="2">divide numbers up to 4-digits by a two-digit whole number using the formal written method of short division where appropriate for the context</td></tr>
<tr><td colspan="2">divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context</td></tr>
<tr><td colspan="2">use written division methods in cases where the answer has up to two decimal places (copied from Fractions (including decimals))</td></tr>
</table>

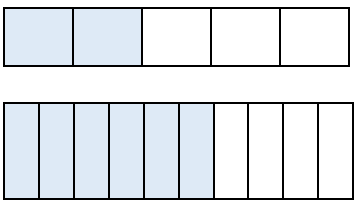
<table>
<tr><td></td><td colspan="2"></td></tr>
<tr><td>Vocabulary<br>- Division</td><td colspan="2">share, share equally, one each, two each…, group, groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, 'carry', remainder, multiple,<br>divisible by, factor, quotient, prime number, prime factors, composite number (non-prime)</td></tr>
<tr><td>Models / resources</td><td>2 1 8<br>4 ) 8 7 2<br>- 8 0 0 (200 x 4)<br>0 7 0<br>- 4 0 (10 x 4)<br>32<br>- 32 (8 x 4 )<br>0</td><td>Chunking<br>Top tip: Children to subtract chunks they are most comfortable with<br>Work out 2x<br>5x<br>10x</td></tr>
<tr><td></td><td>4356 ÷ 5<br>0 8 7 1 r 1<br>5 ) 4 $^{4}$3 $^{3}$5 6<br>Answers can be as a remainder 871r1<br>Answer can be as a fraction 871 $^{1}/_{5}$<br>Answer can be as a decimal 871.2 by continuing the short division calculation after the decimal point.<br>0 8 7 1 . 2<br>5 ) 4 $^{4}$3 $^{3}$5 6.$^{1}$0<br><br>Answer can be rounded 871</td><td>This will lead to short division but only when the children have a good understanding of the numbers. E.g. how many 3's are in 70. A link to multiplication would be beneficial here.<br><br>Children will learn what to do with the remainder in a calculation so they can make the right choice of answer when solving problems.</td></tr>
<tr><td></td><td>13032 ÷ 24 =<br>Multiples of 24<br>0 0 5 4<br>24 | 1 3 0 3 2 | 2 4<br>-1 2 0 | 4 8<br>1 0 3 | 7 2<br>_ 9 6 | 9 6<br>7 2 1 2 0<br>_ 7 2 1 4 4<br>0 2 1 6 8<br>1 9 2<br>2 1 6</td><td>Long division should be used when the divisor is a two-digit number.<br><br>List all the multiples to aid in the calculation.</td></tr>
</table>

| PROPERTIES OF NUMBERS: MULTIPLES, FACTORS, PRIMES, SQUARE AND CUBE NUMBERS | |
|---|---|
| Objectives | identify common factors, common multiples and prime numbers |
| | *use common factors to simplify fractions; use common multiples to express fractions in the same denomination*<br>(copied from Fractions) |
| | *calculate, estimate and compare volume of cubes and cuboids using standard units, including centimetre cubed ($cm^3$) and cubic metres ($m^3$), and extending to other units such as $mm^3$ and $km^3$*<br>(copied from Measures) |
| Reasoning | **Always, sometimes, never?**<br><br>Is it always, sometimes or never true that dividing a whole number by a half makes the answer twice as big.<br><br>Is it always, sometimes or never true that when you square an even number, the result is divisible by 4<br><br>Is it always, sometimes or never true that multiples of 7 are 1 more or 1 less than prime numbers. |
| **ORDER OF OPERATIONS** | |
| **Objective** | use their knowledge of the order of operations to carry out calculations involving the four operations |
| **Reasoning** | **Which is correct?**<br>Which of these number sentences is correct?<br>3 + 6 x 2 =15<br>6 x 5 – 7 x 4 = 92<br>8 x 20 ÷ 4 x 3 = 37 |
| **INVERSE OPERATIONS, ESTIMATING AND CHECKING ANSWERS** | |
| Objective | use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy |
| Reasoning | **Use the inverse**<br>Use the inverse to check if the following calculations are correct:<br>2346 x 46 = 332796<br>27.74 ÷ 19 = 1.46 |
| | **Size of an answer**<br>The product of a single digit number and a number with two decimal places is 21.34<br>What could the numbers be? |
| **PROBLEM SOLVING** | |
| Objective | solve problems involving addition, subtraction, multiplication and division |
| | *solve problems involving similar shapes where the scale factor is known or can be found* |

| | |
|---|---|
| | (copied from Ratio and Proportion) |

| COUNTING IN FRACTIONAL STEPS | |
|---|---|
| Reasoning | **Spot the mistake**<br>Identify and explain mistakes when counting in more complex fractional steps |

| RECOGNISING FRACTIONS | |
|---|---|
| Objectives | recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents<br>(appears also in Equivalence) |
| Reasoning | **What do you notice?**<br>One thousandth of my money is 31p. How much do I have? |
| | **True or false?**<br>25% of 23km is longer than 0.2 of 20km.<br>Convince me. |

| Comparing FRACTIONS | |
|---|---|
| Objectives | compare and order fractions, including fractions >1 |
| Reasoning | Give an example of a **fraction** that is greater than 1.1 and less than 1.5.<br>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?<br>Thirty three fifths<br>Twenty three thirds<br>Forty five sevenths<br>How do you know? |
| Resources / models | **Comparing fractions**<br>$\frac{2}{5} < \frac{6}{10}$<br>  |

| Comparing DECIMALS |
|---|

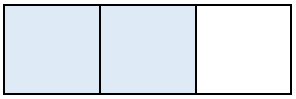
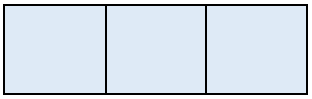
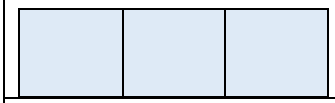
| | |
|---|---|
| Objectives | identify the value of each digit in numbers given to three decimal places |
| Reasoning | **True or false?**<br>In all of the numbers below, the digit 6 is worth more than 6 hundredths.<br><br>3.6 3.063 3.006<br>6.23 7.761<br>3.076<br>Is this true or false?<br>Change some numbers so that it is true. |
| | What needs tobe added to 6.543 to give 7?<br>What needs to be added to 3.582 to give 5? |
| | Circle the two decimals which are closest in value to each other.<br>0.9 0.09 0.99 0.1 0.01 |

| **Rounding including DECIMALS** | |
|---|---|
| Objectives | solve problems which require answers to be rounded to specified degrees of accuracy |
| Reasoning | **Do, then explain**<br>Write the answer of each calculation rounded to the nearest whole number<br>75.7 × 59<br>7734 ÷ 60<br>772.4 × 9.7<br>20.34 × (7.9 – 5.4) |
| | **What's the same, what's different?**<br>… when you round numbers to one decimal place and two decimal places?<br>*Also see rounding in place value* |

| **EQUIVALENCE (INCLUDING FRACTIONS, DECIMALS AND PERCENTAGES)** | |
|---|---|
| Objectives | use common factors to simplify fractions; use common multiples to express fractions in the same denomination |
| | associate a fraction with division and calculate decimal fraction equivalents (e.g. 0.375) for a simple fraction (e.g. $^{3}/_{8}$) |
| | recall and use equivalences between simple fractions, decimals and percentages, including in different contexts. |
| Reasoning | **Odd one out**.<br>Which is the odd one out in each of these collections of 4 fraction<br>s$\frac{3}{4}$ 9/12 26/36 18/24<br>4/20 1/5 6/25 6/30<br>Why? |

| | |
|---|---|
| | **What do you notice?**<br>8/5 of 25 = 40<br>5/4 of 16 = 20<br>7/6 of 36 - 42<br>Can you write similar statements? |
| | **Complete the pattern**<br><table><tr><td>1/8</td><td>2/8</td><td>3/8</td><td>4/8</td></tr><tr><td>0.375</td><td>???</td><td>???</td><td>???</td></tr></table><br>Complete the table. |
| | **Another and another** Write a unit fraction which has a value of less than 0.5?<br>… and another, … and another, … |
| | **Ordering**<br>Which is larger, $^{1}/_{3}$ or $^{2}/_{5}$?<br>Explain how you know.<br><br>Put the following amounts in order, starting with the largest.<br><br>23%, 5/8, 3/5, 0.8 |

| **ADDITION AND SUBTRACTION OF FRACTIONS** | |
|---|---|
| Objectives | add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions |
| Reasoning | **Another and another**<br>Write down two fractions which have a difference of 1 2/… and another, … and another, …<br><br>**Another and another**<br>Write down 2 fractions with a total of 3 4/5.<br>… and another, … and another, … |

<table>
<tr><th colspan="2">MULTIPLICATION AND DIVISION OF Fractions</th></tr>
<tr><td rowspan="3">Objectives</td><td>multiply simple pairs of proper fractions, writing the answer in its simplest form (e.g. $^1/_4 \times {}^1/_2 = {}^1/_8$)</td></tr>
<tr><td>multiply one-digit numbers with up to two decimal places by whole numbers</td></tr>
<tr><td>divide proper fractions by whole numbers (e.g. $^1/_3 \div 2 = {}^1/_6$)</td></tr>
<tr><td rowspan="4">Reasoning</td><td>Continue the pattern<br>1/3 ÷ 2 = 1/6<br>1/6 ÷ 2 = 1/12<br>1/12 ÷ 2 = 1/24</td></tr>
<tr><td>What do you notice?<br>$\frac{1}{2} \times \frac{1}{4} =$</td></tr>
<tr><td>The answer is 1/8 , what is the question (involving fractions / operations)</td></tr>
<tr><td>Give your top tips for dividing fractions.</td></tr>
<tr><td rowspan="2">Resources / Models</td><td><u>Multiplying a fraction by a single digit</u><br>$\frac{2}{3} \ x \ 3 = \frac{6}{3} = 2$<br>  $\mathbf{\frac{2}{3}}$<br>  $\mathbf{\frac{2}{3}}$<br>  $\mathbf{\frac{2}{3}}$<br><u>which becomes…</u><br>  <br>  </td></tr>
<tr><td><u>Dividing a fraction by a single digit</u><br>$\frac{1}{3} \div \ 2 = \frac{1}{6}$</td></tr>
</table>

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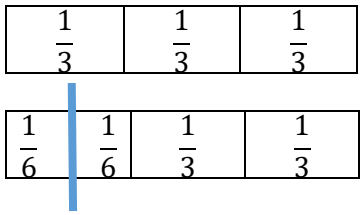
|---|---|
| |  |



| MULTIPLICATION AND DIVISION OF Decimals | |
|---|---|
| Objectives | multiply one-digit numbers with up to two decimal places by whole numbers |
| | 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 places and multiply and divide numbers by 10, 100<br>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<br>(e.g. $^{3}/_{8}$) |
| | use written division methods in cases where the answer has up to two decimal places |
| Reasoning | **Undoing**<br>I multiply a number with three decimal places by a multiple of 10. The answer is approximately 3.21<br>What was my number and what did I multiply buy?<br><br>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 hundreds columns. What could my number have been? |

| Statements only appear in Year 6 but should be connected to previous learning, particularly fractions and multiplication and division | |
|---|---|
| Objective | solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts |
| Reasoning | **What else do you know?** |

| | |
|---|---|
| | In a flower bed a gardener plants 3 red bulbs for every 4 white bulbs. How many red and white bulbs might he plant?<br>If she has 100 white bulbs, how many red bulbs does she need to buy?<br>If she has 75 red bulbs, how many white bulbs does she need to buy?<br>If she wants to plant 140 bulbs altogether, how many of each colour should she buy? |
| | **Do, then explain**<br>Purple paint is made from read and blue paint in the ratio of 3:5.<br>To make 40 litres of purple paint how much would I need of each colour?<br>Explain your thinking. |
| Objective | solve problems involving the calculation of percentages [for example, of measures, and such as 15% of 360] and the use of percentages for comparison |
| Reasoning | **What else do you know?**<br>88% of a sum of money = £242. Make up some other statements.<br>Write real life problems for your number sentences. |
| | **Undoing**<br>I think of a number and then reduce it by 15%. The number I end up with is 306. What was my original number? |
| | In a sale where everything is reduced by 15% I paid the following prices for three items.<br>£255, £850, £4.25<br>What was the original selling price? |
| Objective | solve problems involving similar shapes where the scale factor is known or can be found |
| Reasoning | **Unpicking**<br>A recipe needs to include three times as much apple than peach. The total weight of apples and peaches in a recipe is 700 grammes. How much apple do I need? |
| Objective | solve problems involving unequal sharing and grouping using knowledge of fractions and multiples. |
| Reasoning | **Other possibilities**<br>A 50 seater coach travels to the match. Most of the seats are taken.<br>Junior tickets cost £13 and Adult tickets cost £23.<br>The only people on the coach are Juniors and Adults.<br>The total amount paid for tickets is approximately £900<br>How many people on the coach were adults and how many were juniors? |

| **EQUATIONS** | |
|---|---|
| Objective | express missing number problems algebraically |
| | find pairs of numbers that satisfy number sentences involving two unknowns |

<table>
<tr><td></td><td>enumerate all possibilities of combinations of two variables</td></tr>
<tr><td>Reasoning</td><td>Connected Calculations<br>p and q each stand for whole numbers.<br>p + q = 1000 and p is 150 greater than q.<br>Work out the values of p and q.</td></tr>
<tr><td>Vocabulary</td><td>formulae<br>equation<br>unknown<br>variable</td></tr>
<tr><td colspan="2">FORMULAE</td></tr>
<tr><td>Objectives</td><td>use simple formulae</td></tr>
<tr><td></td><td>recognise when it is possible to use formulae for area and volume of shapes<br>(copied from Measurement)</td></tr>
<tr><td>Reasoning</td><td>Undoing<br>The diagram below represents two rectangular fields that are next to each other.<br><table><tr><td>Field A</td><td>Field B</td></tr></table><br>Field A is twice as long as field B but their widths are the same and are 7.6 metres.<br>If the perimeter of the small field is 23m what is the perimeter of the entire shape containing both fields?</td></tr>
<tr><td></td><td>If y stands for a number complete the table below<br><table><tr><td>y</td><td>3y</td><td>3y + 1</td></tr><tr><td>25</td><td></td><td></td></tr><tr><td></td><td></td><td>28</td></tr></table>What is the largest value of y if the greatest number in the table was 163?</td></tr>
</table>

<table>
<tr><td colspan="2">SEQUENCES</td></tr>
<tr><td>Objective</td><td>generate and describe linear number sequences</td></tr>
<tr><td>Reasoning</td><td>Generalising<br>Write a formula for the 10$^{th}$, 100$^{th}$ and nth terms of the sequences below.<br>4, 8, 12, 16 ……<br>0.4, 0.8, 1.2, 1.6, ……..</td></tr>
</table>

| COMPARING AND ESTIMATING | |
|---|---|
| Objective | calculate, estimate and compare volume of cubes and cuboids using standard units, including centimetre cubed ($cm^3$) and cubic metres ($m^3$), and extending to other units such as $mm^3$ and $km^3$. |
| Reasoning | **Top Tips**<br>Put these amounts in order starting with the largest.<br>100 $cm^3$<br>1000000 $mm^3$<br>1 $m^3$<br>Explain your thinking |
| | **Undoing**<br>A film lasting 200 minutes finished at 17:45. At what time did it start? |
| | **Other possibilities**<br>(links with geometry, shape and space)<br>A cuboid has a volume between 200 and 250 cm cubed.<br>Each edge is at least 4cm long. List four possibilities for the dimensions of the cuboid.. |
| Vocabulary | Yard<br>Foot<br>Feet<br>Inch<br>Inches<br>Circumference<br><br>Tonne<br>Pound<br>Ounce<br><br>Centilitre<br>Cubic centimetres ($cm^3$)<br>Cubic metres ($m^3$)<br>Cubic millimetres ($mm^3$)<br>Cubic kilometres ($km^3$)<br><br>Greenwich Mean Time<br>British Summer Time<br>International Date Line<br><br>Profit<br>Loss |

| MEASURING and CALCULATING | |
|---|---|
| Objective | solve problems involving the calculation and conversion of **units of measure**, using decimal notation up to three decimal places where appropriate (appears also in Converting) |
| Reasoning | **Write more statements**<br>Chen, Megan and Sam have parcels. Megan's parcel weighs 1.2kg and Chen's parcel is 1500g and Sam's parcel is half the weight of Megan's parcel. Write down some other statements about the parcels. How much heavier is Megan's parcel than Chen's parcel? |
| Objective | recognise that shapes with the same areas can have different **perimeters** and vice versa |
| Reasoning | **Testing conditions**<br>A square has the perimeter of 12 cm. When 4 squares are put together, the perimeter of the new shape can be calculated.<br>For example:<br>  <br>What arrangements will give the maximum perimeter? |
| Objective | calculate the area of parallelograms and triangles |
| | calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres ($cm^3$) and cubic metres ($m^3$), and extending to other units [e.g. $mm^3$ and $km^3$]. |
| | recognise when it is possible to use formulae for area and volume of shapes |
| Reasoning | **Always, sometimes, never**<br>The area of a triangle is half the area of the rectangle that encloses it:<br>  <br>*See also Geometry Properties of Shape* |

| CONVERTING | |
|---|---|
| Objectives | use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places |
| | solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate (appears also in Measuring and Calculating) |
| | convert between miles and kilometres |
| Reasoning | **The answer is ….**<br>24 metres cubed<br>What is the question?<br><br>**What do you notice?**8 km = 5 miles<br>16km = ☐ miles<br>4 km = ☐ miles<br>Fill in the missing number of miles.<br>Write down some more facts connecting kilometres and miles. |

| IDENTIFYING SHAPES AND THIER PROPERTIES | |
|---|---|
| Objective | recognise, describe and build simple 3-D shapes, including making nets (appears also in Drawing and Constructing) |
| | illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius |
| Reasoning | **What's the same, what's different?** What is the same and what is different about the nets of a triangular prism and a square based pyramid? |
| | **Visualising**<br>Jess has 24 cubes which she builds to make a cuboid. Write the dimensions of cuboids that she could make.<br>List all the possibilities. |
| Vocabulary | Circumference<br>Concentric<br>Arc<br>Net, open, closed<br>Intersecting<br>Intersection<br>Plane<br><br>Kite |

| | |
|---|---|
| | Dodecahedron<br>Net, open, closed |

| DRAWING AND CONSTRUCTING | |
|---|---|
| Objective | draw 2-D shapes using given dimensions and angles |
| | recognise, describe and build simple 3-D shapes, including making nets (appears also in Identifying Shapes and Their Properties) |
| Reasoning | **Other possibilities**<br>If one angle of an isosceles triangle is 36 degrees.<br>What could the triangle look like – draw it.<br>Are there other possibilities ?<br><br>Draw a net for a cuboid that has a volume of 24 $cm^3$. |

| COMPARING AND CLASSIFYING | |
|---|---|
| Objectives | compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons |
| Reasoning | **Always, sometimes, never**<br>Is it always, sometimes or never true that, in a polyhedron, the number of vertices plus the number of faces equals the number of edges. |
| | **Other possibilities**<br>Not to scale<br>  <br>The angle at the top of this isosceles triangle is 110 degrees.<br>What are the other angles in the triangle? |

| Angles | |
|---|---|
| Objectives | recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles |
| Reasoning | **Convince me**<br>  <br>One angle at the point where the diagonals of a rectangle meet is 36 degrees.<br>What could the other angles be?<br>Convince me |
| Vocabulary | acute, obtuse, right angle, estimate, order, measure, reflex angle |

| POSITION, DIRECTION AND MOVEMENT | |
|---|---|
| Objectives | describe positions on the full coordinate grid (all four quadrants) |
| | draw and translate simple shapes on the coordinate plane, and reflect them in the axes. |
| Reasoning | **Working backwards**<br>Two triangles have the following co-ordinates:<br>Triangle A:<br>(3, 5) (7, 5) (4, 7)<br>Triangle B:<br>(3, 1) (7, 1) (4, 3)<br>Describe the translation of triangle A to B and then from B to A. |
| Vocabulary | |

| INTERPRETING, CONSTRUCTING AND PRESENTING DATA | |
|---|---|
| Objectives | interpret and construct pie charts and line graphs and use these to solve problems |
| Reasoning | **True or false?**<br>(Looking at a pie chart) "More than twice the number of people say their favourite type of T.V. programme is soaps than any other" |

| | |
|---|---|
| | **Is this true or false?**<br>**Convince me.**<br>Make up your own 'true/false' statement about the pie chart. |
| | **What's the same, what's different?**<br>Pupils identify similarities and differences between different representations and explain them to each other |
| Vocabulary | mean (mode, median, range as estimates for this)<br>statistics,<br>distribution |

| SOLVING PROBLEMS | |
|---|---|
| Objectives | calculate and interpret the mean as an average |
| Reasoning | **Create questions** Make up a set of five numbers with a mean of 2.7 |
| | **Missing information** The mean score in six test papers in a spelling test of 20 questions is 15.Five of the scores were 13 12 17 18 16 What was the missing score? |
| Vocabulary | mean (mode, median, range as estimates for this)<br>statistics,<br>distribution |