| **Topic: KS4 Foundation Unit 1 Number**<br>**MathsWatch clip numbers are in brackets: 21, 28, 32, 66, 68, 76, 77, 79, 80, 81, 82, 90, 91** | | **Duration: 9 Lessons** | **Composite: Unit Test** |
|---|---|---|---|
| **Key vocabulary:** | **Powerful knowledge components crucial to commit to long term memory. Declarative knowledge.** | **Core knowledge components. Procedural and conditional knowledge.** | **Links to previous and future topics** |
| Negative Powers, Indices, Index, Exponents<br>Estimate<br>Inverse<br>Prime numbers<br>Lowest Common Multiple (LCM)<br>Highest Common Factor (HCF)<br>Product Decomposition | I know that:<br>*To multiply or divide a positive by a negative number (and vice versa) the product is a negative number **(68a).** 2 x -3 = -6 21 ÷ -3 = -7<br>*Multiply or divide a negative by a negative number (and vice versa) the product is a positive number. -21 ÷ -3 = 7 -2 x -3 = 6<br>*The Priority of Operations is **(75)** **B**rackets, **I**ndices – (powers and roots) **D**ivision, **M**ultiplication, **A**ddition and **S**ubtraction<br>*The inverse operations are **(21)**: Square ↔ Square root<br>Cube ↔Cube root Multiply ↔Divide Add↔ubtract<br>*To divide decimals, multiply both numbers by a power of 10 (10, 100, 100….) until you have a whole number to divide by. Then do the division.<br>*To estimate the answer to a calculation you need to round to 1 significant figure.<br>*I know how to:<br>1. Use one calculation to work out the answer to another. **(92)**<br>2. Use the power and root keys on my calculator.<br>*I know that:<br>1. The rules of indices are:<br>a. to multiply powers of the same number, you add the powers.<br>b. to divide powers of the same number, you subtract the powers.<br>c. to raise a power to a power, you multiply the powers.<br>2. The first few prime numbers are : **2, 3, 5, 7, 11, 13, 17, 19.**<br>To find the LCM and HCF of two numbers, you list or write the numbers as products of their prime factors. **(28, 79, 80)**<br>a. The Lowest Common Multiply LCM of two numbers is the smallest number that is a multiple of both numbers.<br>b. The Highest Common Factor HCF of two numbers is the highest number that is a factor of both numbers.<br>Prime factor decomposition of a number means finding the product if its prime factors. | I know how to:<br>*Use Priority of Operations with positive and negative numbers.<br>*Simplify calculations by cancelling.<br>*Use inverse operations.<br>*Find factors and multiples of numbers.<br>*Find common factors and common multiples of two numbers.<br>*Find the Highest Common Factor (HCF) and the Lowest Common Multiply (LCM) of two numbers by listing.<br>*Find square roots and cube roots.<br>*Recognise powers of 2, 3, 4 and 5.<br><br>I know when to:<br>*Use surd calculations on a calculator.<br>*Square roots and cube roots to do calculations.<br>*Write a number as the product of its prime factors.<br>*Use prime factor decomposition and Venn diagrams to find the HCF and LCM.<br>*Use a combination of number skills to solve problems. | This topic builds on prior knowledge:<br>• Know strategies for multiplying and dividing whole numbers by 2, 4, 5 and 10.<br>• Recall all multiplication facts to 10 × 10, and use them quickly to derive the corresponding division facts.<br><br>This topic will be used in future learning:<br>• Using order of operations with algebraic calculations<br>• Standard form<br>• Use inverse operations to solve equations |

| Impressive reading | Impressive speaking | Impressive writing | Resilience | Employability via: |
|---|---|---|---|---|
| • Read out loud<br>• Selective mutism – peer support or one to one with teacher<br>• Reading Word problems<br>• Identifying key information from text | • Speak out loud<br>• Selective mutism – one to one and visual cards<br>• Explain calculation strategies<br>• Talk about problem solving methods<br>• Share mathematical reasoning and understanding using key vocabulary | • Students show written distinct logical steps in developing an argument.<br>• Review of famous mathematician<br>• Using key vocabulary for explanations and reasoning | Compare methods. Did you use the same approach? Did your partner discover a better approach than yours? | Raise students' awareness of their problem-solving strategies and to encourage them to critique them in an effort to develop better strategies. Use of work related problems in worded questions.<br><br>Confidence with calculations with decimals is essential when working with money and making financial calculations. |

**SEND**

- Visually impaired check resources have correct paper, colour and font size.
- Key vocabulary introduced using precision teaching prior to a new topic.
- Adjust language and speed of explanation when needed. More curriculum time allocated to TAs for more complex skills.
- Allow more processing time for solving problems both verbal and written where needed.
- Repetition – start each lesson with knowledge recall based questions.
- Demonstrate and model mathematic problems.
- Multi-sensory- kinaesthetic learning created so that pupils can move the maths learning around (matching cards, counters etc.)
- Technology use of interactive white boards to demonstrate methods, such as mathsframe.co.uk. **MathsWatch clips: 21, 28, 32, 66, 68, 76, 77, 79, 80, 81, 82, 90, 91**
- Cultural capital – Mathematician of the week, link problem solving to local business and the local area e.g. distances, building costs etc.
- When modelling answers give pupils a hard copy. They can take a photo to copy up in their own time.
- Share resources through Google Classroom before the lesson
- Share on Google Classroom exemplar work

10AMA2

| **Topic: KS4 Foundation Unit 2 Algebra**<br>**MathsWatch clips numbers are in brackets: 33, 34, 35, 75, 83, 93, 94, 95, 137** | | **Duration: 9 Lessons** | **Composite: Unit Test** |
|---|---|---|---|
| **Key vocabulary:** | **Powerful knowledge components crucial to commit to long term memory. Declarative knowledge.** | **Core knowledge components. Procedural and conditional knowledge.** | **Links to previous and future topics** |
| Simplify<br><br>Expression<br><br>Algebraic<br><br>Variables<br><br>Expanding<br><br>Factorising<br><br>Substitution | I know that:<br>1. Collecting like terms means collecting terms with the same letters and powers. **(33, 34, 35)**<br>-Terms can be simplified by multiplying and dividing, even when they are not like terms.<br>-When multiplying, write letters in alphabetical order and write numbers before lettersYou write expressions by using letters to stand for numbers. The letters are called **variables** because their values can change or **vary**. **(75, 95, 137)**<br>2. The rules of indices when simplify algebraic expressions are: **(77, 81, 82)**<br>a. to multiply powers of the same letter, you add the powers<br>b. to divide powers of the same letter, you subtract the powers<br>3. In algebra, "substitution" means putting numbers in place of letters **(95)**<br>4. A **formula** is a general rule that shows a relationship between variables. For example, speed = distance ÷ time, which we can write as s = d ÷ t. Speed, distance and time are variables. Although their values can vary, the rule stays true.<br>5. When expanding brackets, you multiply each term in the bracket by the term on the outside. **(93)**<br>6. To factorise expressions, you write the HCF of the terms outside the bracket and then work out the terms inside the brackets by dividing each term in the expression by the HCF. **(94)**<br>7. The ≡ symbol shows an identity. An identity is an equation that is true for all values of the variable. 5(x + 1) ≡ 5x + 5 is an identity.<br>5(x + 1) has the same value as 5x + 5 for all values of x.<br>The ≠ symbol is used to show that two expressions are not always equal. 5x + 12 ≠ 5(x + 6)<br>A formula has an equal sign. | I know how to:<br>-Correct algebraic notation.<br>-Write and simplify expressions.<br>-Use the rules of indices.<br>-Multiply and divide expressions.<br>-Substitute numbers into expressions.<br>-Recognise the difference between a formula and an expression.<br>-Substitute numbers into a simple formula.<br>-Expand brackets.<br>-Simplify expressions with brackets.<br>I know when to:<br>• Substitute numbers into expressions with brackets and powers.<br>• Factors of algebraic terms.<br>• Factorise algebraic expressions.<br>• Use the identity symbol ≡ and the not equals symbol ≠<br>• Write expressions and simple formulae to solve problems.<br>• Use maths and science formulae. | This topic builds on prior knowledge:<br>• Use the four operations with positive and negative integers.<br>• Find the HCF of two numbers.<br><br>This topic will be used in future learning:<br>• Solving algebraic equations.<br>• Substitute values into more complex formulae such as trigonometry and Pythagoras |

# Topic: KS4 Foundation Unit 3 Graphs, Tables and Charts

**MathsWatch clips numbers are in brackets: 6b, 15, 61, 64, 65, 128, 129, 153**

# Duration: 9 Lessons

# Composite: Unit Test

| Key vocabulary: | Powerful knowledge components crucial to commit to long term memory. Declarative knowledge. | Core knowledge components. Procedural and conditional knowledge. | Links to previous and future topics |
|---|---|---|---|

Inequality

Discrete

Continuous

Two-way tables

Comparative

Composite

Histograms

Pie Charts

Interpret

Stem and Leaf

Scatter Diagrams

Line of Best Fit

Trend

I know that:

1. A **grouped frequency table** contains sorted data in groups called classes. An **inequality** is a mathematical sentence. $30 < y \leq 31$ means a number (y) is greater than 30 but less than or equal to 31. **(138)**
   **Discrete** data can only have a particular value. E.g., shoe size are always whole numbers. For discrete data, you can write groups like 1-5, 6-10.
   **Continuous** data is measured and can have any values, for example length and time.
   **A suitable number of classes** for a grouped frequency table is four to six. Classes should be of equal width. **(65, 153)**

| Time (seconds) | Tally | Frequency |
|---|---|---|
| $13 \leqslant t < 15$ | | |
| $15 \leqslant t < 17$ | | |
| $17 \leqslant t < 19$ | | |
| $19 \leqslant t < 22$ | | |

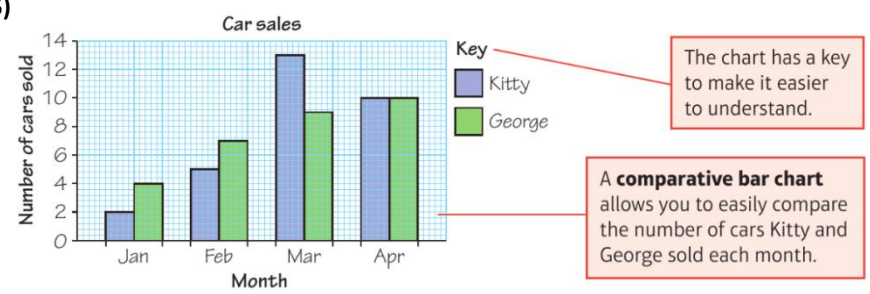
Use inequalities because the data is continuous.

2. **A two-way table** divides data into groups in rows across the table and in columns down the table. You can calculate the totals across and down. **(61)**

Use the two-way table to work out how many females swim.

| | Male | Female | Total |
|---|---|---|---|
| Swim | 9 | | 34 |
| Run | 24 | 12 | 36 |

3. **Comparative and composite bar charts** allow you to compare two sets of data. **(15)**




The chart has a key to make it easier to understand.

A **comparative bar chart** allows you to easily compare the number of cars Kitty and George sold each month.

A **histogram** is used for grouping continuous data. There are no gaps between the bars. **(15)**

I know how to:

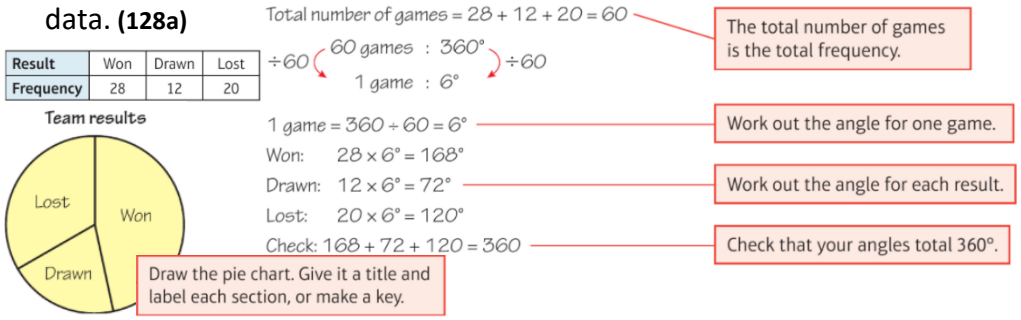
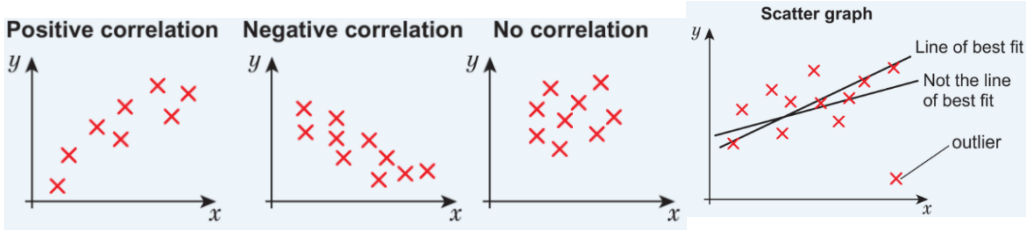
- Designing tables and data collection sheets.
- Reading data from tables.
- Use data from tables.
- Design and use two-way tables.
- Draw and interpret comparative and composite bar charts.
- Interpret and compare data shown in bar charts, line graphs and histograms.
- Plot and interpret time series graphs.
- Construct and interpret stem and leaf and back-to-back stem and leaf diagrams.
- Draw and interpret pie charts.
- Plot and interpret scatter graphs.
- Draw a line of best fit on a scatter graph.

I know when to:

- Use trends to predict what might happen in the future.
- Use the line of best fit to predict values.

This topic builds on prior knowledge:

- order positive and negative integers, decimals and fractions; use the symbols =, ≠, <, >, ≤, ≥.
- apply the four operations, including formal written methods, to integers, decimals and simple fractions (proper and improper), and mixed numbers – all both positive and negative; understand and use place value (e.g. when working with very large or very small numbers, and when calculating with decimals).

| | | | |
|---|---|---|---|
| Correlation<br><br>Outlier<br><br>Interpolation<br><br>Extrapolation | A **line graph** is useful for identifying **trends** in data.<br>4. A **time series** graph is a line graph with time plotted on the x-axis. **(153)**<br>5. A **stem and leaf diagram** shows numerical data split into a 'stem' and 'leaves'. The leaf is usually the last digit, and the stem is the other digits. In a stem and leaf diagram the numbers are placed in order. **(128a)**<br>A **back-to-back stem and leaf diagram** compares two sets of data.<br>  <br>**Females** / **Males**<br>8 5 \| 7 \| 6 7 9<br>7 5 4 3 0 \| 8 \| 8 3 5<br>9 8 6 1 \| 9 \| 9 2 3 5 7 8<br>10 \| 1 3 7<br>**Key**<br>For females: 5 \| 7 means 75 bpm<br>For males: 7 \| 6 means 76 bpm<br>6. A pie chart is a circle divided into sectors. Each sector represents a set of data. **(128a)**<br>  <br>Total number of games = 28 + 12 + 20 = 60<br>The total number of games is the total frequency.<br>÷60 (60 games : 360°) ÷60<br>1 game : 6°<br>Result: Won 28, Drawn 12, Lost 20<br>Team results<br>Lost, Won, Drawn<br>1 game = 360 ÷ 60 = 6°<br>Work out the angle for one game.<br>Won: 28 × 6° = 168°<br>Drawn: 12 × 6° = 72°<br>Work out the angle for each result.<br>Lost: 20 × 6° = 120°<br>Check: 168 + 72 + 120 = 360<br>Check that your angles total 360°.<br>Draw the pie chart. Give it a title and label each section, or make a key.<br>7. **Scatter graphs** show the relationship, or '**correlation**', between two sets of data. Plot with crosses, **don't** join them up. The **line of best fit** is a straight line, to represent **trend**, drawn through the middle of the points. **(128b, 129).** An **outlier** is a value that does not fit the pattern of the data.<br>  <br>Positive correlation<br>Negative correlation<br>No correlation<br>Scatter graph<br>Line of best fit<br>Not the line of best fit<br>outlier<br>8. Using a line of best fit to predict data values within the range of the data is called **interpolation** and is usually reasonably accurate.<br>9. Using a line of best fit to predict data values outside the range of the data is called **extrapolation** and may not be accurate. | | This topic will be used in future learning:<br>• Finding averages for graphs, tables and charts.<br>• Plotting linear and quadratic graphs. |

| **Topic: KS4 Foundation Unit 4 Fractions and percentages**<br>**MathsWatch clip numbers: 24, 25, 40, 71, 72, 73, 74, 84, 85, 86, 88, 108, 111** | | **Duration: 12 Lessons** | **Composite: Unit Test** |
|---|---|---|---|
| **Key vocabulary:** | **Powerful knowledge components crucial to commit to long term memory. Declarative knowledge.** | **Core knowledge components. Procedural and conditional knowledge.** | **Links to previous and future topics** |
| Reciprocal<br><br>Percentage<br><br>Convert<br><br>Numerator<br><br>Denominator<br><br>Value Added Tax (VAT)<br><br>Quantity | I know that:<br>To compare, add or subtract fractions, write them with a common **denominator**.<br><br>To add or subtract **mixed numbers**, it often helps to convert to **improper fractions** first.<br>For example, write $2\frac{2}{3}$ as $\frac{8}{3}$.<br><br>To multiply fractions together, multiply the **numerators** together and the denominators together.<br><br>The **reciprocal** of a fraction is the original fraction turned upside down. The reciprocal of 2 (or $\frac{2}{1}$) is $\frac{1}{2}$.<br><br>Dividing by a number is the same as multiplying by its reciprocal.<br>For example, $12 \div 2$ means $\frac{1}{2}$ of 12 or $12 \times \frac{1}{2}$.<br><br>To convert a fraction to a decimal, divide the numerator by the denominator.<br><br>**Percentage** means 'out of 100'. For example 24% = $\frac{24}{100}$.<br>You multiply a fraction by 100 to change it to a percentage.<br>For example $\frac{3}{20} = \frac{3 \times 100}{20}\% = \frac{300}{20}\% = 15\%$.<br>**Simple interest** is interest paid out each year by banks and building societies.<br><br>To increase a number by a percentage, work out the increase and add this to the original number.<br>To decrease a number by a percentage, work out the decrease and subtract this from the original number. | I know how to:<br>• Compare fractions.<br>• Add, subtract, multiply and divide fractions.<br>• Find a fraction of a quantity.<br>• Simplify calculations by cancelling.<br>• Convert fractions to decimals and vice versa.<br>• Write one number as a fraction of another.<br>• Convert percentages to fractions and vice versa.<br>• Write one number as a percentage of another.<br>• Convert percentages to decimals and vice versa.<br>• Calculate simple interest.<br>• Calculate percentage increases and decreases.<br>• Calculate VAT (value added tax).<br>I know when to:<br>• Use fractions to solve problems.<br>• Use percentages in real-life situations. | This topic builds on prior knowledge:<br>• Have a basic understanding of fractions as being 'parts of a whole' and be able to write one value as a fraction of another.<br>• Define percentage as 'number of parts per hundred'.<br><br>This topic will be used in future learning:<br>• Solve growth and decay problems.<br>• Express a given number as a percentage of another in more complex situations. |