



## Maths KS3 Information for Teachers

### National Curriculum objectives:

#### **Working mathematically**

Through the mathematics content, pupils should be taught to:

- Consolidate their numerical and mathematical capability from key stage 2 and extend their understanding of the number system and place value to include decimals, fractions, powers and roots.
- Select and use appropriate calculation strategies to solve increasingly complex problems.
- Use algebra to generalise the structure of arithmetic, including to formulate mathematical relationships.
- Substitute values in expressions, rearrange and simplify expressions, and solve equations.
- Use language and properties precisely to analyse numbers, algebraic expressions, 2-D and 3-D shapes, probability and statistics.

#### **Reason mathematically**

- Extend their understanding of the number system; make connections between number relationships.
- Extend and formalise their knowledge of ratio and proportion in working with measures and geometry, and in formulating proportional relations algebraically.
- Identify variables and express relations between variables algebraically.

#### **Solve problems**

- Develop their mathematical knowledge, in part through solving problems and evaluating the outcomes, including multi-step problems.
- Develop their use of formal mathematical knowledge to interpret and solve problems, including in financial mathematics.
- Begin to model situations mathematically and express the results using a range of formal mathematical representations.
- Select appropriate concepts, methods and techniques to apply to unfamiliar and non-routine problems.

#### **Number**

- Use the concepts and vocabulary of lowest common multiple.
- Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative.

# Mother Shipton's

- Work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and  $\frac{7}{2}$  or 0.375 and  $\frac{3}{8}$ ).
- Define percentage as 'number of parts per hundred', interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express one quantity as a percentage of another, compare two quantities using percentages, and work with percentages greater than 100%.
- Use standard units of mass, length, time, money and other measures, including with decimal quantities.

## Algebra

- Substitute numerical values into formulae and expressions.
- Understand and use the concepts and vocabulary of expressions.
- Recognise arithmetic sequences and find the  $n$ th term.
- Simplify and manipulate algebraic expressions to maintain equivalence by collecting like terms.

## Geometry and measures

- Calculate and solve problems involving areas of circles.
- Apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles.
- Understand and use the relationship between parallel lines and alternate and corresponding angles.

## Probability

- Understand that the probabilities of all possible outcomes sum to 1.

## Statistics

- Describe, interpret and compare observed distributions of a single variable through: grouped data; and appropriate measures of central tendency (mean).

## Activities:

### Mother Shipton trail:

Students go through the park using their surroundings to work out mathematical calculations and problems which include:

- \* Round number to the nearest 10,000. Estimation of the height of the viaduct and calculation of the price to build each arch supporting the viaduct.
- \* Obtuse, acute, reflex and right-angle hunt and challenge of working out missing angles in shapes and in lines.
- \* Working out averages and FDPs from a frequency table.
- \* Conversions of length from metric to imperial linking to the length of the river.
- \* Area of a circle.
- \* Algebraic equations linking to the steps up to the top of the petrifying well.

# Mother Shipton's

- \* Conversions between fractions, decimals and percentages.
- \* 3D shape net drawing.
- \* Challenge to work out how long ago the lake and spring which flow over the Petrifying Well were formed in days.
- \* Multiplication and division calculations linking to the number of teddies hanging up under the Petrifying Well with challenge of showing remainder as mixed number.
- \* Measurement conversions - matching up.
- \* Money problems linking to souvenirs sold in the museum including percentages and probability.
- \* Mathematical vocabulary word search.

## Resources needed:

- *Pencils*
- *Rubbers*
- *Measuring tape*
- *Paper for working out*
- *Any other mathematical supporting resources normally used for each area*

## Answers:

### 1. Eerie Estimation:

- dependent on estimations of height of viaduct and probability scale

### 2. Angle Hunt

- a)  $X = 113$  degrees       $Y = 67$  degrees
- b)  $X = 98$        $Y = 82$        $Z = 82$
- c)  $? = 140$
- d) 900 degrees

### 3. Tree Tester

- a) 2%
- b) 0.02
- c) There are 203 trees, so the answer is 29

### 4. Crafty Conversions

- a) 94.45km
- b) 59 miles

# Mother Shipton's

c) Dependent on tree trunk measured

## 5. Cackling Calculations

✧ There are 21 steps so  $C = 119$

✧✧ Expand:  $2(x + 5) = 2x + 10$       Expand:  $3(2a + b) = 6a + 3b$

✧✧✧ What is the  $n$ th term for this sequence: 8, 15, 22, 29, .... ( $7n + 1$ )

## 6. Fearsome fractions, decimals and percentages

✧  $18/27 = 2/3$

✧ 0.5

✧✧ 0.7, 0.705, 0.75, 7.05%, 7.5%

✧✧✧ 21% is larger as it is 0.21 as a decimal which is larger than 0.206

## 7. Canon Conundrum

a) 360 around a point divided by 12 = 30

b) 120 centuries

## 8. Petrifying Puzzles

✧ 5.75 years

✧✧ 95 altogether

✧✧✧ 65 can be hung

## 9. Mystical Measuring:

- dependent on estimation
- $40\text{cm} = 0.4\text{m}$ ,  $4000\text{mm} = 400\text{cm}$ ,  $4\text{mm} = 0.4\text{cm}$ ,  $4\text{m} = 400\text{cm}$ ,  
 $40\text{km} = 40,000\text{m}$ ,  $4000\text{m} = 4\text{km}$

## 10. Mystifying Museum

✧ Price of teddy, water and magnet dependent on shop price at time

✧✧ £4

✧✧✧ £2.13

✧  $1/10$