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## **1. AIMS AND LEARNING OUTCOMES**

### **a. General Aims & Learning Outcomes**

The fundamental aims of the Mathematics programme for secondary aged children are summarised as follows:

#### **Successful Learners**

- The curriculum aim of developing successful learners that are numerate, creative and enquiring, able to communicate clearly and work both independently and collaboratively is at the heart of the programme of study for Mathematics and links strongly to pupils' experience of the curriculum.
- The key concept of applications and implications of Mathematics and critical understanding enables pupils to find out about mathematical ideas that shape our world.
- Our Mathematics programme, which follows the National Curriculum, helps to develop pupils who are able to think for themselves, providing pupils with the opportunity to tackle problems with more than one approach and solve open-ended problems. Pupils are encouraged to learn from their mistakes and to consider errors and misconceptions as a means to understanding how they learn. Communication and critical understanding encourage pupils to reason and evaluate, both independently and in-group situations.

#### **Confident Individuals**

- The mathematics curriculum provides opportunities for pupils to develop confidence in an increasing range of methods and techniques. Pupils are given the opportunity to express their ideas using strategies they are familiar and secure with. This helps them communicate confidently and encourages them to believe in themselves. Peer and self-assessment opportunities allow pupils to consider where they are and how to move on, thus becoming increasingly confident and independent. Sharing feedback also allows them to express their ideas and suggestions and relate well to others. The mathematics programme of study encourages pupils to enjoy the challenge of trying new things and justifying their own views with evidence, through discussing different interpretations of ideas.

#### **Responsible Citizens**

- Pupils are able to prepare for life and work through the mathematics programme of study. It contributes the underpinning skills for financial capability that will prepare individuals to live safe, responsible and healthy lives. Similarly, the emphasis on analysing and justifying conclusions in mathematical situations helps prepare pupils for taking critical and analytical approaches to real-life situations.
- An open mind and an appreciation of how different cultures have influenced society are important in understanding what it means to be a responsible citizen. The mathematics programme of study takes into account the rich historical and cultural roots of mathematics, encouraging pupils to appreciate the diverse nature of mathematics and recognise the role of mathematics in modern society. Through exploring real data pupils are able to investigate real-life issues and problems related to social justice, globalisation and environmental changes.

**b. Key Stage 3 Aims**

- To provide a chronological continuation of the Mathematical studies carried out in Key Stage 2.
- To make Mathematics lessons fun, interactive and relevant to the children's lives.
- To treat Mathematics as a series of puzzles and problems to be investigated and solved.
- To continue to develop essential learning skills such as literacy, numeracy and ICT skills as well as general skills such as enquiry, creativity, communication and independent and collaborative work through the key processes of enquiry and study.
- To develop pupils' ability to ask pertinent questions, evaluate evidence, detect bias, identify and analyse different interpretations of the past, and learn how to substantiate any arguments and judgements they make.
- To assist in the building of each child's confidence and self-worth as they become increasingly independent and are open to the excitement and inspiration offered by human achievements.
- To stimulate in pupils a fascination and understanding of mathematics by firing their imagination, moving and inspiring them with dilemmas, puzzles and possible solutions
- To help pupils develop the ability to present their ideas in a coherent manner whereby they are able to substantiate and justify their arguments.
- Through the extensive use of group discussion and the increasing use of different media for researching and presenting their work developing in all children the confidence to perform effectively and to appreciate the ideas of others and the value of working with others with different perspectives.
- To develop pupils ability to think and work democratically and in an active and responsible manner.
- To prepare pupils with a firm mathematical grounding and the necessary skills required to successfully move on to the GCSE Mathematics course in Key Stage 4.

**c. Key Stage 4 Aims**

- To undertake the full GCSE course in Mathematics.
- A GCSE specification in Mathematics encourages candidates to develop a positive attitude towards Mathematics.
- To consolidate basic skills and meet appropriately challenging work.
- To apply mathematical knowledge and understanding to a wide range of problems and global issues in order to seek solutions.
- To think and communicate mathematically, with precision, logic and creativity.
- To appreciate the place and use of mathematics in society.
- To apply mathematical concepts to situations arising in their own lives.
- To understand the interdependence of different branches of mathematics.

- To acquire the skills needed to use technology such as calculators and computers effectively.
- To work cooperatively, independently, practically and to learn how to explore and investigate.
- To acquire a firm foundation for further study.

## **2. INCLUSION OF ALL PUPILS**

### **a. Setting suitable learning challenges**

- We aim to give every pupil the opportunity to experience success in learning and to achieve as high a standard as possible. The school curriculum programmes of study set out what most pupils should be taught at each key stage – but we teach the knowledge, skills and understanding in ways that suit our particular pupils' abilities at any given time. This may mean choosing knowledge, skills and understanding from earlier or later key stages so that individual pupils can make progress and show what they can achieve. Where it is appropriate for pupils to make extensive use of content from an earlier key stage, there may not be time to teach all aspects of the age-related programmes of study. A similarly flexible approach is applied to take account of any gaps in pupils' learning resulting from missed or interrupted schooling (for example, that may be experienced by travelers, refugees, those in care or those with long-term medical conditions, including pupils with neurological problems, such as head injuries, and those with degenerative conditions).
- For pupils who have been traumatised by previous experiences or schooling and need to follow a gentler pace provision is made to ensure these pupils receive time in the school day to rebuild their confidence and enthusiasm for learning. In certain circumstances this may lead to a reduction in homework, a lessening of written work in class or attendance on a part time basis. However these provisions are carefully monitored and regularly reviewed by staff in consultation with the pupil and parents.
- For pupils whose attainments fall significantly below the expected levels at a particular key stage, a much greater degree of differentiation is necessary. In these circumstances, teachers may need to use the content of programmes of study as a resource or to provide a context, in planning learning appropriate to the age and requirements of their pupils.
- For pupils whose attainments significantly exceed the expected level of attainment in English during a particular key stage, teachers plan suitably challenging work. As well as drawing on work from later key stages or higher levels of study, teachers may plan further differentiation by extending the breadth and depth of study within Mathematics or by planning work that draws on the content of different subjects.

### **b. Responding to pupil's diverse learning needs**

- When planning, teachers set high expectations and provide opportunities for all pupils to achieve, including boys and girls, pupils with special educational needs, pupils from all social and cultural backgrounds, pupils from different ethnic groups including travelers, refugees and asylum seekers, and those from diverse linguistic backgrounds. We are aware that pupils bring to the school different experiences, interests and strengths, which will influence the way in which they learn. Teachers plan their approaches to teaching and learning so that pupils can take part in lessons fully and effectively.

- To ensure that we meet the full range of pupils' needs, teachers are aware of the requirements of the equal opportunities legislation that covers race, gender and disability.
- Teachers take specific action to respond to pupils' diverse needs by creating effective learning environments, securing pupil's motivation and concentration, providing equality of opportunity through teaching approaches, using appropriate assessment approaches and by setting flexible targets for learning.
- We also trust that if all of the above is set in place individual children will invariably begin to fulfill their potential. Targets for learning are not written in stone and take into consideration that each child learns at a different pace.

### **c. Overcoming potential barriers to learning and assessment for individuals and groups of pupils**

A minority of pupils will have particular learning and assessment requirements which go beyond the provisions described above and, if not addressed, can create barriers to learning. These requirements are likely to arise as a consequence of a pupil having a special educational need or disability or may be linked to a pupil's progress in learning English as an additional language.

#### **Pupils with special educational needs**

We provide access to learning for pupils with special educational needs by:

- Providing for pupils who need help with communication. Language and literacy.
- Planning, where necessary, to develop pupils' understanding through the use of all available senses and experiences.
- Planning for pupils' full participation in learning and in physical and practical activities.
- Helping individuals to manage their emotions, particularly trauma and stress, and to take part in learning.

#### **Pupils with disabilities**

The school takes specific action to enable effective participation of pupils with disabilities by:

- Planning appropriate amounts of time to allow for the satisfactory completion of tasks.
- Planning opportunities, where necessary, for the development of skills in practical aspects of Mathematics.
- Identifying aspects of programmes of study and attainment targets that may present specific difficulties for individuals.

#### **Pupils who are learning English as an additional language**

- The school takes specific action to help pupils who are learning English as an additional language by:
  - Developing their spoken and written language
  - Ensuring access to curriculum and to assessment

#### **d. Inclusion in Mathematics**

To overcome any potential barriers to learning in Mathematics, some pupils may require:

- Specific help with number recall or the interpretation of data represented in graphs, tables or bar charts, to compensate for difficulties with long- or short-term memory or with visual impairment.
- Access to tactile and other specialist equipment for work relating to shape, space and measures, to overcome difficulties in managing visual information.
- Help in interpreting or responding to oral directions when making mental calculations, to compensate for difficulties in hearing or with auditory discrimination.
- Access to equipment or other resources, such as ICT to overcome difficulties in thinking and working in the abstract.

In Assessment:

- When judgements against level descriptions are required, these will, where appropriate, allow for the provision of the above.

### **3. MATHEMATICS, PERSONAL DEVELOPMENT AND EVERY CHILD MATTERS**

Personal development is an essential aspect of the New Forest Small School's curriculum and Mathematics has an important role to play in this area. The Mathematics Schemes of Work provide opportunities to plan sequences of work, learning outcomes and teaching approaches that support personal development through Every Child Matters outcomes.

#### **a. Enjoy and Achieve**

- Mathematics can be enjoyed as a worthwhile activity for its own sake and as a powerful tool in a wide range of applications. Enjoyment stems from the creative and investigative aspects of mathematics, from developing mathematical ways of perceiving the world and recognising underlying structures and connections between mathematical ideas.
- Mathematics is a subject that empowers pupils to prove results. Pupils develop their problem-solving, decision-making and reasoning skills through working on a range of tasks.

#### **b. Be Healthy**

- Mathematics enables pupils to understand the numerical data related to becoming and staying healthy. Monitoring nutritional intake, blood sugar levels and cardiovascular health are all examples where mathematics assists understanding and can lead to making healthy decisions. By becoming financially capable, young people are able to exert greater control over factors affecting their health such as housing and money management. Strategy games and logic puzzles are an important part of maintaining mental health.

#### **c. Stay Safe**

- Understanding risk through the study of probability is a key aspect of staying safe and making balanced risk decisions. Pupils learn to understand the probability scale and use it as a way of communicating risk factors. They develop an understanding of how

data leads to risk estimates. By understanding probability and risk factors young people are able to make informed choices about investments, loans and gambling.

#### **d. Achieve Economic Wellbeing**

- An understanding of mathematics, and confidence in using a variety of mathematical skills, are both key to young people's ability to play their part in modern society. The skills of reasoning with numbers, interpreting graphs and diagrams and communicating mathematical information are vital in enabling individuals to make sound economic decisions in their daily lives. Mathematics skills and habits of mind are highly prized by many employers and mathematics is a gatekeeper to many careers and professions.

#### **e. Make a Positive Contribution**

- Having confidence and capability in mathematics allows pupils to develop their ability to contribute to arguments using logic, data and generalisations with increasing precision. This in turn allows pupils to take a greater part in a democratic society. Becoming skilled in mathematical reasoning means pupils learn to apply a range of mathematical tools in familiar and unfamiliar contexts.

## **4. SKILLS**

### **a. General and Functional Skills**

The study of Mathematics provides pupils with a broad range of opportunities for developing different skills important for learning and for life beyond the classroom. Pupils are encouraged to apply their different skills in everyday situations as they spend time planning and developing their work, make choices and decisions, and think creatively and independently.

- The school develops the key skills necessary to be functional in mathematics – representing, analysing, interpreting, evaluating, communicating and reflecting.
- The schemes of work in Key Stage 3 lay the groundwork for pupils to apply their mathematics to real contexts in Key Stage 4, whilst introducing pupils to a range of real life uses of mathematics.
- There is plenty of opportunity for pupils to communicate effectively in class discussions, in-group activities as well as through their written work.
- Pupils are given broad scope to express themselves clearly and succinctly whilst developing their own point of views through careful analysis, reasoning and persuasion.
- Mathematics incorporates the development of many cross-curricular skills including skills essential to History, ICT, Geography, Science, English, PSHE and Art and Design. Although cross-curricular activities take place in each lesson, time is also given in the timetable for thematic days, activity weeks and events.
- Pupils are always encouraged to read and understand information and instructions, then to use this understanding to act appropriately.

## **b. PLTS**

The study of Mathematics also supports PLTS (Personal, Learning and Thinking Skills), whereby the pupils are able to develop the ability to become independent enquirers, creative and reflective thinkers, team workers, self-managers and effective participants.

### **i. Independent Enquirers**

The programme of study requires students to work on open and closed tasks in a variety of contexts that allow them to select the mathematics to use. The key concept of competence requires students to process and evaluate information, applying mathematics to familiar and unfamiliar contexts. Students plan what to do, selecting the most appropriate methods, tools and models when representing situations or problems.

### **ii. Creative Thinkers**

The key concept of creativity requires students to combine understanding, experiences, imagination and reasoning to construct new knowledge. They are also expected to use existing mathematical knowledge in novel contexts. By adopting a questioning approach they develop their own lines of enquiry and convincing arguments to support their decisions and conclusions. When deciding on how to use mathematics to model a situation or solve a problem students need to think creatively, drawing on their knowledge and understanding of mathematics and identifying the mathematical features that are important.

### **iii. Team Workers**

The mathematics programme of study provides opportunities for students to work collaboratively as well as independently to solve mathematical problems in a range of contexts. Knowing about the history of mathematics and the mathematics of different cultures encourages and supports students to listen to, and be sensitive to, different views and broadens their perspective on the subject.

### **iv. Self-Managers**

Students are expected to work independently on extended tasks that bring together different aspects of mathematical content, using several of the key processes. They will make decisions autonomously while working towards goals, showing initiative, confidence, commitment and perseverance.

### **v. Effective Participators**

Students' use of mathematical ideas and models to explore issues or problems is mediated through the key concept of critical understanding. When interpreting and evaluating, students should be able to develop convincing arguments to influence others and take part in discussions. Working on problems that arise in other subjects and outside school helps students understand how mathematics is relevant in all areas of life.

### **vi. Reflective Learners**

Students will be expected to evaluate their own and others' work and respond constructively. The key process of analysing requires them to work logically towards results and solutions, and to value feedback and learn from mistakes.

### **vii. Embedding PLTS**

A range of PLTS can be embedded in any sequence of work whilst planning. For example, students might be asked to investigate and compare different ways of upgrading and paying for a new mobile phone over several lessons. This would involve students:

- INDEPENDENT ENQUIRERS - Identifying questions to answer and problems to solve, planning and carrying out research to compare pay as you go with contract phones.
- CREATIVE THINKERS - Generating ideas and constructing mathematical models, exploring possibilities by carrying out calculations, varying values and following their own ideas.
- REFLECTIVE LEARNERS – Discussing and writing up their findings, reflecting on and communicating what they have learnt, selecting appropriate mathematical representations.
- TEAM WORKERS – Collaborating with others to prepare a class presentation, showing confidence in themselves, their contribution and their findings.
- SELF-MANAGERS – Working towards goals, organising time and resources, and prioritising actions.
- INDEPENDENT ENQUIRERS – Comparing students' approaches and findings and making judgements about how they compare with their own.
- EFFECTIVE PARTICIPATORS – Proposing practical ways forward, breaking the problem and analysis down into manageable steps.

## **5. CROSS-CURRICULUM DIMENSIONS**

Cross-curriculum dimensions provide important unifying areas of learning that help young people make sense of the world and give education relevance and authenticity. They reflect the major ideas and challenges that face individuals and society. Subjects and topics are not taught in isolation but with constant reference to other subjects in the curriculum or other topics areas in Mathematics. At all times children are encouraged to see and investigate the connections between different disciplines as well as the connections with their own lives.

Cross-curriculum dimensions include the key areas of identity and cultural diversity, healthy lifestyles, social participation, enterprise, global dimension and sustainable development, technology and the media, and creative and critical thinking.

Dimensions are incorporated into the school timetable by:

- Outlining the connections across subjects where there are common issues or areas of learning
- Specifically timetabled thematic days, activity weeks and events
- General activities integrated into the school day routine
- Educational visits
- Using experts from outside of the school to stimulate discussion and debate

## **6. ASSESSMENT**

### **a. Key Stage 3 Assessment**

In Key Stage 3 the children are assessed in a multitude of different ways. The emphasis is on non-pressurised and often fun means of assessing children's ability and mathematical understanding in a way that benefits the individual child. Assessment is a means by which the school gains a greater understanding of how to help each pupil develop and find success. Therefore assessment can vary from pupil to pupil as we try to avoid setting children up to fail and seek the most useful and pragmatic way to help our pupils succeed. Most assessment is carried out on a daily basis through extensive class discussions involving all pupils, through 1 to 1 tuition and through careful observation. Each child is assessed with reference to their own unique abilities and skills.

Pupils at the New Forest Small School are assessed in the following ways, although each assessment procedure is tailored, as much as possible, to the individual child's specific needs:

- Daily assessment through teacher observation.
- Teacher assessment through extensive and in depth class discussions involving all pupils.
- One to one assessment through individual tuition carried out during free choice and during independent tasks carried out in lesson.
- Weekly homework.
- Regular quizzes and challenges.
- At the end of each half term pupils take a short, fun test.
- Assessment through end of year exams for Year 7, 8 and 9 pupils.
- Regular staff meetings where the general progress of each child is discussed and whereby a greater understanding of each child's assessment needs is gained.
- Regular discussions with each child's parents to assess the child's progress both at home and at school.

#### **b. Key Stage 4 Assessment**

In Key Stage 4 pupils begin their GCSE course in Maths with OCR examination board. Consequently much of the assessment is specific to this course. However most of the assessment procedures listed above continue to apply to Key Stage 4 pupils. Only 4 of the units below are assessed and pupils.

Specific to Key Stage 4 assessment are the following procedures:

Please see OCR Mathematics GCSE Specification Scheme of Assessment

#### **c. Qualification Titles and Levels**

This qualification is shown on a certificate as OCR GCSE in Mathematics. Candidates who gain Grades D to G will have achieved an award at Foundation Level 1. Candidates who gain Grades A\* to C will have achieved an award at Intermediate Level 2.

## **7. MATHEMATICS LESSONS AND RESOURCES**

### **a. Typical Structure of Lessons**

Although Maths lessons can vary in structure according to the requirements at the time the general pattern of Maths lessons are as follows:

**i. Introduction**

- Remind class of last topic area explored and relate to current topic.
- Discuss and explore.
- Practical Application – discuss how topic area is applied in every life.
- Making Connections – discuss and explore connections between topic and other topic areas and subjects.

**ii. Main Activity** (involving one or more of the following)

- Drama – Pupils enact areas of topic.
- Group Work – Set small groups an area to explore.
- Individual research.
- Media – use video clips and programmes and/or computer programmes and websites where appropriate.
- Record through text and illustrations. Record using their own words.

**iii. Conclusion**

- Concluding discussion, recapping the main points.
- Short quiz.
- Setting of homework.

**b. Resources**

The following resources are used in class where and when appropriate:

- Interactive Whiteboard
- OCR Maths Resources
- Maths Books
- Maths Worksheets
- ICT Equipment
- Maths CD ROMs
- Internet Maths Learning Sites
- General Mathematical Equipment
- Mathematical Games

## 8. KEY CONCEPTS

There are a number of key concepts that underpin the study of Mathematics. These key concepts are applied across the Mathematics Schemes of Work and are therefore incorporated into the general topic areas of Number and Algebra, Geometry and Measures, and Statistics.

### 1. Mathematical Competence

- a. Applying Mathematics
  - i. Managing Finances
  - ii. Assessing Risk
  - iii. Problem Solving
  - iv. Decision Making
  - v. Cross-Curricular
- b. Communicating Mathematically
  - i. Mathematical Notation
  - ii. Mathematical Conventions
  - iii. Oral Communication
  - iv. Written Communication
- c. Using Mathematical Tools
  - i. Calculators
  - ii. Graphic Calculators
  - iii. Dynamic Geometry
  - iv. Spreadsheets
- d. Mathematical Methods
  - i. Equivalence
  - ii. Proportional Thinking
  - iii. Algebraic Structure
  - iv. Relationships
  - v. Axiomatic Systems
  - vi. Symbolic Representation
  - vii. Proof
  - viii. Operations
  - ix. Inverses

### 2. Mathematical Creativity

- a. Constructing New Mathematical Knowledge
  - i. Through Understanding
  - ii. Through Experience
  - iii. Through Imagination
  - iv. Through Reasoning
- b. Using Existing Mathematical Knowledge
  - i. Solutions to Unfamiliar Problems
- c. Posing Questions
  - i. Questioning Data
  - ii. Questioning Evidence
  - iii. Considering and Analysing Alternatives
  - iv. Developing Convincing Arguments

### 3. Applications and Implications of Mathematics

- a. Mathematics as a Tool
  - i. Financial Decisions
  - ii. Architecture / Building
  - iii. Design
  - iv. Engineering
  - v. Geographical / Environmental Models
  - vi. Weather Forecasting

- vii. Science
- viii. Internet
- ix. Sociological Models
- x. Elections
- xi. Managing Risk
- xii. The Value and Limitations of a Mathematical Perception of the World
- b. Historical and Cultural Roots of Mathematics
  - i. History of the Number 1
  - ii. Historical Development of Mathematics
  - iii. Development of New Mathematical Areas
  - iv. Global Problems and Issues Resolved Mathematically
  - v. The Mathematical Origins of Different Practical Applications
  - vi. The Continuing Development of Mathematics

#### 4. Critical Understanding

- a. Nature of Mathematics
  - i. Abstract Models
  - ii. Abstract Interpretations
  - iii. Abstract Representations
- b. Limitations and Scope of Mathematics
  - i. Making Sense of the World
  - ii. Creating Future Scenario Models
  - iii. Solving Problems
  - iv. Creating New Problems
  - v. Complexities of Everyday and Global Situations
  - vi. The Limitations of the Linear, Abstract Interpretation of Situations
  - vii. Can Mathematical Models Represent and Interpret Real Life?
  - viii. Bias of Selective Mathematical Models and Data

## 9. KEY PROCESSES

These key processes are the essential skills that are necessary for the study of Mathematics. These key processes are applied across the Mathematics Schemes of Work and are therefore incorporated into the general topic areas of Number and Algebra, Geometry and Measures, and Statistics.

### 1. Representing

- a. Identifying the Mathematical Aspects of a Situation or Problem
  - i. Simplifying the Situation or Problem
  - ii. Where is the Maths?
  - iii. Major Features
  - iv. Mathematical Experimentation
- b. Choosing Between and Creating Mathematical Representations
  - i. Using Appropriate Variables
  - ii. Using Appropriate Symbols
  - iii. Using Appropriate Diagrams
  - iv. Using Appropriate Models
- c. Selecting Mathematical Information, Models and Tools
  - i. Systematic Methods
  - ii. Breaking Down a Problem
  - iii. Using Existing Knowledge
  - iv. Statistical Investigations
  - v. Minimising Sources of Bias in Experiments and Surveys
  - vi. Methods for Collecting Primary and Secondary Data
  - vii. Use of ICT Tools
  - viii. Iteration
  - ix. Algorithms

## 2. Analysing – Using Mathematical Reasoning

- a. Making Connections
  - i. Different Representations for the Same Situation or Problem
  - ii. Connections between Different Data
  - iii. Statistical Connections
  - iv. Related Problems or Situations
- b. Making Generalisations
  - i. Identifying and Classifying Patterns
  - ii. Making Conjectures and Generalisations
  - iii. Considering Special Cases
  - iv. Considering Counter-Examples
  - v. The Limitations of Generalisations
- c. Varying Values
  - i. Identifying Invariance
  - ii. Identifying Covariance
  - iii. Changing Values
  - iv. Exploring Statistical Situations with Random Variations
  - v. Exploring Statistical Situations with Systematic Variations
- d. Learning from Mistakes
- e. Listening to and Responding to Feedback
- f. Using Different Techniques
  - i. Being Adaptable
  - ii. Working Backwards
  - iii. Simplification
- g. Working Towards Logical Results
  - i. Logical Understanding of a Situation or Problem
  - ii. Inductive Reasoning
  - iii. Deductive Reasoning
  - iv. Impact of Constraints
  - v. Impact of Assumptions

## 3. Analysing – Using Appropriate Mathematical Procedures

- a. Accurate Representations
  - i. Diagrams
  - ii. Graphs
  - iii. Mathematical Constructions
  - iv. Notation
  - v. Syntax when using ICT
- b. Accurate Calculations
  - i. Mental Methods
  - ii. Written Methods
  - iii. Using a Calculator
- c. Appropriate Manipulation
  - i. Numbers
  - ii. Algebraic Expressions
  - iii. Algebraic Equations
  - iv. Routine Algorithms
- d. Accurate Records
  - i. Recording Findings
  - ii. Methods
  - iii. Solutions
  - iv. Conclusions
- e. Estimating
- f. Approximating
- g. Checking Workings

4. Interpreting and Evaluating
  - a. Forming Convincing Arguments
    - i. Based on Findings
    - ii. Analyse of Findings
    - iii. Evaluation of Findings
    - iv. Consideration of Assumptions Made
    - v. Empirical Evidence
    - vi. Difference Between Evidence and Proof
    - vii. Checking Appropriateness and Accuracy of Results and Conclusions
    - viii. Making Conclusions
    - ix. Making General Statements
    - x. Creating Possible Solutions to Problems
  - b. Finding Patterns and Exceptions
    - i. Patterns
    - ii. Predictability
    - iii. Exceptions
    - iv. Random Processes
    - v. Unpredictability
  - c. Context
    - i. Original Context
    - ii. Does the Original Context Support or Refute Conjectures
  - d. Interpreting and Evaluating Other's Data
    - i. Other Pupil's Data
    - ii. Media's Data
    - iii. Advertising Data
    - iv. Scientific Data
    - v. Environmental Data
  - e. Using Alternative Strategies
5. Communicating and Reflecting
  - a. Effective Oral Communication
  - b. Effective Written Communication
  - c. Alternative Solutions
    - i. ICT
  - d. Equivalence
    - i. Different Approaches to the Same Problem
    - ii. Different Problems with the Same Structures
  - e. Connections
    - i. Between Current Situation and Outcomes
    - ii. Between Previous Situations and Outcomes

## **10. SUMMARY OF MATHS CONTENT**

1. Number
2. Algebra
3. Geometry and Measures
4. Statistics

**11. MATHEMATICS SCHEMES OF WORK****YEAR 7****Autumn Term****1. NUMBER****1. Sequences**

- a. Simple Integer Sequences
  - i. Times Tables
  - ii. Fractions
  - iii. Decimals
  - iv. Negative Numbers
  - v. Through Mental Addition
  - vi. Through Mental Subtraction
  - vii. Missing Numbers
  - viii. Practical Contexts
  - ix. Justifying and Explaining Answers
- b. Describing Sequences
  - i. With Words
  - ii. Through Algebra
- c. Generating Terms of a Simple Sequence to a Rule
  - i. Term to Term
  - ii. Position to Term
- d. Increasing and Decreasing Sequencing Steps
  - i. Fibonacci Numbers
  - ii. Square Numbers
  - iii. Rectangular Numbers
  - iv. Triangular Numbers
  - v. Cubic Numbers

**2. Place Values**

- a. Identifying Place Value of Digits
  - i. Reading Numbers
  - ii. Decimals
  - iii. Place Value Chart
  - iv. Through Mental Addition
  - v. Through Mental Subtraction
  - vi. Negative Numbers

**3. Decimals**

- a. What is a Decimal?
  - i. Decimals in Everyday Life
- b. Ordering Decimals
  - i. Using a Number Cards
  - ii. Using a Number Line
  - iii. Using Partitioning
- c. Addition of Decimals
  - i. Mental Addition
  - ii. Most Significant Digit
  - iii. Estimating
  - iv. Zero Place Holder
  - v. Written Addition
  - vi. Solving Word Problems
  - vii. Addition with Calculator

- viii. Justifying and Explaining Answers
- d. Subtraction of Decimals
  - i. Mental Subtraction
  - ii. Most Significant Digit
  - iii. Estimating
  - iv. Zero Place Holder
  - v. Written Subtraction
  - vi. Solving Word Problems
  - vii. Subtraction with Calculator
  - viii. Justifying and Explaining Answers

#### 4. Negative Numbers

- a. What is a Negative Number?
  - i. Positive and Negative Numbers
  - ii. Negative Numbers in Everyday Life
  - iii. Temperatures
  - iv. Using Negative Numbers on a Calculator
- b. Ordering Negative Numbers
  - i. Using a Number Cards
  - ii. Using a Number Line
  - iii. Using Partitioning
- c. Addition of Negative Numbers
  - i. Mental Addition
  - ii. Most Significant Digit
  - iii. Estimating
  - iv. Zero Place Holder
  - v. Written Addition
  - vi. Solving Word Problems
  - vii. Addition with Calculator
  - viii. Justifying and Explaining Answers
- d. Subtraction of Negative Numbers
  - i. Mental Subtraction
  - ii. Most Significant Digit
  - iii. Estimating
  - iv. Zero Place Holder
  - v. Written Subtraction
  - vi. Solving Word Problems
  - vii. Subtraction with Calculator
  - viii. Justifying and Explaining Answers

#### 5. Fractions

- a. Sequencing Fractions
- b. Equivalent Fractions
  - i. Recognising Equivalent Fractions
  - ii. Converting Between Fractions
  - iii. Comparing Fractions
  - iv. Finding Common Factors
  - v. Numerators
  - vi. Denominators
  - vii. Cancelling all Common Factors
  - viii. Equivalent Snap Game
  - ix. Relating Fractions to Division
  - x. Relating Fractions to Multiplication
- c. Equivalence of Fractions and Decimals
  - i. Converting Fractions into Decimals
  - ii. Converting Decimals into Fractions

- d. Addition of Fractions
  - i. Doubling
  - ii. Mental Addition
  - iii. Estimating
  - iv. Written Addition
  - v. Solving Word Problems
  - vi. Justifying and Explaining Answers
- e. Subtraction of Fractions
  - i. Halving
  - ii. Mental Subtraction
  - iii. Estimating
  - iv. Written Subtraction
  - v. Solving Word Problems
  - vi. Justifying and Explaining Answers

## 6. Percentages

- a. Equivalent of Percentages, Fractions and Decimals
  - i. Recognising Equivalence and Comparing
  - ii. Using Number Lines
  - iii. Converting Fractions to Percentages
  - iv. Converting Percentage to Fractions
  - v. Converting Decimals to Percentages
  - vi. Converting Percentages to Decimals
  - vii. Finding Common Factors
  - viii. Equivalence Snap Game
  - ix. Relating Percentage to Division
  - x. Relating Percentage to Multiplication
- b. Common Percentages
- c. Calculating Percentages
  - i. Using Common Percentages
  - ii. Mental Calculation
  - iii. Estimating
  - iv. Using Spider Diagram
  - v. Written Calculation
  - vi. Solving Word Problems
  - vii. Justifying and Explaining Answers

## 2. ALGEBRA

### 7. Introduction to Algebra

- a. What is Algebra?
  - i. Using Letter Symbols
  - ii. Mathematical Shorthand
  - iii. Unknown Numbers
  - iv. Unknown Variables
  - v. Equations
  - vi. Practical Application of Algebra
  - vii. Scientific Use of Algebra
- b. Rules of Algebra
  - i. Addition of 2 Numbers with the Same Sign
  - ii. Addition of 2 Numbers with Different Signs
  - iii. Multiplication and Signs
  - iv. Use of Letters
  - v. Use of Brackets

- c. Developing Use of Algebra
  - i. Using a Number Machine
  - ii. Using Mapping
  - iii. Using Shape Symbols
  - iv. Letter Symbols
  - v. What Next? Why?
  - vi. Tables
  - vii. Writing Equations
  - viii. Writing Expressions
  - ix. Inverse Operations
  - x. Significance of Counter Examples
  - xi. Properties of Functions
  - xii. Identifying Common Errors and Differences
- d. Algebraic Addition
  - i. Mental Addition
  - ii. Most Significant Digit
  - iii. Estimating
  - iv. Written Addition
  - v. Solving Word Problems using Algebra
  - vi. Justifying and Explaining Answers
- e. Algebraic Subtraction
  - i. Mental Subtraction
  - ii. Most Significant Digit
  - iii. Estimating
  - iv. Written Subtraction
  - v. Solving Word Problems
  - vi. Justifying and Explaining Answers
- f. Using Algebra
  - i. Use of Brackets in Algebra
  - ii. BODMAS
  - iii. Extended Chain Problem

### 3. GEOMETRY AND MEASURES

#### 8. Area

- a. Introduction to Area
  - i. What is Area?
  - ii. Which Tetrominos are Easiest to Calculate?
  - iii. Surface Area
  - iv. Explanation of Area Formulae Using Letters
- b. Area Rules
  - i. Squares
  - ii. Rectangles
- c. Calculating Area
  - i. Estimating Area
  - ii. Taking Measurements
  - iii. Squares
  - iv. Rectangles
  - v. Compound Shapes
  - vi. Solving Word Problems
  - vii. Justifying and Explaining Answers

## 9. Perimeter

- a. Introduction to Perimeter
  - i. What is the Perimeter?
  - ii. Relationship Between Area and Perimeter
  - iii. Do Shapes with the Same Area Always have the Same Perimeter?
  - iv. Which Tetrominos are Easiest to Calculate?
  - v. Explanation of Perimeter Formulae Using Letters
- b. Calculating Perimeter
  - i. Estimating Perimeter
  - ii. Taking Measurements
  - iii. Squares
  - iv. Rectangles
  - v. Compound Shapes
  - vi. Calculating Missing Number Sizes on a Shape
  - vii. Solving Word Problems
  - viii. Justifying and Explaining Answers

## 10. 3-D Shapes

- a. Introduction to 3-D Shapes
  - i. What are 3-D Shapes?
  - ii. What Solids can be Made?
- b. Relationship between 2-D and 3-D Shapes
  - i. 2-D Shapes – Squares, Rectangles and Triangles
  - ii. Cubes
  - iii. Cuboids
  - iv. Cylinders
  - v. Hemispheres
  - vi. Prisms
  - vii. Pyramids
  - viii. Square-Based Pyramid
  - ix. Sphere
  - x. Tetrahedron
- c. 3-D Properties
  - i. Net
  - ii. Edges
  - iii. Faces
  - iv. Vertex
  - v. Vertices
  - vi. Symmetry
  - vii. Combined 3-D Shapes
- d. Making and Drawing 3-D Shapes
  - i. Cubes
  - ii. Cuboids
  - iii. Cylinders
  - iv. Hemispheres
  - v. Prisms
  - vi. Pyramids
  - vii. Square-Based Pyramid
  - viii. Sphere
  - ix. Tetrahedron
  - x. Compound Shapes

- e. Measuring 3-D Shapes
  - i. Cubes
  - ii. Cuboids
  - iii. Surface Area
  - iv. Length
  - v. Width
  - vi. Height
  - vii. Perimeter
  - viii. Using Formulas

## 11. Angles

- a. Introduction to Angles
  - i. What is an Angle?
  - ii. Acute
  - iii. Right Angle
  - iv. Obtuse
  - v. Reflex
- b. The Sum of Angles for Different Shapes
  - i. Squares and Rectangles
  - ii. Triangles
  - iii. Circles
- c. Calculating Angles
  - i. Naming Angle
  - ii. Estimating
  - iii. Measuring
  - iv. Calculating the Missing Angle
  - v. Recognising Vertically Opposite Angles
  - vi. Solving Word Problems
  - vii. Justifying and Explaining Answers
- d. Using Angles
  - i. Using Angles to Give Instructions
  - ii. Turnabout Activity
- e. Angles on a Line
  - i. Parallel Lines
  - ii. Perpendicular Lines
  - iii. Angles on a Straight Line Using Algebra

## 12. Co-Ordinates

- a. Identifying Co-Ordinates
  - i. 2-D Co-ordinates
  - ii. Quadrants
  - iii. Using Geometric Information
  - iv. Axis & Axes
- b. Using Co-Ordinates
  - i. Notation for Co-Ordinates
  - ii. Reading Co-Ordinates from a Plotted Shape
  - iii. Plotting a Shape from a List of Co-Ordinates
  - iv. Battleships Game

## 4. STATISTICS

### 13. Averages

- a. Calculating Averages
  - i. Mode
  - ii. Modal Class
  - iii. Modal Group
  - iv. Median
  - v. Mean
  - vi. Comparing Mean, Median and Mode
  - vii. Range
  - viii. Hidden Numbers
  - ix. Solving Word Problems
  - x. Justifying and Explaining Answers
- b. Collecting Data for Averages
  - i. Familiar In Class Data
  - ii. Simple Frequency Table
  - iii. Grouped Data
  - iv. Geographical Data
  - v. Data Handling Games

### 14. Handling Data

- a. Interpreting Diagrams and Graphs
  - i. Bar Chart
  - ii. Bar Line Chart
  - iii. Frequency Diagram
  - iv. Compound Bar Chart
  - v. Pie Chart
  - vi. Interpreting Shapes of the Graph
  - vii. Same Chart – Different Scales
  - viii. Interpreting Geographical Data
  - ix. Visual Interpretation of a Pie Chart
  - x. Visual Calculation of Angle Degrees / Fractions
- b. Probability Scales
  - i. Creating a Probability Scale
  - ii. Finding and Justifying Probabilities
  - iii. Chance / Likelihood
  - iv. Higher or Lower Chance Games
  - v. Probability of Dice
  - vi. Probability of Cards
  - vii. Probability as a Fraction
  - viii. Interactive Likelihoods Scale
  - ix. Interactive Probability Scale
  - x. Recording in a Frequency Table
  - xi. Estimating Probabilities
  - xii. Prediction Games
  - xiii. Predicting Level of Risk

## Spring Term

### 4. STATISTICS

#### 15. Collecting Data

- a. Surveys and Questionnaires
  - i. Everyday Subject Matter
  - ii. Compiling a Questionnaire
  - iii. Straw Polls
  - iv. Tally
  - v. Using a Sheet Database
- b. Creating Data Sheets
  - i. Identifying Relevant Data
  - ii. Key Questions
  - iii. Deciding Data Sources
  - iv. Collecting and Organising Sources
  - v. Designing a Data Collection Sheet / Questionnaire
  - vi. Constructing Bar Line Graphs
  - vii. Constructing Grouped Frequency Diagrams
  - viii. Constructing Pie Charts using ICT
  - ix. Justifying and Explaining Methods
- c. Interpreting Data Displays
  - i. Identifying Key Figures
  - ii. Ease of Misinterpretation
  - iii. Misleading Charts
  - iv. Problem of Questions Asked to Obtain Data
  - v. Justifying and Explaining Methods

### 1. NUMBER

#### 16. Calculations

- a. Mental Calculations
  - i. Rounding off Numbers to nearest 10, 100, 1000 etc...
  - ii. Rounding off Decimals to Nearest Whole Number or 1d.p.
  - iii. Estimating
  - iv. FDP Equivalents
  - v. Mental Gym Game
  - vi. Solving Word Problems Mentally
  - vii. Cross-Curricular Mental Calculations
  - viii. Justifying and Explaining Answers
- b. Mental Strategies
  - i. Counting on and Back
  - ii. Factors
  - iii. Partitioning
  - iv. Nearly Doubles
  - v. Nearly Numbers
  - vi. Relationship between Plus and Minus
  - vii. Extending Known Sums to their Multiples
- c. Addition
  - i. Mental Addition
  - ii. Most Significant Digit
  - iii. Estimating
  - iv. Inverse Operations
  - v. Written Addition
  - vi. Solving Word Problems
  - vii. Addition with Calculator
  - viii. Justifying and Explaining Answers

- d. Subtraction
  - i. Mental Subtraction
  - ii. Most Significant Digit
  - iii. Estimating
  - iv. Inverse Operations
  - v. Written Subtraction
  - vi. Solving Word Problems
  - vii. Subtraction with Calculator
  - viii. Justifying and Explaining Answers
- e. Multiplication
  - i. Mental Multiplication
  - ii. Most Significant Digit
  - iii. Estimating
  - iv. Inverse Operations
  - v. Written Multiplication
  - vi. Solving Word Problems
  - vii. Multiplication with Calculator
  - viii. Justifying and Explaining Answers
- f. Division
  - i. Mental Division
  - ii. Most Significant Digit
  - iii. Estimating
  - iv. Inverse Operations
  - v. Long Division
  - vi. Solving Word Problems
  - vii. Division with Calculator
  - viii. Justifying and Explaining Answers
- g. Comparing the Four Operations
  - i. Relationships between 4 Operations
  - ii. Inverse Operations
  - iii. Estimating
  - iv. Level of Efficiency between Different Operations
  - v. Calculate Missing Numbers
  - vi. Relating Division to Fractions
  - vii. Commutative Law
  - viii. Distributive Law
  - ix. Associative Law
  - x. The '24' Game
  - xi. Express in Algebraic Formula
  - xii. Using Brackets
  - xiii. Memory
  - xiv. Square Root
  - xv. Sign Key Changes
  - xvi. Rules of BODMAS
  - xvii. Breaking Down a Complex Calculation into Smaller Steps
  - xviii. Choosing and Using Appropriate and Efficient Methods
  - xix. Solving Word Problems
  - xx. Justifying and Explaining Answers

- h. Percentages, ratio and proportion
  - i. Review concept that fractions, decimals and percentages are all parts of a total
  - ii. Recognise equivalence of %s, fractions and decimals
  - iii. Calculate simple %s
  - iv. Use equivalence between % fractions and decimals in describing proportions
  - v. Apply language of proportion interchangeably with that of F. D and %
  - vi. Understand the relationship between ratio and proportion
  - vii. Consolidate language of ratio
  - viii. Use ratio notation
  - ix. Reduce ratio to its simplest form and divide a quantity into 2 parts in a given ratio
  - x. Use informal strategies with ratio and proportion to solve problems
  - xi. Link ratios to equivalent fractions
  - xii. Work practical problems using ratio and proportion
  - xiii. Check results by working problem backwards

### 3. GEOMETRY AND MEASURES

#### 17. Measures - units

- a. Introduction to length and measures for weight and capacity
  - i. use names and abbreviations of measurement units
  - ii. compare estimated lengths with measured lengths
  - iii. know relevant metric units (mm, cm, m, km, g, kg, ml, cl, l)
  - iv. know equivalent imperial units (inch, foot, yard, mile, ounce, pound, stone)
  - v. convert one metric unit to another (eg. cm to m)
  - vi. link skills of  $\times$  and  $\div$  by powers of 10 to conversion rules within the metric system
- b. Scales
  - i. Read and interpret scales on a range of measuring instruments
  - ii. Check a result by considering whether it is of the correct order of magnitude
- c. Drawing Lines
  - i. Use ruler to measure and draw lines to nearest mm
  - ii. Use protractor to measure and draw angles to nearest degree, including reflex angles
  - iii. Importance of accuracy

#### 18. Angles

- a. Recap meaning and language of angles
  - i. Review angle and side properties of triangles
  - ii. Review angle and side properties of quadrilaterals
  - iii. Review main shapes and size of angles of regular polygons
- b. Angle rules
  - i. Angles on a straight line
  - ii. Vertically opposite angles
  - iii. Angles in a triangle
  - iv. Using the sum of angles in triangles and quadrilaterals calculate a missing angle.
  - v. Calculate angles on a line and at a point
  - vi. Calculate angles on parallel lines
  - vii. Solve geometric problems

- c. Angles and Symmetry
  - i. Reflection symmetry
  - ii. Understand reflection, rotation and translation
  - iii. Draw in the lines of symmetry of common shapes
  - iv. Combine shapes to make a shape with a line of symmetry
- d. Constructing Angles
  - i. Estimate angles
  - ii. Demonstrate construction of triangles
  - iii. Construct triangle given 2 sides and enclosed angle
  - iv. Construct triangle given 2 angles and included side
  - v. Further constructions given SAS or ASA
  - vi. Extend to more complex constructions
  - vii. Review SAS using polygon constructions
  - viii. Draw a polygon using interior angles instead of centre angles

## 2. ALGEBRA

### 19. Equations, formulae and identities

- a. Writing down expressions / equations
  - i. Connections between algebraic operations and arithmetic operations
  - ii. Using letter symbols
  - iii. Know meanings of the words – term, variable, expression, equation
  - iv. Use expressions involving = and – accurately
  - v. Use expressions involving  $x$  and  $\div$
  - vi. Questions involving  $x, \div$ , indices and brackets
  - vii. Partitioning approach
  - viii. Construct and solve simple equations
  - ix. Use number machines to introduce equation construction
  - x. Solve given equations in context
  - xi. BODMAS

### Summer Term: First Half

## 3. GEOMETRY AND MEASURES

### 20. Transformations

- a. Recognise reflection symmetry
  - i. Recognise where a shape will be after reflection
  - ii. Recognise where a shape will be after a translation
  - iii. Use language and notation of rotation
  - iv. Understand and use the language and notation associated with reflections, translations and rotations.
  - v. Recognise and visualise the transformation and symmetry of a 2D shape.
  - vi. Reflection in given mirror lines, and line symmetry
  - vii. Rotation about a given point, and rotation symmetry
  - viii. Translation; explore transformations and symmetries using ICT
  - ix. Solve word problems and investigate in a range of contexts; shape and space
  - x. Read and plot coordinates in all four quadrants

## 4. STATISTICS

### 21. Handling data 3a

#### Interpreting and discussing results

- a. Raw Data
  - i. Data
  - ii. Primary data
  - iii. Secondary data
  - iv. Grouped data
  - v. Discrete data
  - vi. Decide which data is suited to an enquiry
  - vii. Design collection sheet or questionnaire and frequency tables
- b. Using data to draw graphs and charts
  - i. Brainstorm data
  - ii. Collect data
  - iii. Bar charts
  - iv. Pie charts
  - v. Bar-line graphs
  - vi. Compare charts
  - vii. Construct statistical diagrams
- c. Interpret diagrams
  - i. Interpret diagrams and graphs
  - ii. Draw simple conclusions based on the shape of graphs and simple statistics for a single distribution
  - iii. Find range, average (mean, median or mode) as appropriate
  - iv. Compare two simple distributions using the range and average
  - v. Write and present a short report from data and graphs

## 2. ALGEBRA

### 22. Equations

- a. Construct and solve simple linear equations
  - i. Expression
  - ii. Equation
  - iii. Formula
  - iv. Linear
  - v. Collect like terms
  - vi. Difference between an expression and an equation
  - vii. Solve simple equations
- b. Use simple formulae
  - i. Use letter symbols to represent unknown numbers or variables
  - ii. Understand that algebraic operations follow the same conventions and order as arithmetic operations
  - iii. Begin to distinguish between the different roles played by letter symbols in equations, formulae and functions
  - iv. Know the meanings of the words formula and function
  - v. Derive word formulas from algebraic formulas

## 1. NUMBER

### 23. Number calculations

- a. Recognise and use multiples, factors and prime numbers
  - i. Multiples
  - ii. Factors
  - iii. Prime numbers
  - iv. Eratosthenes Sieve
- b. Solve problems involving multiples and prime numbers
  - i. LCM
  - ii. HCF
  - iii. Common factors
  - iv. Rapid recall of tables
  - v. Use tests of divisibility
  - vi. Find factors in pairs
  - vii. Simplify word problems
- c. Related facts
  - i. Mental addition
  - ii. Mental subtraction
  - iii. Mental multiplication and division
  - iv. Use mental strategies to 100
  - v. Use games covering all 4 operations
  - vi. Use strategies for mental  $\times$  and  $\div$  extending to decimals
  - vii. Check results by considering order of magnitude
  - viii. Rapid fire interactive  $\times$  game
- d. Standard column methods for addition and subtraction
  - i. Place value
  - ii. Tenths / hundredths
  - iii. Column addition of whole numbers and decimals to 2 d.p.
  - iv. Rounding activities
  - v. Column subtraction methods
  - vi. Find ways to check results
  - vii. Thinking of a number game
- e. Standard written multiplication and division methods
  - i. Rapid recall of tables 1 – 10
  - ii. Brainstorm written multiplication methods
  - iii. Grid and standard methods
  - iv. Fizz – Buzz
  - v. Activities involving written  $\times$  methods
  - vi. Activities involving written  $\div$
  - vii. Review different meanings of  $\div$
  - viii. Quotient
  - ix. Check results

### Summer Term: Second Half

## 3. GEOMETRY AND MEASURES

### 24. Constructions

- a. Construct a triangle
  - i. Construct an angle
  - ii. Use a ruler and protractor to construct a triangle given (SAS)
  - iii. Construct a triangle given 2 angles and included side (ASA)
  - iv. Use ICT to explore constructions

- b. Construct simple nets
  - i. Construct a variety of regular polygons
  - ii. Draw a parallelogram or kite
  - iii. Calculate interior angles
  - iv. Use ruler and protractor to construct simple nets of 3-D shapes, eg. cuboid, regular tetrahedron, square-based pyramid, triangular prism
  - v. Solve word problems and investigate in a range of contexts
  - vi. Match nets to corresponding 3-D shapes
  - vii. Sketch nets for a variety of 3-D shapes
  - viii. Identify 3-D shapes from 3 unknown nets

#### 25. Geometrical reasoning: lines, angles and shapes

- a. Identify properties of triangles and quadrilaterals
  - i. Key properties of triangles
  - ii. Key properties of quadrilaterals
  - iii. Activities on angle, side and symmetry properties
- b. Solve geometrical problems
  - i. Use knowledge of properties to convert square to a rectangle
  - ii. Convert square to a rhombus
  - iii. Convert rectangle / rhombus to a parallelogram
  - iv. Convert rhombus to a kite
  - v. Organise responses in table / set as task
- c. Identify properties of polygons
  - i. Activities on angle properties
  - ii. Side properties
  - iii. Symmetry properties
  - iv. Solve geometrical problems involving these problems
  - v. Recognise, use and apply to problems
  - vi. Collect responses in a table
  - vii. Explain reasoning with diagrams and text

### 4. STATISTICS

#### 26. Probability

- a. Finding Theoretical Probability
  - i. Record likely, certain, unlikely, impossible events
  - ii. Probability line
  - iii. Understand and use probability scale from 0 – 1
  - iv. Outcomes
  - v. Equally likely outcomes
  - vi. Find and justify probabilities
  - vii. Identify all possible outcomes of a single event
  - viii. Discuss possible investigations
  - ix. Counter Cheating
  - x. Compare experimental and theoretical probabilities in simple contexts
- b. Deciding, Planning and Collecting Data
  - i. Plan how to collect and organise small sets of data
  - ii. Design a data collection sheet
  - iii. Design a questionnaire to use in a simple survey
  - iv. Design data collection sheet
  - v. Collect data on data collection sheet
  - vi. Calculate statistics
  - vii. Display charts and diagrams
  - viii. Interpret
  - ix. Conclusion
  - x. Report findings

## 27. Handling Data

- a. Review Averages
  - i. Mode
  - ii. Median
  - iii. Mean
  - iv. Modal class
  - v. Range
  - vi. Simple frequency table
  - vii. Calculate averages
  - viii. Calculate range
- b. Construct tables and Charts
  - i. Draw bar chart
  - ii. Construct frequency table
  - iii. Draw pie chart
  - iv. Draw compound bar chart
  - v. Draw bar-line graph
- c. Comparing Data
  - i. The language of statistics
  - ii. Compare statistics
  - iii. Interpret diagrams and graphs (including pie charts)
  - iv. Draw conclusions based on the shape of graphs and simple statistics for a single distribution.
  - v. Compare with theoretical average
  - vi. Use bar charts for comparison
  - vii. Compare 2 simple distributions using range and 1 of the mode, median or mean

## 2. ALGEBRA

### 28. Sequences, Functions and graphs

- a. Sequences
  - i. Reinforce link between sequences and formulae
  - ii. Derive formulae
  - iii. Substitute values in formulae
  - iv. Solve formulae from practical contexts
  - v. Generate simple integer sequences
  - vi. Describe simple integer sequences
  - vii. Generate terms of a simple sequence
  - viii. Generate sequences from practical contexts
  - ix. Describe the general term in simple cases
- b. Functions
  - i. Express simple functions in words
  - ii. Using symbols, represent functions in mappings
  - iii. Connections between terms
  - iv. Differences between terms
  - v. Draw simple function machines
  - vi. Generate coordinate pairs that satisfy a simple linear rule
- c. Graphs
  - i. Plot the graphs of simple linear functions
  - ii. Straight line graphs
  - iii. Recognise straight-line graphs parallel to the x –axis or y-axis
  - iv. Plot graphs of simple linear functions arising from real life situations
  - v. Identify necessary information to solve a problem
  - vi. Represent information as a graph
  - vii. Make correct use of symbols, words, diagrams and tables

## 1. NUMBER

### 29. Fractions, decimals and percentages

- a. Equivalence
  - i. Percentages
  - ii. Fractions
  - iii. Decimals
  - iv. Review concept that F,D and % are all parts of a total
  - v. Activities to find FDP equivalences
- b. Fractions
  - i. Add fractions
  - ii. Subtract fractions
  - iii. Compare simple fractions
  - iv. Mental methods
  - v. Written methods
  - vi. Calculator methods
  - vii. Checking answer by estimating
- c. Review and extend understanding of calculations
  - i. Fraction x integer
  - ii. Fractions of an amount
  - iii. of an amount
  - iv. %s to compare proportions
  - v. Decimals & %s using calculator
  - vi. Interpreting display
  - vii. Check by estimating
- d. Simple calculations with FDP
  - i. Brackets
  - ii. Memory
  - iii. Square root and sign
  - iv. Mental methods
  - v. Written methods
  - vi. Simple calculator methods
- e. Simple problems with FDP
  - vii. Calculate simple fractions of quantities and measurements
  - viii. Multiply a fraction by an integer
  - ix. Note differences between written and mental methods
  - x. Simple word problems requiring different methods
  - xi. Mental methods
  - xii. Jottings
  - xiii. Written method
  - xiv. Calculator method
  - xv. Check by estimation
  - xvi. Simplify fractions by cancelling
- f. More complex problems with FDP
  - i. Break complex problem into simpler steps
  - ii. Choose and use appropriate operation
  - iii. Calculator methods
  - iv. Interpret calculator display

**YEAR 8****Autumn Term****1. NUMBER**30. Powers, integers, roots

- a. Solving number problems
  - i. Add / subtract integers
  - ii. Multiply / division integers
  - iii. Developing negatives
  - iv. Number line
  - v. Consecutive products
  - vi. Prime numbers
  - vii. Prime factors
  - viii. Venn diagrams for HCF / LCM
  - ix. Eratosthenes' sieve
  - x. Solving Word Problems
  - xi. Justifying and Explaining Answers
- b. Exploring prime activities
  - i. Numbers of factors
  - ii. Factors of square numbers
  - iii. Mersenne primes
  - iv. LCM sequence
  - v. Goldbach's theorem
  - vi. Venn diagrams for HCF / LCM
  - vii. Eratosthenes' sieve

31. Sequences

- i. Spreadsheet sequences
- ii. Creating sequences of shapes
- iii. Describe rule for next term/ nth term

**3. GEOMETRY and MEASURES**32. Geometrical reasoning : Lines, angles and shapes

- a. Triangles (side and angle properties)
  - i. Equilateral
  - ii. Isosceles
  - iii. Right angled
  - iv. Scalene
  - v. Solve geometrical problems
  - vi. Tessellation
- b. Quadrilaterals (side and angle properties)
  - i. Square
  - ii. Rectangle
  - iii. Parallelogram
  - iv. Solve geometrical problems
  - v. Tessellation
  - vi. Classify quadrilaterals

- c. Angles
  - i. Sum of angles in a triangle
  - ii. Sum of angles in a quadrilateral
  - iii. Identify alternate angles
  - iv. Identify corresponding angles
  - v. Angle properties of parallel lines
  - vi. Exterior angles of triangle
  - vii. Angles in polygons
- d. Construction
  - i. Construct an equilateral triangle
  - ii. Use straight edge and compasses to construct mid-point of a line segment
  - iii. Perpendicular bisector
  - iv. Bisector of an angle
  - v. Perpendicular from a point to a line
  - vi. Perpendicular from a point on a line
  - vii. Use ICT to explore
  - viii. Change resources:- protractor and ruler / set square
  - ix. Investigate constructions

### 33. Area of Formulae

- a. Deduce and use formulas
  - i. Area of a triangle
  - ii. Area of a parallelogram
  - iii. Calculate area of shapes made from rectangles and triangles
  - iv. Area of a trapezium
  - v. Polygons within polygons

## 4. STATISTICS

### 34. Handling data

- a. Probability
  - i. Probability vocabulary
  - ii. Interpret results of experiments
  - iii. Number line
  - iv. Spider line
  - v. Possibility space diagrams
  - vi. Tree Diagrams
  - vii. Problem solving
  - viii. Designing games of chance
  - ix. Different outcomes / reasons
  - x. Find and justify probabilities

## 1. NUMBER

### 35. Ratio and proportion

- a. Relationships
  - i. Consolidate relationship between ratio and proportion
  - ii. Reduce a ratio to its simplest form
  - iii. Recognise links with fraction notation

- b. Solving problems
  - i. Identity information
  - ii. Check results
  - iii. Describe problem using symbols, words or diagrams
  - iv. Explain reasoning
  - v. Break down complex problems
  - vi. Make smaller, more manageable tasks
  - vii. Interpret and discuss information
  - viii. Justify answers by testing
  - ix. Calculate using ratios in appropriate situations
  - x. Use equivalence of fractions, decimals and% to compare proportions

## 2. ALGEBRA

### 36. Equations, formulae and identities

- a. Distinguish symbols
  - i. Use simple formulae
  - ii. Simplify expressions
  - iii. Expand brackets
  - iv. Solve linear equations with integer coefficients
  - v. Solve linear equations with unknown values on both sides
  - vi. Interpret the terms in expressions and formulae
  - vii. Substitute integers into simple formulae
  - viii. Equation snakes.

## 3. GEOMETRY and MEASURES

### 37. Measures

- a. Use units of measure to estimate, calculate and solve everyday problems
  - i. Estimate length
  - ii. Estimate area
  - iii. Estimate volume
  - iv. Estimate weight
  - v. Calculate and solve everyday problems
- b. Know rough metric equivalents of imperial measures in daily use
  - i. Length – (feet, miles)
  - ii. Area – (acres, yards)
  - iii. Volume – (pints, gallons)
  - iv. Weight – (oz. lbs, stone)

## Spring Term

### 2. ALGEBRA

#### 38. Sequences, functions and graphs

- i. Express simple functions in symbols
  - ii. Represent mappings
  - iii. Identify all four quadrants
  - iv. Plot and read points on all four quadrants
  - v. Plot graphs of linear functions
  - vi. Plot and read 'y' and 'x'
  - vii. Recognise equations using 'y' and 'x.'
  - viii. Straight line graphs
  - ix. Discuss and interpret graphs arising from real situations
  - x. Function machines
- b. Equations, formulae and identities
- i. Different roles of letter symbols
  - ii. Formula
  - iii. Function
  - iv. Construct linear equations
  - v. Solve linear equations using the number line
  - vi. Solve linear equations using the matching method
  - vii. Integer coefficients (unknown on either or both sides)
  - viii. Inverse operations
  - ix. Transforming both sides in the same way
  - x. Identify information to solve a problem
  - xi. Represent problems
  - xii. Interpret solutions in algebraic or graphical form
  - xiii. Hard equation game

### 1. NUMBER

#### 39. Number operations.

- a. Mental Methods
- i. Round positive numbers to 10
  - ii. Addition of fractions and integers
  - iii. Subtraction of fractions and integers
  - iv. Multiplication of integers
  - v. Division of integers
  - vi. Use laws of arithmetic
  - vii. Use inverse operations
  - viii. Mental methods with squares and square roots
  - ix. Cubes and cube roots
  - x. Solve word problems mentally
- b. Written Methods
- i. Consolidate addition column methods
  - ii. Consolidate subtraction written methods.
  - iii. Use order of operations
  - iv. Brackets
  - v. Make and justify estimates and approximations
  - vi. Use standard column procedures for multiplication of integers and decimals
  - vii. Use standard column procedures for division of integers and decimals
  - viii. Position of decimal point
  - ix. Check results
  - x. Work problem backwards

- c. Calculator Methods
  - i. Enter numbers in different contexts
  - ii. Interpret display in different contexts
  - iii. Negative numbers
  - iv. Fractions
  - v. Decimals
  - vi. Percentages
  - vii. Money
  - viii. Metric measures
  - ix. Time
  - x. How to use the bracket, square, square root and sign-change keys on calculator
  - xi. How to use the power and/or cube and cube root keys
  - xii. Use different function keys efficiently and accurately for sign change, powers, roots and fractions
  - xiii. Use brackets and the memory

### 3. GEOMETRY and MEASURES

#### 40. Transformations

- a. Geometrical reasoning: shapes
  - i. Congruent 2-D shapes (sides and angles equal)
  - ii. Transform 2-D shapes by rotation
  - iii. Transform 2-d shapes by reflection and translation
  - iv. Use paper and ICT methods
  - v. Identify all symmetries of 2-D shapes
  - vi. Language and notation associated with enlargement
  - vii. Enlarge 2-D shapes
  - viii. Compare 2 reflections with a rotation
  - ix. Scale factor
  - x. Enlarging on a coordinate grid

### 4. STATISTICS

#### 41. Handling Data

- a. Processing data
  - i. Sketching graphs from words
  - ii. Appropriate use of range, mean, median and mode
  - iii. Modal class
  - iv. Calculate a mean
  - v. Compare 2 sets of data
  - vi. Understand Stem diagrams
  - vii. Understand leaf diagrams
  - viii. Construct on paper
  - ix. Use ICT
  - x. Pie Charts
  - xi. Bar Charts
  - xii. Frequency Diagrams
  - xiii. Line graphs
  - xiv. Scatter graphs
  - xv. Interpret graphs and diagrams

## Summer Term

### 1. NUMBER

#### 42. Place Value

- a. Ordering and rounding
  - i. Read and write positive integer powers of 10
  - ii. Order decimals
  - iii. Round positive numbers to any given power of 10
  - iv. Multiply and divide integers and decimals by 0.1, 0.01
  - v. Round decimals to the nearest whole number
  - vi. Round decimals to one or two decimal places
- b. Mental methods
  - i. Make estimates and approximations of calculations
  - ii. Justify estimates and approximations of calculations
  - iii. Consolidate and extend mental methods of calculation
  - iv. Decimals
  - v. Fractions
  - vi. Percentages
  - vii. Squares and square roots
  - viii. Cubes and cube roots
  - ix. Solve word problems mentally
  - x. Check results
- c. Written methods
  - i. Make estimates and approximations of calculations
  - ii. Justify estimates and approximations of calculations
  - iii. Consolidate standard column procedures for + & - of integers and decimals up to two places
  - iv. Use standard column procedures for  $\times$  &  $\div$  of integers & decimals, including by decimals such as 0.6 or 0.06
  - v. Understand where to position the decimal point by considering equivalent calculations
  - vi. Check results

#### 43. Fractions, Decimals and Percentages

- a. Fractions
  - i. Addition
  - ii. Subtraction
  - iii. Use laws of arithmetic and inverse operations
  - iv. Make estimates and approximations of calculations
  - v. Justify estimates and approximations of calculations
  - vi. Know that a recurring decimal is a fraction
  - vii. Use  $\div$  to convert a fraction to a decimal
  - viii. Order fractions by writing them with a common denominator
  - ix. Order fractions by converting them to decimals
  - x. Add and subtract fractions by writing them with a common denominator
  - xi. Calculate fractions of quantities (fraction answers)
  - xii. Multiply and divide an integer by a fraction
  - xiii. Extend sequences of + & - fractions

- b. Number operations
  - i. Rapid recall of x facts to 100
  - ii. Derive associated  $\div$  facts
  - iii. Make estimates & approximations of calculations
  - iv. Justify estimates & approximations of calculations
  - v. Interpret % as the operator (so many 100s of)
  - vi. Express one given number as a % of another
  - vii. Use the equivalence of fractions, decimals and % to compare proportions
  - viii. Calculate %
  - ix. Find the outcome of a given % increase or decrease
  - x. Recall known facts
  - xi. Use known facts to derive unknown facts
  - xii. Involve numbers such as 0.7 and 6, and 0.03 and 8
- c. Mental Methods
  - i. Consolidate mental methods of calculation
  - ii. Extend mental methods of calculation working with:-
  - iii. Decimals
  - iv. Fractions
  - v. Percentages
  - vi. Squares and square roots
  - vii. Cubes and cube roots
  - viii. Solve word problems mentally

## 2. ALGEBRA

### 44. Equations, formulae and identities

- a. Linear Expressions
  - i. Simplify linear expressions
  - ii. Transform linear expressions
  - iii. Multiply a single term over a bracket
  - iv. Place positive integers into expressions involving small powers
- b. Linear Equations
  - i. Construct linear equations with integer coefficients
  - ii. Solve linear equations with unknown on either or both sides
  - iii. Inverse operations
  - iv. Transforming both sides in the same way
- c. Formulae
  - i. Use formulae from mathematics and other subjects
  - ii. Substitute integers into simple formulae
  - iii. Include examples that lead to an equation to solve
  - iv. Derive simple formulae
  - v. Use graphs to solve simple problems involving direct proportion
  - vi. Set up equations to solve simple problems involving direct proportion
  - vii. Fibonacci sequences

### 45. Sequences, functions and graphs

- a. Graphs
  - i. Recognise straight-line graphs parallel to the x axis or y axis
  - ii. Plot graphs of linear functions
  - iii. Use ICT
  - iv. Recognise equations that correspond to straight-line graphs
  - v. Real life graphs with cross-curricular links

### 3. GEOMETRY and MEASURES

#### 46. Measures and Mensuration

- a. Units of measurement
  - i. Estimate, calculate and solve problems involving:-
  - ii. Capacity
  - iii. Mass
  - iv. Time
  - v. Know rough metric equivalents of imperial measures in daily use (pounds, pints, gallons, ounces, inches, miles)

#### 47. Geometrical Reasoning

- a. Shapes
  - i. Know properties of cuboids and shapes made from cuboids
  - ii. Use geometric properties of cuboids
  - iii. Begin to use plans and elevations
  - iv. Make simple scale drawings
  - v. Know formula for the volume of a cuboid
  - vi. Use formula for the volume of a cuboid
  - vii. Calculate volume and surface areas of cuboids
- b. Coordinates
  - i. Use coordinates to find the mid-point of a line
- c. Construction
  - i. Know how to construct a triangle from given data
  - ii. Use ICT to explore constructions
  - iii. Change resources used for construction
- d. Bearings
  - i. Use bearings to specify direction
  - ii. Direction and distance
  - iii. Difference between bearings and angles

### 4. STATISTICS

#### 48. Handling data

- a. Planning and Collecting Data
  - i. Specify problem
  - ii. Identify questions to explore
  - iii. Decide which data to collect
  - iv. Decide degree of accuracy needed
  - v. Identify possible sources
  - vi. Plan how to collect data
  - vii. Collect data using controlled experiment
  - viii. Data logging using ICT
  - ix. Questionnaire
- b. Representing Data
  - i. Construct frequency tables
  - ii. Design and use two-way tables for discrete data
  - iii. Use ICT as appropriate

- c. Construction
  - i. Use Stem diagrams
  - ii. Use Leaf diagrams
  - iii. Construct on paper
  - iv. Use ICT
  - v. Pie charts for categorical data
  - vi. Bar charts ( ) for discrete
  - vii. Frequency Diagrams ( ) and continuous data
  - viii. Simple Line Graphs for time series
  - ix. Simple Scatter Graphs
- d. Interpretation and Discussion of Results
  - i. Interpret tables
  - ii. Graphs and diagrams
  - iii. Discuss results
  - iv. Draw inferences that relate to discussed problem
  - v. Relate summarised data to questions explored
  - vi. Compare two distributions using range and one or more of mode, median and mean
  - vii. Communicate orally methods used
  - viii. Communicate on paper results of enquiry
  - ix. Use ICT as appropriate
  - x. Justify choice of what is presented

#### 49. Probability

- a. Compare experimental and theoretical probabilities in different contexts
  - i. Number line
  - ii. Spider diagram
  - iii. Probability recording sheets
  - iv. Space diagrams
  - v. Tree diagrams
  - vi. Coloured Counters
  - vii. Dice
  - viii. Coins

## YEAR 9

### Autumn Term

### 3. GEOMETRY and MEASURES

#### 50. Angles and Circles

- a. Distinguish between conventions, definitions and derived properties
- b. Calculate angles
  - i. Find vertically opposite angles
  - ii. Find corresponding angles
  - iii. Find alternate angles
  - iv. Calculate missing angles
- c. Polygons
  - i. Find interior angles of regular polygons
  - ii. Find exterior angles of regular polygons
  - iii. Calculate sum of interior angles
  - iv. Calculate sum of exterior angles
  - v. Use the sum of interior angles
  - vi. Use the sum of exterior angles

- d. Circles
  - i. Know definition of a circle
  - ii. Know names of parts of a circle
  - iii. Circumference
  - iv. Diameter
  - v. Radius
  - vi. Calculate circumference of circle
  - vii. Calculate diameter
  - viii. Calculate radius
  - ix. Know formulae & understand how it was derived
  - x. Calculate area
  - xi. Find composite areas to include sectors
  - xii. Use correct calculator key

#### 51. Construction and Loci

- a. Triangles
  - i. Construct triangles from different starting points
  - ii. SSS
  - iii. AAA
  - iv. AAS
  - v. SSA
  - vi. SAS
  - vii. RHS hypotenuse
  - viii. Pythagoras theorem
  - ix. Understand the Pythagorean triples.
  - x. Construct right angled triangles
  - xi. Find the hypotenuse
- b. Triangles, 2-D shapes
  - i. Use ICT to construct triangles
  - ii. Use ICT to construct 2-D shapes
  - iii. Construct shapes only using straight edge and compasses
- c. Loci
  - i. Construct a perpendicular bisector
  - ii. Construct the bisector of an angle
  - iii. Construct the perpendicular from a point to a line
  - iv. Construct the perpendicular from a point on a line to complete a triangle
  - v. Find the locus of a point by reasoning
  - vi. Find the locus of a point that moves by using ICT
  - vii. Sketch and draw loci

## 1. NUMBER

#### 52. Fraction, Percentage, Ratio

- a. Fractions
  - i. Add fractions with efficient method
  - ii. Subtract fractions with and without common denominator
  - iii. Add mixed number fractions
  - iv. Subtract mixed number fractions
  - v. Convert mixed number fractions to improper fractions and v.v.
  - vi.  $\times$  &  $\div$  fractions, cancelling to simplify
  - vii.  $\times$  &  $\div$  fractions, including mixed numbers
- b. Percentages
  - i. Solve problems involving % changes
  - ii. Increase
  - iii. Decrease
  - iv. Profit and loss
  - v. Compound interest

- c. Ratio
  - i. Simplify ratios
  - ii. Compare ratios
  - iii. Share quantities in a given ratio
  - iv. Use proportional reasoning
  - v. Use ratio in solving word problems

#### 53. Calculations

- i. Make sensible estimates of answers
- ii. Know that  $\times$  a positive no. by a no. between 0 & 1 makes it smaller
- iii. Know that  $\div$  a positive no. by a number between 0 & 1 makes it larger
- iv. Fill in missing inequality
- v. Recognise Reciprocals
- vi. Work out expressions involving powers
- vii. Understand that the 'O' in BODMAS or the 'I' in BIDMAS relates to powers
- viii. Extend mental methods
- ix. Round off all numbers for all calculations and estimating answers
- x. Make sensible decisions about the use of estimations

## 4. STATISTICS

### 54. Handling Data

- a. Data
  - i. Identify data
  - ii. Collect data
  - iii. Refine data
  - iv. Compare two or more sets of data
  - v. Distributions
  - vi. Appropriate statistics
- b. Survey / Experiment
  - i. Design survey
  - ii. Determine sample size
  - iii. Determine degree of accuracy
  - iv. Communicate results
  - v. Interpret survey
- c. Tables
  - i. Construct tables
  - ii. Discrete and continuous
  - iii. Choose suitable class intervals
  - iv. Two-way tables
  - v. Calculate averages
  - vi. Calculate range
- d. Graphs
  - i. Construct graph to represent data
  - ii. Construct diagrams to represent data
  - iii. Use paper
  - iv. Use ICT as appropriate
  - v. Select most suitable representation
  - vi. Interpret graphs and diagrams
  - vii. Draw inferences from graphs
  - viii. Identify any misleading graphs / statistics
- e. Data display
  - i. Line of best fit
  - ii. Cumulative frequency graph
  - iii. Scatter graph

## 2. ALGEBRA

### 55. Sequences and Graphs

- a. Sequence
  - i. Write the first five terms of a sequence
  - ii. Term to-term definitions
  - iii. Position-to-term definitions
  - iv. Make sequences from practical contexts
  - v. Describe nth term
  - vi. Quadratic sequence
  - vii. Find nth term in linear series
  - viii. Find the inverse of the function
- b. Graphs
  - i. Interpret graphical representations
  - ii. Sketch a line graph
  - iii. Represent problems in graph form

### 56. Equations and Formulae

- a. Letter symbols
  - i. Equations
  - ii. Formulae
  - iii. Function
- b. Equations
  - i. Construct equations
  - ii. Solve linear equations
  - iii. Integer coefficients
  - iv. Brackets
  - v. Negative signs
  - vi. Negative solutions
  - vii. Use trial & improvement methods to find approximate solutions
  - viii. Solve problems involving direct proportion
  - ix. Use ICT as appropriate

## Spring Term

### 3. GEOMETRY and MEASURES

#### 57. Measures & Volume

- a. Units of measurement
  - i. Relationship between the units of measurements
  - ii. Kilometre to metre
  - iii. £ to pence
  - iv. Grams to kilograms
  - v. Millilitres to litres, etc.
- b. Equivalent Measures
  - i. Know rough equivalent metric and imperial measures
  - ii. Know and convert between metric and imperial measures
- c. Area and Volume
  - i. Use appropriate units
  - ii. Use appropriate methods
  - iii. Estimate areas
  - iv. Estimate volumes
  - v. Convert between area measure ( $\text{mm}^2$  to  $\text{cm}^2$ ) and volume measure (e.g.  $\text{cm}^3$  to  $\text{m}^3$ )
  - vi. Prisms
  - vii. Surface area of a prism
  - viii. Volume of a prism
  - ix. Calculate area and volume of a range of prisms
- d. Transformations
  - i. Transform 2-D shapes
  - ii. Translations
  - iii. Reflections
  - iv. Enlargement
  - v. Whole number scale factor

### 1. NUMBER

#### 58. Powers, Rounding, + - x ÷

- a. Powers
  - i. Read and write positive integer powers of 10
  - ii. Multiply any integer power of 10
  - iii. Divide by any integer power of 10
- b. Rounding
  - i. Use rounding to make estimates
  - ii. Round decimals to the nearest whole number
  - iii. Round decimals to one, two or three decimal places
  - iv. Know that rounding is the final operation of a calculation
- c. + - x ÷
  - i. Add any two decimal numbers
  - ii. Subtract any two decimal numbers
  - iii. As above with differing numbers of decimal places
  - iv. Use long x method (2 digit no. x 3 digit no.)
  - v. Place decimal point correctly
  - vi. Have approximate answer by rounding
  - vii. Use standard method of ÷
  - viii. Remove decimal point by x by 10, 100 etc.
  - ix. Apply 4 operations in a broader range of contexts

### 59. Percentages, Ratio and Proportion

- a. Percentages
  - i. Calculate %
  - ii. Use % to solve problems
  - iii. Mental methods
  - iv. Written methods
  - v. Calculator methods
- b. Ratio and proportion
  - i. Use ratio to solve simple problems
  - ii. Use proportion to solve problems
  - iii. Use the equivalence of fractions, decimals & % to compare simple proportions
  - iv. Use the equivalence of F,D & % to solve problems
  - v. Find a % increase
  - vi. Find a % decrease
  - vii. Interest
  - viii. VAT
  - ix. Commission
  - x. Discount
  - xi. Sale price
  - xii. Use % changes to solve problems
  - xiii. Inverse methods

## 2. ALGEBRA

### 60. Prime Factors, $y=mx +c$

- a. Prime Factors
  - i. Find the LCM of 2 or more numbers using prime factor decomposition
  - ii. Use LCM to find common denominators of fractions
  - iii. Solve number investigations
  - iv. Factorisation of algebraic expressions
- b. Equations / Graphs
  - i. Produce tables of values for linear functions
  - ii. Draw graph
  - iii. Calculate gradient
  - iv. Rearrange equations to draw graphs
  - v. Compare graphs of the same family
  - vi. Draw and use graphs to solve distance-time problems
  - vii. Sketch graphs to show relationship between 2 variables
  - viii. Discuss graphs from real-life situations
  - ix. Interpret graphs from real-life situations
  - x. Construct and interpret linear graphs of the form:  $y=mx + c$

## 4. STATISTICS

### 61. Handling Data (Processing and Interpreting)

- a. Calculate Statistics
  - i. Calculate mean
  - ii. Calculate mode
  - iii. Calculate median
  - iv. Calculate range for a set of data
  - v. Calculate a mean using an assumed mean
  - vi. Recognise which mean is most appropriate
  - vii. Distorting extreme values

- b. Construct/Interpret tables
  - i. Bar charts
  - ii. Frequency diagrams
  - iii. Frequency Polygons
  - iv. Line graphs
  - v. Scatter graphs
  - vi. Recognise positive and negative correlations in scatter graphs
- c. Probability
  - i. Record systematically all possible outcomes for single events
  - ii. Record systematically all possible outcomes for 2 successive events
  - iii. Record systematically all possible outcomes for an experiment
  - iv. Sum of probabilities
  - v. Mutually exclusive outcomes
  - vi. Experimental data
  - vii. Theoretical probabilities
  - viii. Spider diagrams
  - ix. Tree diagrams

### Summer Term

## 3. GEOMETRY and MEASURES

### 62. Problem- Solving & Transformations

- a. Solve problems
  - i. Know and use angle and symmetry properties of polygons
  - ii. Visualise and sketch 2-D shapes
  - iii. Know and use angle properties of parallel & intersecting lines
  - iv. Use these properties to solve problems
  - v. Visualisation exercises
  - vi. Tessellations
  - vii. Analyse 3-D shapes
  - viii. 2-D projections
  - ix. Cross-sections
  - x. Planes of symmetry
  - xi. Understand, recall and use Pythagoras' theorem
  - xii. Know and use properties of triangles
  - xiii. Interpret maps and scale drawings
  - xiv. Use map scale to convert a map distance to actual distance

## 4. STATISTICS

### 63. Handling Data (Survey & Interpretation)

- a. Review procedure
  - i. Discuss data needed
  - ii. Identify data sources (Internet, published lists and tables)
  - iii. Design & use two-way tables
  - iv. Calculate averages and ranges
  - v. Construct graphs and diagrams (paper/ICT)
  - vi. Frequency diagrams & polygons
  - vii. Line graphs
  - viii. Scatter diagrams
  - ix. Interpret graphs & diagrams
  - x. Draw inferences
  - xi. Compare 2 or more sets of data
  - xii. Use graphs and appropriate statistics
  - xiii. Communicate results & interpretations

- b. Use Review
  - i. Break substantial problems into simpler tasks
  - ii. Use efficient techniques & methods
  - iii. Use efficient resources (ICT)
- c. Plan and Carry out a more complex enquiry
  - i. Conjecture
  - ii. Sources (Internet, printed lists)
  - iii. Bias:- identify sources of bias & response
  - iv. 2-way tables
  - v. Statistics – calculate averages and range, estimate mean
  - vi. Construct graphs & diagrams
  - vii. Compare using graph shapes & statistics
  - viii. Interpret / Infer to support or reject hypothesis
  - ix. Communicate results
- d. Probability
  - i. Use appropriate vocabulary
  - ii. Identify all mutually exclusive outcomes of a range of experiments
  - iii. Know that the sum of probabilities of all mutually exclusive outcomes is 1
  - iv. Use to solve problems
  - v. List events
  - vi. Estimate probabilities
  - vii. Compare probabilities
  - viii. Compare theoretical probabilities for a specific experiment
  - ix. Discuss differences
  - x. Discuss accuracy
  - xi. Experiments where events are equally likely
  - xii. Experiments where events are not equally likely
  - xiii. Appreciate difference between mathematical explanation & experimental evidence

## 2. ALGEBRA

### 64. Equations, Formulae and Graphs

- a. Simplify Expressions
  - i. Collecting like terms
  - ii. Multiplying out a bracket
  - iii. Taking out Common factors
  - iv. Simplify expressions in problems
- b. Formulae
  - i. Substituting & solving
  - ii. Deriving
  - iii. Transforming
  - iv. Use skills with maths formulae and other subjects
- c. Graphs
  - i. Rearrange points
  - ii. Linear function
  - iii. Plot graph
  - iv. Spot similarities and differences
  - v. Find gradient
  - vi. Change is proportional
  - vii. Constant of proportionality
  - viii. Solve increasingly demanding problems
  - ix. Explore connections across a range of contexts

## 5. SOLVING PROBLEMS

### 65. Solving Problems

- a. Solving: To be able to solve increasingly demanding problems, evaluating solutions
- b. Exploring: To explore across Number, Algebra, Geometry and Measures & Statistics
- c. Reasoning: Present concise reasoned arguments (*symbols, diagrams, graphs*)
- d. Reporting: Give answers to appropriate degree of accuracy
- e. Extending: Conjecturing & Generalising: Suggest extensions to problems
- f. Representing: Use algebraic / geometric / graphical forms to represent / synthesise information; move between forms for new perspectives.
- g. Breaking down: To break down problems into simpler tasks, using a range of efficient techniques, methods and resources, including ICT.
- h. Number: To use proportional reasoning & ratios to solve a problem, including % changes
- i. Algebra: Construct functions arising from real-life problems and plot their corresponding graphs.
- j. Shape and Space: Solve problems using properties of angles, parallel & intersecting lines, triangles, other polygons; justify inferences; reasoning using diagrams & text.