## Autumn Term

Pupils will have the opportunity to develop the following skills :

## Numbers and the number system - including prime factorisation and standard form

- Write a number as a product of its prime factors
- Use prime factorisations to find the highest common factor of two numbers
- Use prime factorisations to find the lowest common multiple of two numbers
- Solve problems using highest common factors or lowest common multiples
- Round numbers to a given number of significant figures
- Use standard form to write large numbers
- Use standard form to write small numbers


## Calculating - with negative numbers and fractions

- Subtract a number from a smaller number
- Add a positive number to a negative number
- Subtract a positive number from a negative number
- Add a negative number
- Subtract a negative number
- Multiply a positive number by a negative number
- Multiply a negative number by a negative number
- Divide a positive number by a negative number
- Divide a negative number by a negative number
- Square and cube positive and negative numbers
- Use a scientific calculator to calculate with negative numbers
- Use a scientific calculator to calculate with fractions, both positive and negative
- Understand how to use the order of operations including powers
- Understand how to use the order of operations including roots

Pupils will have the opportunity to develop their knowledge about:

- Numbers and the number system - including prime factorisation and standard form
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- Identify and use the prime factorisation of a number
- Understand and use standard form
- use the concepts and vocabulary of prime numbers, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation theorem
- round numbers and measures to an appropriate degree of accuracy (e.g. to a specified number of decimal places or significant figures)
- interpret standard form $\mathrm{A} \times 10 \mathrm{n}$, where $1 \leq \mathrm{A}<10$ and n is an integer
- Calculating - with negative numbers and fractions
- Calculate with negative numbers
- Apply the correct order of operations

Pupils will learn the following key vocabulary :
Numbers and the number system including prime factorisation and standard form

Prime, factor, factorisation, standard form, highest common factor, lowest common multiple, product, notation indices, powers, significant figures

Calculating - with negative numbers and fractions
Subtract, add, negative, positive, multiply, divide, calculator, scientific, negative, fractions, operations, brackets, indices order, roots, powers, square, cube

## Visualising and constructing - enlargement, scale and bearings

- Use the centre and scale factor to carry out an enlargement with a positive integer scale factor
- Find the centre of enlargement
- Find the scale factor of an enlargement
- Use scale diagrams, including maps
- Use the concept of scaling in diagrams
- Interpret plans and elevations
- Understand and use bearings
- Construct scale diagrams involving bearings
- Solve geometrical problems using bearings


## Risk - probability

- Know and use the vocabulary of probability
- Understand the use of the 0-1 scale to measure probability
- List all the outcomes for an experiment, including the use of tables
- Work out theoretical probabilities for events with equally likely outcomes
- Know that the sum of probabilities for all outcomes is 1
- Apply the fact that the sum of probabilities for all outcomes is 1

Visualising and constructing - enlargement, scale and bearings

- Use and interpret scale drawings
- Use and interpret bearings
- Explore ways of representing 3D shapes
- Explore enlargement of 2D shapes
- measure line segments and angles in geometric figures, including interpreting maps and scale drawings and use of bearings
- identify, describe and construct similar shapes, including on coordinate axes, by considering enlargement
- interpret plans and elevations of 3D shapes
- use scale factors, scale diagrams and maps


## Risk - probability

- Understand the meaning of probability
- Explore experiments and outcomes
- Develop understanding of probability
- relate relative expected frequencies to theoretical probability, using appropriate language and the 0-1 probability scale
- record describe and analyse the frequency of outcomes of probability experiments using tables
- construct theoretical possibility spaces for single experiments with equally likely outcomes and use these to calculate theoretical probabilities
- apply the property that the probabilities of an exhaustive set of outcomes sum to one


## Visualising and

 constructing enlargement, scale and bearingsScale, diagrams, interpret, bearings, 3D 2D, enlarge, enlargement, scale factor, maps, scaling, plans, elevations, construct, geometrical

## Risk - probability

Risk, probability, chance, evens, impossible, certain, likely, unlikely, fraction, outcomes, percentage, theoretica

## Algebraic proficiency - including factorisation,

 expressions and formulae- Use and interpret algebraic notation, including: $a^{2} b$ in place of $a \times a \times b$, coefficients written as fractions rather than as decimals
- Simplify an expression involving terms with combinations of variables (e.g. $3 a^{2} b+4 a b^{2}+2 a^{2}-a^{2} b$ )
- Factorise an algebraic expression by taking out common factors
- Simplify expressions using the law of indices for multiplication
- Simplify expressions using the law of indices for division
- Simplify expressions using the law of indices for powers
- Know and use the zero index
- Substitute positive and negative numbers into formulae
- Change the subject of a formula when one step is required
- Change the subject of a formula when two steps are required


## Spring Term

Pupils will have the opportunity to develop the following skills :

- Exploring fractions, decimals and percentages
- Identify if a fraction is terminating or recurring
- Recall some decimal and fraction equivalents (e.g. tenths, fifths, eighths, thirds, quarters, etc.)
- Write a terminating decimal as a fraction
- Write a fraction in its lowest terms by cancelling common factors
- Use a calculator to change any fraction to a decimal


## Algebraic proficiency - including factorisation,

 expressions and formulae- Understand the concept of a factor
- Understand the notation of algebra
- Manipulate algebraic expressions
- Evaluate algebraic statements
- use and interpret algebraic notation, including: $a^{2} b$ in place of $a \times a \times b$, coefficients written as fractions rather than as decimals
- understand and use the concepts and vocabulary of factors
- simplify and manipulate algebraic expressions by taking out common factors and simplifying expressions involving sums, products and powers, including the laws of indices
- substitute numerical values into scientific formulae
- rearrange formulae to change the subject

Algebraic proficiency including factorisation, expressions and formulae

Pupils will have the opportunity to develop their knowledge about:

- Exploring fractions, decimals and percentages
- Explore links between fractions, decimals and percentages
- work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and $7 / 2$ or 0.375 or $3 / 8$ )


## Pupils will learn the following key vocabulary : <br> Exploring fractions, decimals and percentages <br> Fraction, decimals, percentage equivalent, common, convert, terminating, corresponding

## Proportional reasoning

- Express the division of a quantity into two parts as a ratio
- Understand the connections between ratios and fractions
- Find a relevant multiplier in a situation involving proportion
- Solve ratio problems involving mixing
- Solve ratio problems involving comparison
- Solve ratio problems involving concentrations
- Understand and use compound units
- Convert between units of speed
- Solve problems involving speed
- Solve problems involving rates of pay
- Solve problems involving unit pricing


## Investigating patterns and sequences, including nth term

- Generate terms of a sequence from a position-to-term rule
- Find the nth term of an ascending linear sequence
- Find the nth term of an descending linear sequence Use the nth term of a sequence to deduce if a given number is in a sequence


## Angles in parallel lines and polygons

- Solve missing angle problems involving alternate angles
- Solve missing angle problems involving corresponding angles
- Use knowledge of alternate and corresponding angles to calculate missing angles in geometrical diagrams
- Establish the fact that angles in a triangle must total $180^{\circ}$
- Establish the size of an interior angle in a regular polygon
- Establish the size of an exterior angle in a regular polygon
- Solve missing angle problems in polygons


## Proportional reasoning

- Explore the uses of ratio
- Investigate the connection between ratio and proportion
- Solve problems involving proportional reasoning
- Solve problems involving compound units
- express the division of a quantity into two parts as a ratio; apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing, concentrations)
- identify and work with fractions in ratio problems
- understand and use proportion as equality of ratios
- express a multiplicative relationship between two quantities as a ratio or a fraction
- use compound units (such as speed, rates of pay, unit pricing)
- change freely between compound units (e.g. speed, rates of pay, prices) in numerical contexts
- relate ratios to fractions and to linear functions


## Investigating patterns and sequences, including nth term

- Explore sequences
- generate terms of a sequence from either a term-to-term or a position-to-term rule
- deduce expressions to calculate the nth term of linear sequences


## Angles in parallel lines and polygons

- Explore geometrical situations involving parallel lines
- Develop knowledge of angles
- understand and use alternate and corresponding angles on parallel line
- derive and use the sum of angles in a triangle (e.g. to deduce and use the angle sum in any polygon, and to derive properties of regular polygons)


## Proportional reasoning

Ratio, proportion, division, multiplication, quantity, share, split, divide, compare, compound, speed, pricing, rates, pay, scale, mix, concentrations, linear

## Investigating patterns and sequences, including nth term

Terms, sequence, linear, nth term, rule, positions, substitute, replace

Angles in parallel lines and polygons

Geometrical, alternate, corresponding, supplementary/co-interior, angles, polygon, regular polygon, parallel

Calculating with fractions, decimals and percentages simple and compound interest, comparing amounts, percentage change

- Identify the multiplier for a percentage increase or decrease when the percentage is greater than $100 \%$
- Use calculators to increase an amount by a percentage greater than $100 \%$
- Solve problems involving percentage change
- Solve original value problems when working with percentages
- Solve financial problems including simple interest
- Solve problems that require exact calculation with fractions

Solving equations and inequalities - including graphical methods

- Solve linear equations with the unknown on one side when calculating with negative numbers is required
- Solve linear equations with the unknown on both sides when the solution is a whole number
- Solve linear equations with the unknown on both sides when the solution is a fraction
- Solve linear equations with the unknown on both sides when the solution is a negative number
- Solve linear equations with the unknown on both sides when the equation involves brackets
- Recognise that the point of intersection of two graphs corresponds to the solution of a connected equation


## Summer Term <br> Pupils will have the opportunity to develop the following skills :

Calculating space - circles including segments, cylinders, prisms

- Know circle definitions and properties, including: centre, radius, chord, diameter, circumference
- Calculate the circumference of a circle when radius or diameter is given
- Calculate the perimeter of composite shapes that include sections of a circle

Calculating with fractions, decimals and percentages - simple and compound interest, comparing amounts, percentage change

- Calculate with fractions
- Calculate with percentages
- interpret fractions and percentages as operator
- work with percentages greater than $100 \%$
- solve problems involving percentage change, including original value problems, and simple interest including in financial mathematic
- calculate exactly with fractions


## Solving equations and inequalities - including

 graphical methods- Solve linear equations with the unknown on one side
- Solve linear equations with the unknown on both sides
- Explore connections between graphs and equations
- find approximate solutions to linear equations using a graph


## Calculating with fractions, decimals and percentages - simple and compound interest, comparing amounts, percentage change <br> raction, percentages, multiplier, calculators, interest, value

Solving equations and inequalities - including graphical methods

Graph, linear, equation, balance, solve, fraction, decimal ,negative, positive, intersection, axes, co-ordinate

Pupils will have the opportunity to develop their knowledge about :
Calculating space - circles including segments, cylinders, prisms

- Investigate circles
- Discover pi
- Solve problems involving circles
- Explore prisms and cylinders
- compare lengths, areas and volumes using ratio notation

Pupils will learn the following key vocabulary :
Calculating space circles including segments, cylinders, prisms

Circles, area, circumference, pi, radius, diameter, units, composite, volume

- Calculate the area of a circle when radius or diameter is given
- Calculate the area of composite shapes that include sections of a circle
- Calculate the volume of a right prism
- Calculate the volume of a cylinder
- Compare lengths, areas and volumes using ratio notation


## Algebraic proficiency - graphs

- Know that graphs of functions of the form $y=m x+c, x \pm y=c$ and $a x \pm b y=c$ are linear
- Plot graphs of functions of the form $y=m x \pm c$
- Plot graphs of functions of the form $a x \pm b y=c$
- Find the gradient of a straight line on a unit grid
- Find the $y$-intercept of a straight line
- Sketch linear graphs
- Distinguish between a linear and quadratic graph
- Plot graphs of quadratic functions of the form $y=x^{2} \pm c$
- Sketch a simple quadratic graph
- Plot and interpret graphs of piece-wise linear functions in real contexts
- Plot and interpret distance-time graphs (speed-time graphs) including approximate solutions to kinematic problems


## Risk - frequency trees and Venn diagrams, expected outcomes

- List all elements in a combination of sets using a Venn diagram
- List outcomes of an event systematically
- Use a table to list all outcomes of an event
- Use frequency trees to record outcomes of probability experiments
- Construct theoretical possibility spaces for combined experiments with equally likely outcomes
- Calculate probabilities using a possibility space
- Use theoretical probability to calculate expected outcomes
- Use experimental probability to calculate expected outcomes
- calculate perimeters of 2D shapes, including circles
- identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference
- know the formulae: circumference of a circle $=2 \pi r=\pi d$, area of a circle $=\pi r^{2}$
- calculate areas of circles and composite shapes
- know and apply formulae to calculate volume of right prisms (including cylinders)


## Algebraic proficiency - graphs

- Plot and interpret linear graphs
- Plot and quadratic graphs
- Model real situations using linear graphs
- plot graphs of equations that correspond to straight-line graphs in the coordinate plane
- identify and interpret gradients and intercepts of linear functions graphically
- recognise, sketch and interpret graphs of linear functions and simple quadratic functions
- plot and interpret graphs and graphs of non-standard (piece-wise linear) functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance and speed


## Risk - frequency trees and Venn diagrams, expected outcomes

- Explore experiments and outcomes
- Develop understanding of probability
- Use probability to make predictions
- apply systematic listing strategies
- record describe and analyse the frequency of outcomes of probability experiments using frequency trees
- enumerate sets and combinations of sets systematically, using tables, grids and Venn diagrams
- construct theoretical possibility spaces for combined experiments with equally likely outcomes and use these to calculate theoretical probabilities
- apply ideas of randomness, fairness and equally likely events to calculate expected outcomes of multiple future experiments


## Algebraic proficiency graphs

Linear, graphs, quadratic, plot, coordinate, axes, axis, straight-line, gradients, intercept, sketch, interpret, solutions, approximate, functions

Risk - frequency trees and Venn diagrams, expected outcomes

Experiments, outcomes, probability, fraction, decimal, percentage, sum, strategies, listing, frequency, Venn diagrams, grids, theoretical, events, possibility space diagrams, expected

- Construct and interpret a grouped frequency table for continuous data
- Construct and interpret histograms for grouped data with equal class intervals
- Plot a scatter diagram of bivariate data
- Interpret a scatter diagram using understanding of correlation
- Find the modal class of set of grouped data
- Find the class containing the median of a set of data
- Calculate an estimate of the mean from a grouped frequency table
- Estimate the range from a grouped frequency table
- Analyse and compare sets of data, appreciating the limitations of different statistics (mean, median, mode, range)
- Choose appropriate statistics to describe a set of data
- Know the meaning of discrete data
- Interpret and construct frequency tables
- Construct and interpret pictograms, bar charts, pie charts, tables and vertica line charts
- interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate graphical representation involving discrete, continuous and grouped data
- use and interpret scatter graphs of bivariate data
- recognise correlation
- Investigate averages
- Explore ways of summarising data
- Analyse and compare sets of data
- interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate measures of central tendency (median, mean, mode and modal class) and spread (range, including consideration of outliers)
- apply statistics to describe a population

Interpret, frequency, grouped frequency, table, scatter graph, histogram, classinterval, grouped, data, set, median mean, range, mean, statistics, discrete, continuous, correlation, averages, summarise, compare, outliers, population

