

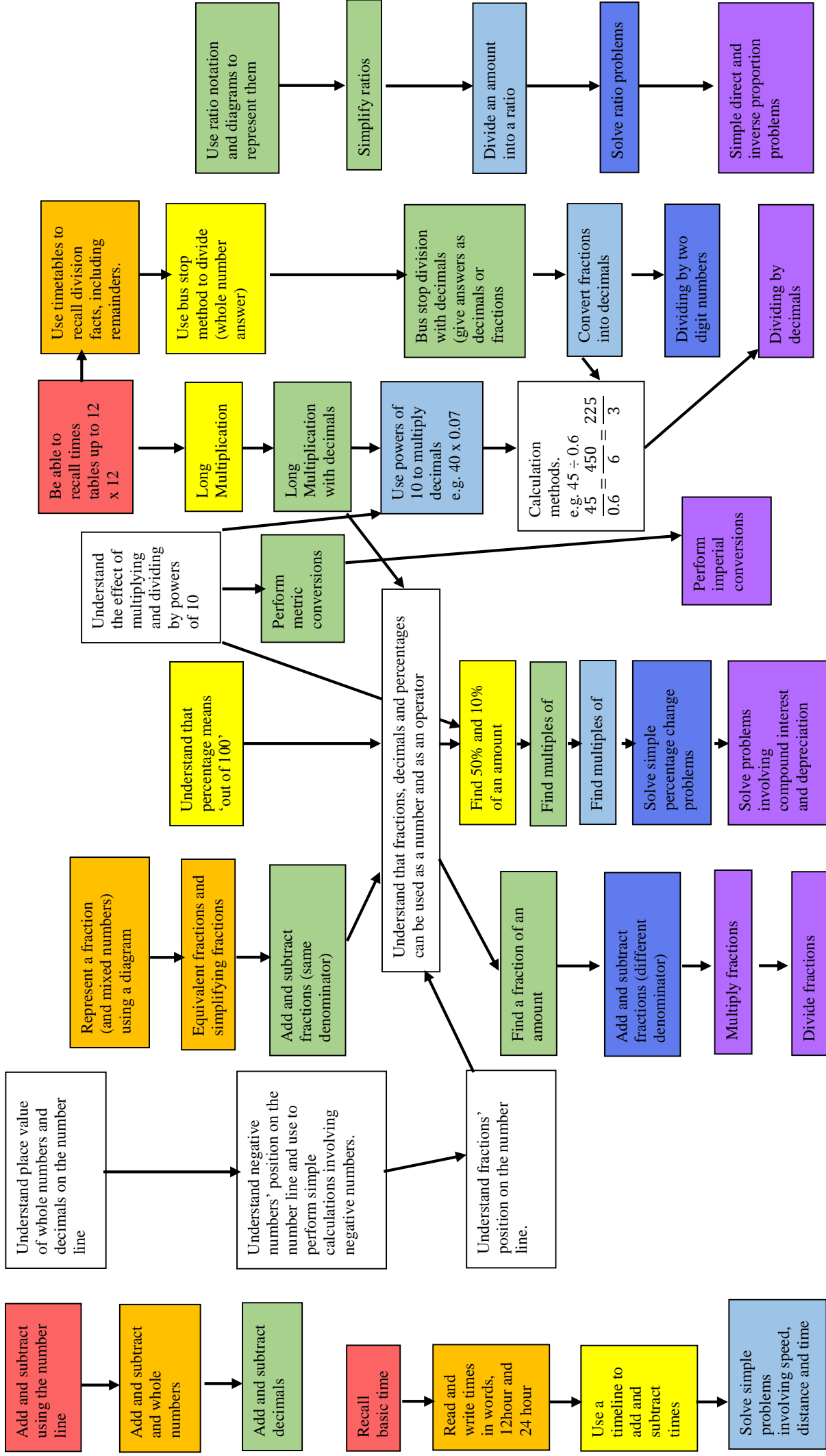


**Year 9 Higher**  
**Student Booklet**

**Name.....**



# Rainbow Number - Colours



T1	Test Mark	/	6 Skills Target		Class Rank	
	Strength					Date Completed
	1st Target:					
	2nd Target:					

T2	Test Mark	/	6 Skills Target		Class Rank	
	Strength					Date Completed
	1st Target:					
	2nd Target:					

T3	Test Mark	/	6 Skills Target		Class Rank	
	Strength					Date Completed
	1st Target:					
	2nd Target:					

T4	Test Mark	/	6 Skills Target		Class Rank	
	Strength					Date Completed
	1st Target:					
	2nd Target:					

T5	Test Mark	/	6 Skills Target		Class Rank	
	Strength					Date Completed
	1st Target:					
	2nd Target:					

T6	Test Mark	/	6 Skills Target		Class Rank	
	Strength					Date Completed
	1st Target:					
	2nd Target:					

# Number Objectives

Old Levels	Laws of Indices & Standard Form & Surds	Assessment	I can do this already	Covered in Class	Strength?	Revised it?	Aced it
6b	Establish index laws for positive powers where the answer is a positive power						
6a	Understand which part of an expression is raised to a power						
6a	Be able to simplify expressions containing powers						
6a	Solve word problems using square roots and cube roots						
6a	Know the prefixes associated with $10^{12}$ , $10^9$ , $10^6$ , $10^3$ , $10^{-2}$ , $10^{-3}$ , $10^{-6}$ , $10^{-9}$ , $10^{-12}$						
6a	Know that any number to the power of zero is 1						
7c	Make and justify estimates and approximations of calculations involving more than two operations and BIDMAS						
7b	Understand the order in which to calculate expressions that contain powers and brackets						
7a	Apply the index laws for multiplication and division of integer powers						
7a	Write and order numbers in standard index form						
7c	Find the reciprocal of simple numbers /fractions mentally, e.g. 10 and 1/10, 1/3 and 3 etc.						
7b	Know that a number multiplied by its reciprocal is 1						
7a	Know that the reciprocal of a reciprocal is the original number						
7c	Use the index laws to include negative power answers and understand that these answers are smaller than 1						
7c	Evaluate powers of fractions						
8c	Complete calculations using numbers written in standard form						
8b	Use fractional indices and write a fractional power as a root						
8a	Work out negative fractional powers of numbers						
8b	Simplify expressions which include surds						
8a	Present a concise and reasoned argument using surds						
8+	Understand / use rational / irrational numbers						
8+	Distinguish between exact representations of roots and their decimal approximations						

# Unit 1 Objectives

Band	Inequalities Equations & Formulae	Assessment	I can do this already	Covered in Class	Strength?	Revised it?	Aced it
<b>Developing</b>	Construct and solve equations of the form $(ax +/- b)/c = (dx +/- e)/f$ {one of $c$ or $f$ should be 1}						
	Find a positive square root as a solution of an equation involving $x^2$						
	Know and understand the meaning of an identity and use the identity sign						
	Explain the distinction between equations, formulae and functions						
	Know that $a^0 = 1$						
<b>Securing</b>	Construct and solve equations of the form $a(bx +/- c) = d(ex +/- f)$ where negative signs are anywhere in the equation. { $a$ or $d$ are bigger than 1} e.g. $3(-2x - 1) = -4x + 1$						
	Multiply both sides of an inequality by a negative number						
	Solve simple linear inequalities in one variable and represent the solution on a number line e.g. $-6 < 2n = 4$ or $-9 < 2n + 3 = 7$						
	Understand the steps required to solve a pair of simultaneous equations of the form $ax + y = b, y = ax$						
	Use systematic trial and improvement to find the approximate solution to one decimal place of equations such as $x^3 = 29$						
	Construct and solve equations that involve multiplying out brackets by a negative number and collecting like terms						
	Find an unknown where it is not the subject of the formula and where an equation must be solved						
	Solve more complex linear inequalities in one variable and represent the solution on a number line e.g. $3n + 2 < 11$ and $2n - 1 > 1$						
	Understand the steps required to solve a pair of simultaneous, when they are solved by addition. Equations are of the form $ax + y = b, x - y = c$						
	Use systematic trial and improvement to find the approximate solution to one decimal place of equations such as $x^3 + x = 50$						
<b>Extending</b>	Construct and solve equations of the form $(ax +/- b)/c = (dx +/- e)/f$ { $c$ and $f$ are both bigger than 1}						
	Change the subject of a formula						
	Use factorisation to make a given letter the subject of a formula						
	Change the subject of a complex formula that involves fractions, e.g. make $u$ or $v$ the subject of the formula $1/v + 1/u = 1/f$						
	Change algebraic fractions to equivalent fractions						
	Solve problems by finding a variable that is not the subject of a formula						

TEST 1

# Unit 2 Objectives

Band	Statistics	Assessment	I can do this already	Covered in Class	Strength?	Revised it?	Aced it	
<b>Developing</b>	Select the range of possible methods that could be used to collect primary data							
	Determine suitable sample size and degree of accuracy needed							
	Design and use a data collection sheet for continuous grouped data							
	Discuss factors that may affect the collection of data							
	Design tables recording discrete and continuous data							
	Identify key features of data sets described in either line graphs or scatter graphs – including exceptions and correlation							
	From a small choice of options identify ways to reduce bias in a sample							
	Find the modal class of a large set of data							
	Construct and use frequency polygons to compare sets of data							
	Select appropriate level of accuracy of data							
	From a range of sample sizes identify the most sensible answer							
	Select and discuss the range of possible sources that could be used to collect this data as secondary data							
	Select and discuss the range of possible sources that could be used to collect this data as secondary data							
	Construct a frequency diagram from a grouped frequency table, and use it to draw a frequency polygon.							
	<b>Securing</b>	Compare two distributions using the shape of the distributions – frequency polygons.						
		Use stem and leaf diagrams to find mode, median, mean, range						
Construct stem and leaf diagrams								
Use back to back stem and leaf diagrams to compare sets of data								
Use a line of best fit, drawn by eye, to estimate the missing value in a two variable data set								
Calculate estimate of mean from large sets of grouped data								
Estimate the range of a large set of grouped data								
<b>Extending</b>	Calculate an estimate of the mean of a large set of grouped data							
	Calculate possible values of the set of data given summary statistics							
	Identify a random sample							
	Estimate the mean from a frequency polygon							
	Identify the class that contains the median of a set of grouped data from a table							
	Find quartiles from raw data and present data in a box plot							
Draw a grouped frequency graph								
Estimate the median of a set of grouped data using a cumulative frequency chart								
Find the lower and upper quartiles of a set of grouped data using a cumulative frequency chart and box and whisker diagram								
Find the interquartile range of a large set of grouped data using a cumulative frequency chart								
Interpret / construct histograms								



## Unit 3 Objectives

Band	<b>Multiplicative Reasoning</b>	Assessment	I can do this already	Covered in Class	Strength?	Revised it?	Aced it
<b>Developing</b>	Given a relationship (as proportion) graphically or in words, extend beyond known values (e.g. off lines of chart, or above pairs of values given)						
	Check by drawing graphs whether two variables are in direct proportion						
	Set up equations to show direct proportion						
	Recognise sets of data that are proportional						
	Understand direct proportion as equality of ratio						
	Use algebraic methods to solve problems involving variables in direct proportion						
	Use expressions of the form $y$ is proportional to $x$						
<b>Securing</b>	Solve problems using compound measures						
	Solve problems using constant rates and related formulae						
	Use expressions of the form $y$ is proportional to $x^2$						
	Identify data that is proportional to the inverse of a variable						
<b>Extending</b>	Calculate percentage change, using the formula $\frac{\text{actual change}}{\text{original amount}} \times 100$ – where formula is recalled						
	Understand / use inverse proportion						
	Recognise the formulae for length of arcs in a circle						
	Recognise the formulae for area of sectors in a circle						
	Use the formulae for length of arcs and area of sectors of circles to solve problems						

### TEST 3

# Unit 4 Objectives

Band	<b>Non-linear Graphs</b>	Assessment	I can do this already	Covered in Class	Strength?	Revised it?	Aced it
<b>Developing</b>	Recognise the graph of a quadratic function						
	Construct a table of values, including negative values of $x$ for a quadratic function such as $y = ax^2$						
	Construct a table of values, including negative values of $x$ for a function such as $y = ax^2 + b$						
	Construct a table of values, including negative values of $x$ for a function such as $y = ax^3$						
<b>Securing</b>	Solve simple quadratic equations graphically, e.g. $x^2 - 10 = 0$ , $2x^2 - 15 = 0$						
	Construct a table of values, including negative values of $x$ for a function such as $y = ax^2 + bx$ and $y = ax^2 + bx + c$						
	Recognise the graphs of $y = x^2$ , $y = 3x^2 + 4$ , $y = x^3$						
	Find the line of symmetry and write down the turning point of a quadratic graph						
	Explain the effect on a quadratic graph of changing the parameter						
	Recognise graphs of functions of the form $y = ax^2 + b$ and $y = ax^3$						
<b>Extending</b>	Recognise and use reciprocal graphs and graphs for inverse proportion						
	Solve quadratic equations such as $ax^2 + bx = 0$ graphically and relate the solutions to quadratic factorisation						
	Identify maxima, minima and lines of symmetry on quadratic and cubic graphs						
	Construct models of real-life situations by drawing graphs and constructing algebraic equations						
	Solve quadratic equations such as $x^2 + bx + c = 0$ graphically and relate the solutions to quadratic factorisation						
	Sketch / interpret graphs of reciprocal functions						

## TEST 4

# Unit 5 Objectives

Band	<b>Quadratics</b>	Assessment	I can do this already	Covered in Class	Strength?	Revised it?	Aced it
<b>Developing</b>	Generate the next term in a quadratic sequence						
	Generate any term of a sequence when the $n$ th term is given.						
	Multiply out brackets involving positive terms such as $(a + b)(c + d)$ and collect like terms						
	Classify sequences as linear, geometric and quadratic.						
	Find a term of a quadratic sequence with $T(n) = an^2$ for a given value of $n$						
	Generate the sequence of triangle numbers by considering the arrangement of dots and deduce that $T(n) = 1 + 2 + 3 + \dots + n$ , the sum of the series						
<b>Securing</b>	Multiply out brackets involving positive and negative terms such as $(a + b)(c - d)$ or $(a - b)(c - d)$ and collect like terms						
	Square a linear expression and collect like terms						
	Find the $n$ th term of a quadratic sequence of the term with $T(n) = an^2 +/- b$						
	By looking at the spatial patterns of triangular numbers, deduce that the $n$ th term is $n(n + 1)/2$						
	Derive and use identities for the product of two linear expressions of the form $(a + b)(a - b) = a^2 - b^2$ and $(x + 2)(x - 2) = x^2 - 4$						
<b>Extending</b>	Find the $n$ th term of a quadratic sequence of the term with $T(n) = an^2 +/- bn +/- c$						
	Factorise a quadratic expression						
	Factorise a perfect square						
	Derive and use the difference of two squares						
	Solve quadratics with first term $x$ squared (no multiples of $x$ squared)						

## EOY TEST 5

# Unit 6 Objectives

Band	<b>Geometry in 2D &amp; 3D</b>	Assessment	I can do this already	Covered in Class	Strength?	Revised it?	Aced it
<b>Developing</b>	Know the names of parts of a circle						
	Use the formula for the circumference of a circle						
	Round to an appropriate number of decimal places after calculations						
	Use the formula for area of a circle, given the radius or diameter						
	Use the formulae for the circumference, given the circumference, to calculate the radius or diameter						
	Use the formulae for area of a circle, given area, to calculate the radius or diameter						
	Calculate the surface area and volume of right prisms (including cylinder)						
<b>Securing</b>	Identify and calculate upper and lower bounds						
	Know the formula for Pythagoras' theorem and how to substitute in values from a diagram						
	Use and apply Pythagoras' theorem to solve problems						
	Understand that the ratio of any two sides is constant in similar right-angles triangles						
	Use the sine, cosine and tangent ratios to find the lengths of unknown sides in a right-angled triangle, using straight-forward algebraic manipulation, e.g. calculate the adjacent (using cosine), or the opposite (using sine or tangent ratios)						
<b>Extending</b>	Use the sine, cosine and tangent ratios to find the lengths of unknown sides in a right-angled triangle, using more complex algebraic manipulation, e.g. the hypotenuse (using cosine or sine), or adjacent (using the tangent ratio)						
	Begin to use the trigonometric ratios to find the size of an angle in a right-angled triangle						
	Use the appropriate ratio to find a length, or angle, and hence solve a two-dimensional problem						
	Calculate simple error intervals, such as +/- 10%						
	Use sine / cosine / tangent of any size of angle and Pythagoras' theorem when solving problems in 3D						
	Sketch graphs of sine / cosine / tangent functions for any angle, generating/interpreting them						

## TEST 6

# Unit 7 Objectives

Band	Graphical & Algebraic Solutions	Assessment	I can do this already	Covered in Class	Strength?	Revised it?	Aced it
Developing	Recognise that linear functions can be rearranged to give $y$ explicitly in terms of $x$ , e.g. rearrange $y + 3x - 2 = 0$ in the form $y = 2 - 3x$						
	Reduce a given linear equation in two variables to the standard form $y = mx + c$						
	Plot lines of the form $y = mx + c$						
	Understand the steps required to solve a pair of simultaneous equations of the form $ax + y = b, y = ax$						
	Understand the steps required to solve a pair of simultaneous equations, when they are solved by addition. Equations are of the form $ax + y = b, x - y = c$						
	Identify the solution of simultaneous equations on a graph						
Securing	Understand the steps required to solve a pair of simultaneous, when they are solved by subtraction. Equations are of the form $ax + y = b, x + y = c$						
	Rearrange equations of the form $ax+by=c$ to compare gradients and $y$ -intercept						
	Find the equation of the line between two points						
	Solve inequalities in two variables by using linear graphs						
Extending	Understand the steps required to solve a pair of simultaneous equations, when they are solved by multiplication. Equations are of the form $ax + y = b, x +/- cy = d$						
	Solve more complex inequalities in two variables by using linear and quadratic graphs						
	Construct models of real-life situations by drawing graphs and constructing algebraic equations						

## Unit 8 Objectives

Band	Mathematical Reasoning & Proof	Assessment	I can do this already	Covered in Class	Strength?	Revised it?	Aced it
<b>Developing</b>	Know and use the proof of the angles in a triangle.						
	Apply angle theory to develop the formulae for the interior and exterior angles of regular polygons.						
	Develop proofs for alternate angles and vertically opposite angles.						
	Understand and use algebraic generalisation as a means to prove arithmetic statements. e.g "The product of any two consecutive numbers is even".						
<b>Securing</b>	Justify solutions to problems set in an unfamiliar context						
	Generate fuller solutions using reasoned argument						
	Construct models of real-life situations by drawing graphs and constructing algebraic equations						
	Identify exceptional cases or counter-examples and explain why						
	Use counter example to show why a statement is false						
<b>Extending</b>	Explore the effects of varying values and make convincing arguments to justify generalisations						
	Justify generalisations, arguments or solutions and investigate whether particular cases can be generalised further						
	Present a reasoned argument using algebra						
	Use algebra to investigate an extension to a problem						