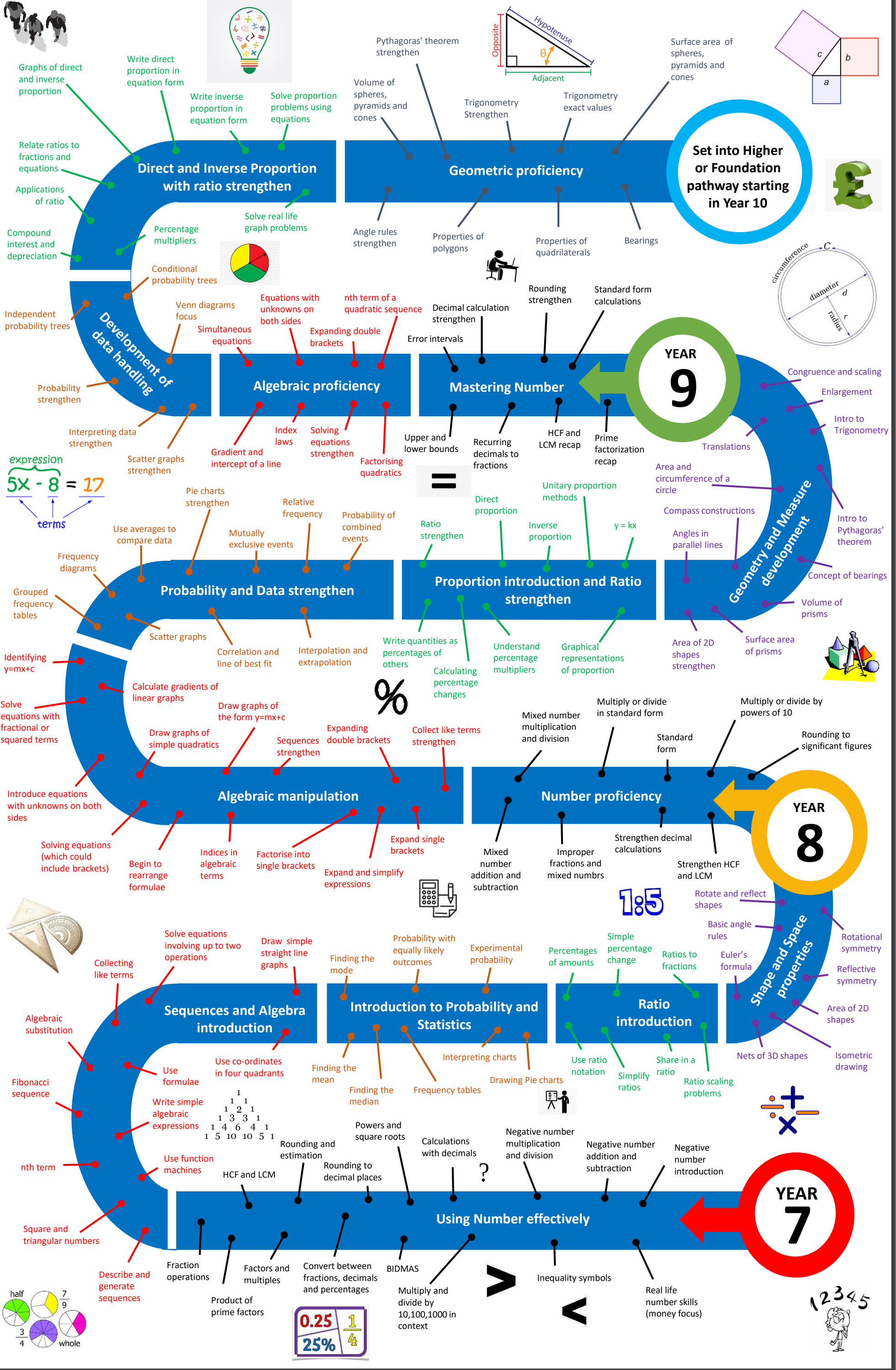
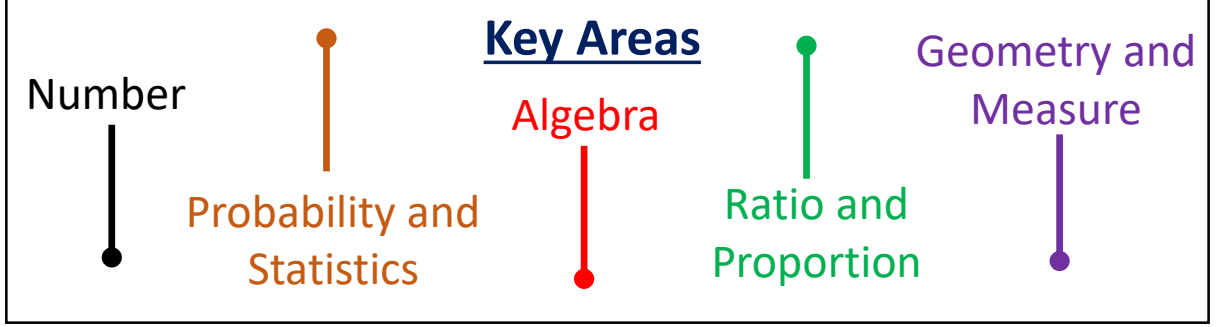


Maths Learning Journey Year 7-9

Maths at S. Peter's Collegiate School in KS3 and beginning GCSE in year 9 provides a strong base for all students to become efficient mathematicians. See our GCSE Higher and Foundation Learning journey for the differing pathways from Year 10.

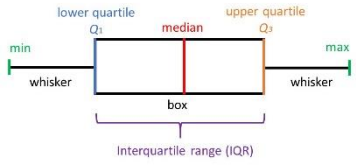
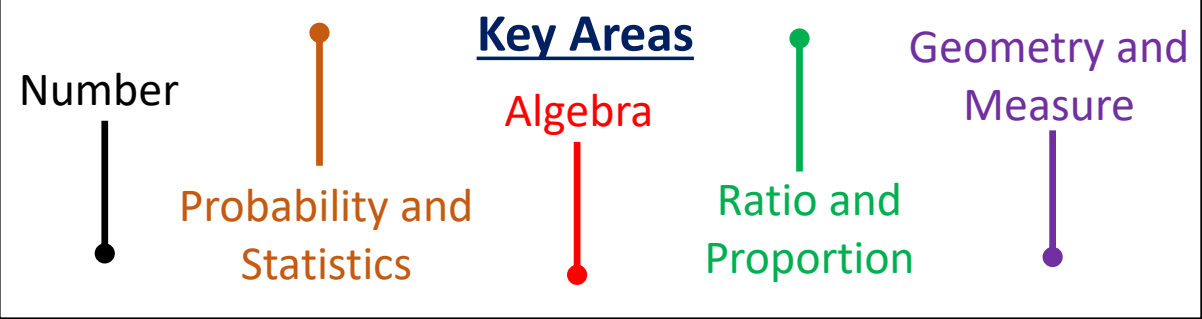
There are 5 key areas of study in Mathematics which have been shown through the different colour labels. We have a clear focus on number initially to ensure learners are highly numerate by the end of KS3



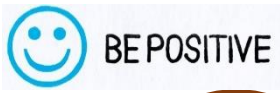
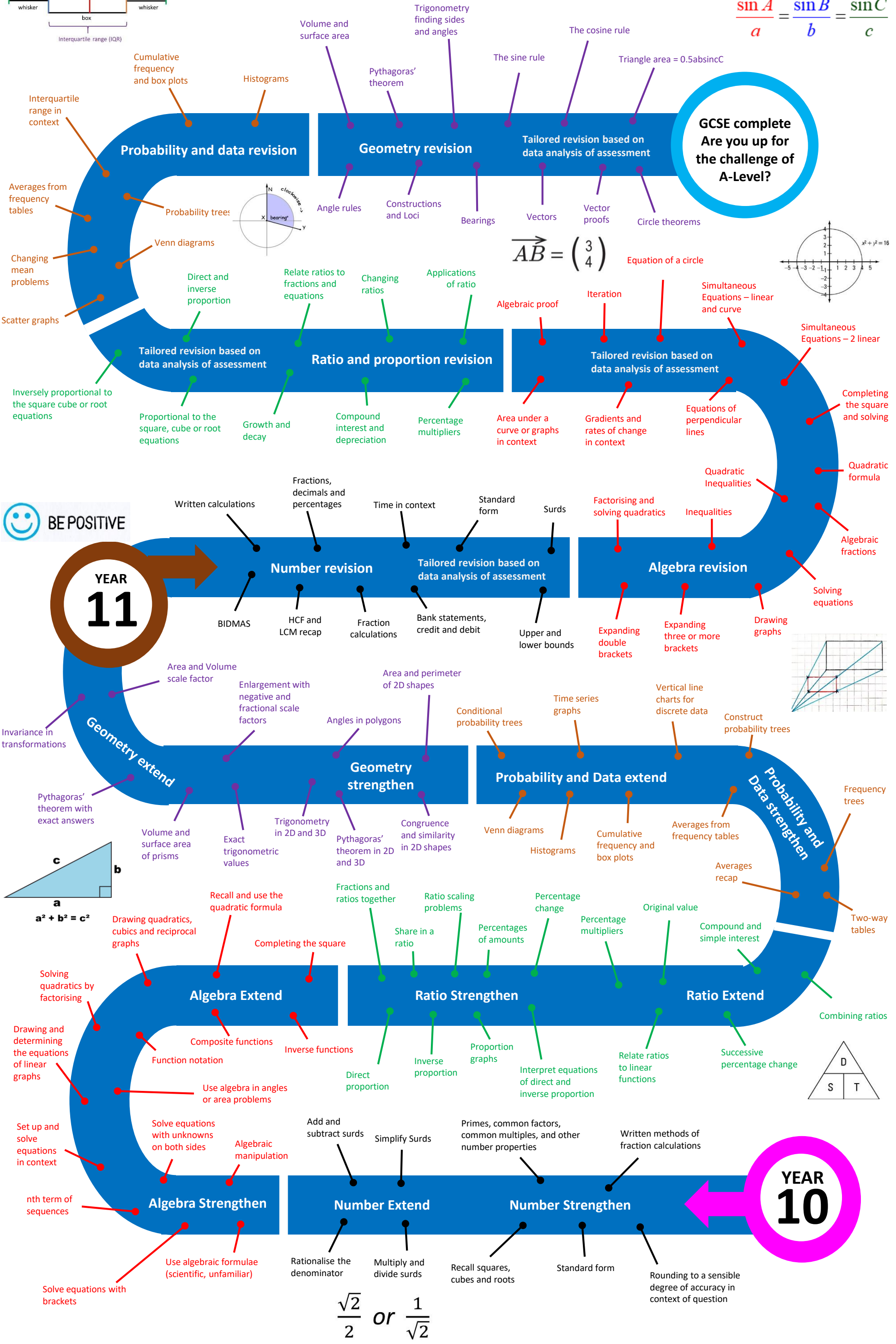
Maths Learning Journey Year 10-11

Maths at S. Peter's Collegiate School in KS4 provides carefully sequenced learning of new topics, whilst also adding in vital consolidation and strengthening of all key areas. Year 11 is mainly revising content and improving exam technique.

There are 5 key areas of study in Mathematics which have been shown through the different colour labels. Here we strengthen and extend to prepare students fully to complete their GCSE.



$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$



YEAR 11

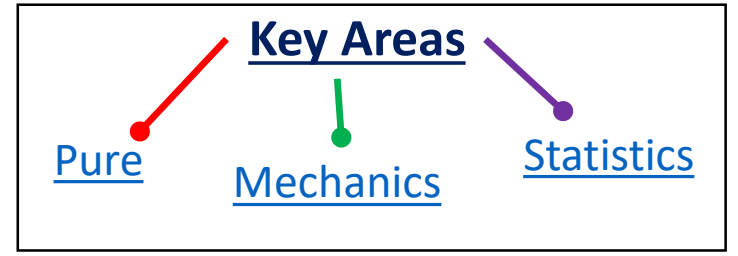
YEAR 10

$$\frac{\sqrt{2}}{2} \text{ or } \frac{1}{\sqrt{2}}$$

AS/A Level Maths Learning Journey Year 12 & 13

Students wishing to extend their knowledge of mathematical methods beyond GCSE and increase their ability to solve complex problems, are able to study Mathematics at AS level in year 12 and continue to A level in Year 13. Maths is a facilitating subject and is seen to be an essential skill in many professional careers. It helps to develop critical and analytical thinking and enables us to construct logical arguments.

There are three areas of study for Advanced Level Mathematics: Pure Maths –the study of the basic concepts and structures that underlie mathematics. Mechanics- Applying mathematics to model real life situations using forces, Newton’s Laws, kinematics and motion. Statistics- Applying mathematics to model data, calculate probabilities and perform hypothesis testing to analyse results.



Year 12 Topics:

- Algebra 1:** Solve simultaneous equations graphically and algebraically; Complete the square to find the min and max turning point; Use the discriminant to find the number of real roots of a quadratic; Recognize and sketch quadratic functions.
- Algebra 2:** Functions-domain, range and mappings; Composite and inverse functions; Transformations of all types of functions; Parametric Equations; Partial Fractions.
- Differentiation:** Differentiation from 1st principles for small +ve integer powers; Use $\frac{dy}{dx}$ as the gradient of a tangent; Increasing and decreasing functions; Use $\frac{d^2y}{dx^2}$ as the gradient of a tangent; Maximization and minimization problems; Understand differentiation is 'reverse' of integration and vice versa; Know Calculus is integration and differentiation; Understand and use the sine, cosine and tangent functions; their graphs, symmetries and periodicity; Solve quadratic trig equations and equations with multiples of the unknown angle.
- Integration:** Understand the terms definite and indefinite integration; Find the area between the curve, x-axis and limits; Recall and use Trig identities to solve equations; The sine and cosine rules; Solve simple trigonometric equations in a given interval; Simple transformations of the graphs of the sine, cosine and tangent functions; Exponential models and processes; The exponential function $y = e^x$; Curve fitting; Exponential functions; Understand and use the laws of logarithms; $\log_b b^x = x$; $b^{\log_b x} = x, x > 0$.
- Logarithms & exponentials:** Solve equations of the form $a^x = b$.
- Trigonometry:** Solve simple trigonometric equations in a given interval; Simple transformations of the graphs of the sine, cosine and tangent functions; Exponential models and processes; The exponential function $y = e^x$; Curve fitting; Exponential functions; Understand and use the laws of logarithms; $\log_b b^x = x$; $b^{\log_b x} = x, x > 0$.
- Co-ordinate geometry:** Formulas for gradient, mid-point and distance between 2 points; Equations of parallel and perpendicular lines; The general equation of a line including the forms: $y - y_1 = m(x - x_1)$ and $ax + by + c = 0$; Using sketches to solve equations using points of intersection; The Binomial Theo; algebraic division; Solve simultaneous equations graphically and algebraically; Complete the square to find the min and max turning point; Use the discriminant to find the number of real roots of a quadratic; Recognize and sketch quadratic functions.
- Polynomials:** Factor theorem; Manipulate expressions; Argument and Proof and disproof; surds; Index Laws.
- Inequalities:** Express inequalities in set notations; Solve linear and quadratic inequalities graphically; Equations of tangents and normals; Use of circle theorems; Formulas for gradient, mid-point and distance between 2 points; Equations of parallel and perpendicular lines; The general equation of a line including the forms: $y - y_1 = m(x - x_1)$ and $ax + by + c = 0$; Using sketches to solve equations using points of intersection; The Binomial Theo; algebraic division; Solve simultaneous equations graphically and algebraically; Complete the square to find the min and max turning point; Use the discriminant to find the number of real roots of a quadratic; Recognize and sketch quadratic functions.
- Differentiation:** Differentiate ax^n for all rational values of n; Product of gradients of parallel and perpendicular lines; Curve sketching to include up to cubics and reciprocal graphs; Factor theorem; Manipulate expressions; Argument and Proof and disproof; surds; Index Laws.
- Integration:** Understand the terms definite and indefinite integration; Find the area between the curve, x-axis and limits; Recall and use Trig identities to solve equations; The sine and cosine rules; Solve simple trigonometric equations in a given interval; Simple transformations of the graphs of the sine, cosine and tangent functions; Exponential models and processes; The exponential function $y = e^x$; Curve fitting; Exponential functions; Understand and use the laws of logarithms; $\log_b b^x = x$; $b^{\log_b x} = x, x > 0$.
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- Algebra 2:** Functions-domain, range and mappings; Composite and inverse functions; Transformations of all types of functions; Parametric Equations; Partial Fractions.

Year 13 Topics:

- Algebra 1:** Solve simultaneous equations graphically and algebraically; Complete the square to find the min and max turning point; Use the discriminant to find the number of real roots of a quadratic; Recognize and sketch quadratic functions.
- Algebra 2:** Functions-domain, range and mappings; Composite and inverse functions; Transformations of all types of functions; Parametric Equations; Partial Fractions.
- Differentiation:** Differentiate from 1st principles for small +ve integer powers; Use $\frac{dy}{dx}$ as the gradient of a tangent; Increasing and decreasing functions; Use $\frac{d^2y}{dx^2}$ as the gradient of a tangent; Maximization and minimization problems; Understand differentiation is 'reverse' of integration and vice versa; Know Calculus is integration and differentiation; Understand and use the sine, cosine and tangent functions; their graphs, symmetries and periodicity; Solve quadratic trig equations and equations with multiples of the unknown angle.
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- Algebra 2:** Functions-domain, range and mappings; Composite and inverse functions; Transformations of all types of functions; Parametric Equations; Partial Fractions.

Mechanics Topics:

- Kinematics:** Sketching and calculations with Displacement/time Velocity/time and acceleration/time graphs; The SI Unit System and conversions within.
- Vectors:** Addition, multiplication by scalars and geometrical interpretations; Use vectors in problem solving for both pure and mechanics; Resultant vectors and application with force questions; Newton's 1st Law. Different types of force and equilibrium; Newton's 2nd and 3rd laws. Motion under gravity.
- Forces and Newton's Laws:** Draw and label force diagrams on a horizontal plane; Limitations and assumptions of modelling; Pulleys and systems of forces; Use calculus in Kinematics.
- Motion & Variable Acceleration:** Use calculus in Kinematics.

Statistics Topics:

- Collecting and analysing data:** Bivariate Data-calculations and diagrams; Central Tendency and Spread; Sampling methods.
- Probability and DRV's:** Discrete and continuous distributions; mutually exclusive and independent events; Single variable data-calculations and diagrams.
- Hypothesis Testing:** Interpret the result in context; Find and interpret correctly the critical region for a hypotheses test; Apply a hypothesis test to the mean of Binomial model; Formulate a test; The Binomial Probability Distribution.
- Probability and Hypothesis Testing 2:** Understand and use conditional probability and select the most appropriate method; Understand and use the Normal distribution as a model; Select an appropriate probability distribution for a context; Testing correlation; Model probability & critique its validity by considering assumptions made; Find probabilities using the Normal distribution; the Normal distribution as an approximation to the binomial distribution; Testing the normal distributive.

Numerical methods: Cobweb & staircase diagrams; The trapezium Rule to estimate an area; Newton Raphson method to solve equations; Change of sign to locate roots; Form and solve differential equations in a variety of contexts; Integration by parts; Definite integration Area between 2 curves; Integration by Inspection.

Integration 2 & Differential equations: Integrals with partial fractions; Integration by substitution; Standard integrals; Geometric sequences; Iterative sequences; Binomial series $(1+x)^n$ for $|x| < 1$; Proof and equations using trig identities; Reciprocal and inverse trig functions; Arc length & area of sector; Parametric functions; Implicit Differentiation; $\frac{dy}{dx} = \frac{1}{\frac{dx}{dy}}$.

Sequences: Arithmetic sequences; Geometric sequences; Iterative sequences; Binomial series $(1+x)^n$ for $|x| < 1$; Proof and equations using trig identities; Reciprocal and inverse trig functions; Arc length & area of sector; Parametric functions; Implicit Differentiation; $\frac{dy}{dx} = \frac{1}{\frac{dx}{dy}}$.

Trigonometry 2: Radian measure; Concave, convex & shapes of functions; Algebraic Fractions; The modulus function; Partial Fractions; Parametric Equations; Transformations of all types of functions; Composite and inverse functions; Functions-domain, range and mappings; Proof by Contradiction.