

# Detailed Year Specific Route-maps

- Year 7
- Year 8
- Year 9
- Year 10 - higher and foundation
- Year 11 – higher and foundation
- Year 12 – A-level
- Year 13 – A-level
- Year 12 and 13 – GCSE Resit
- Year 12 and 13 – Functional skills

# MATHS LEARNING JOURNEY

Year 7

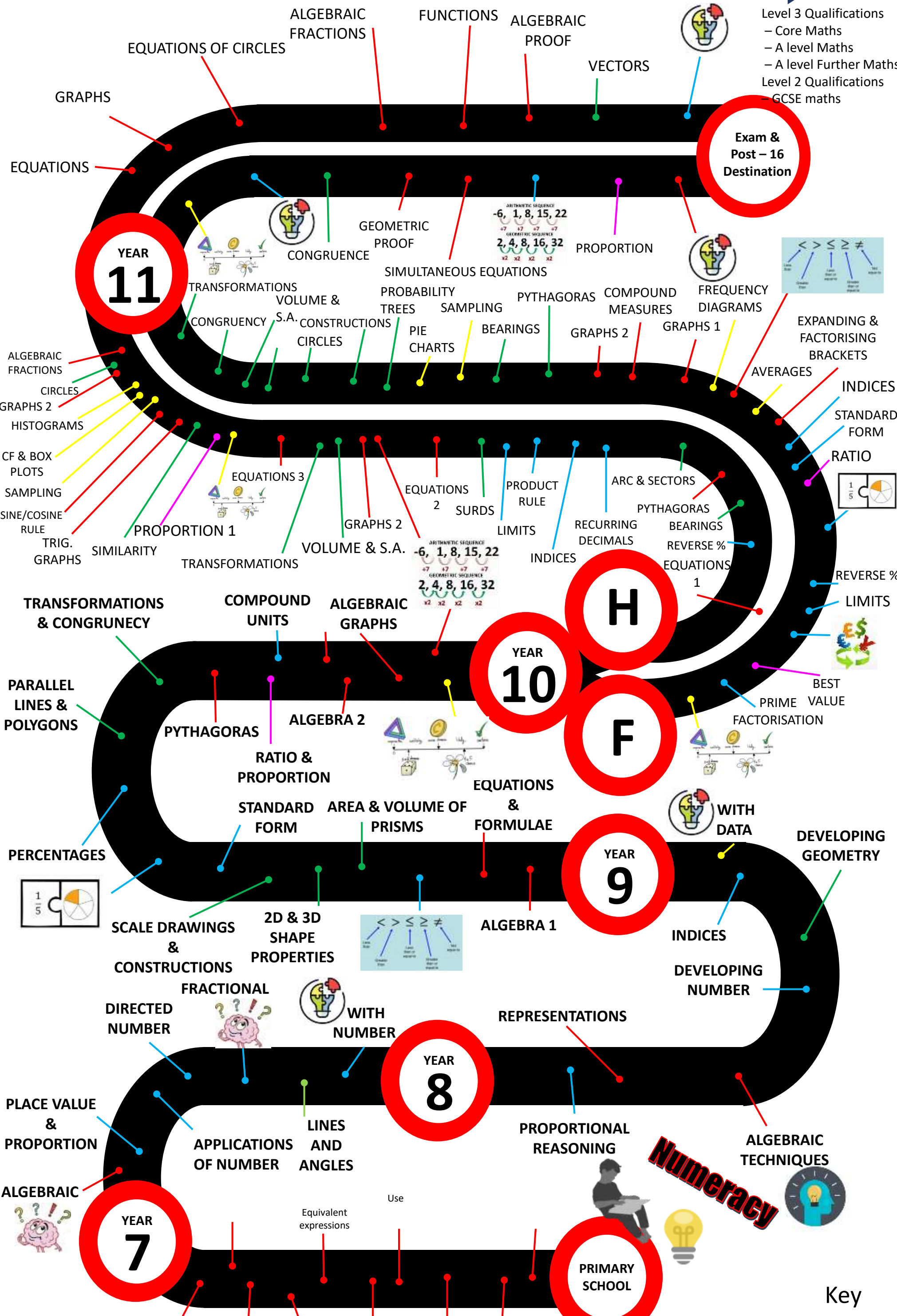
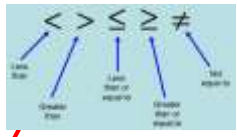
Develop fluency, reason mathematically, solve problems

Year 11

Level 3 Qualifications  
 - Core Maths  
 - A level Maths  
 - A level Further Maths  
 Level 2 Qualifications  
 - GCSE maths

**Exam & Post - 16 Destination**

**YEAR 11**



**YEAR 10**

**F**

**YEAR 9**

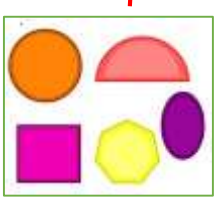
**YEAR 8**

**YEAR 7**

**PRIMARY SCHOOL**

Key

|                           |
|---------------------------|
| Number                    |
| Algebra                   |
| Statistic and Probability |
| Geometry and Measures     |
| Ratio and Proportion      |



Expressing relationships algebraically  
 Formulae in maths & science  
 General Number Skills



# MATHS LEARNING JOURNEY



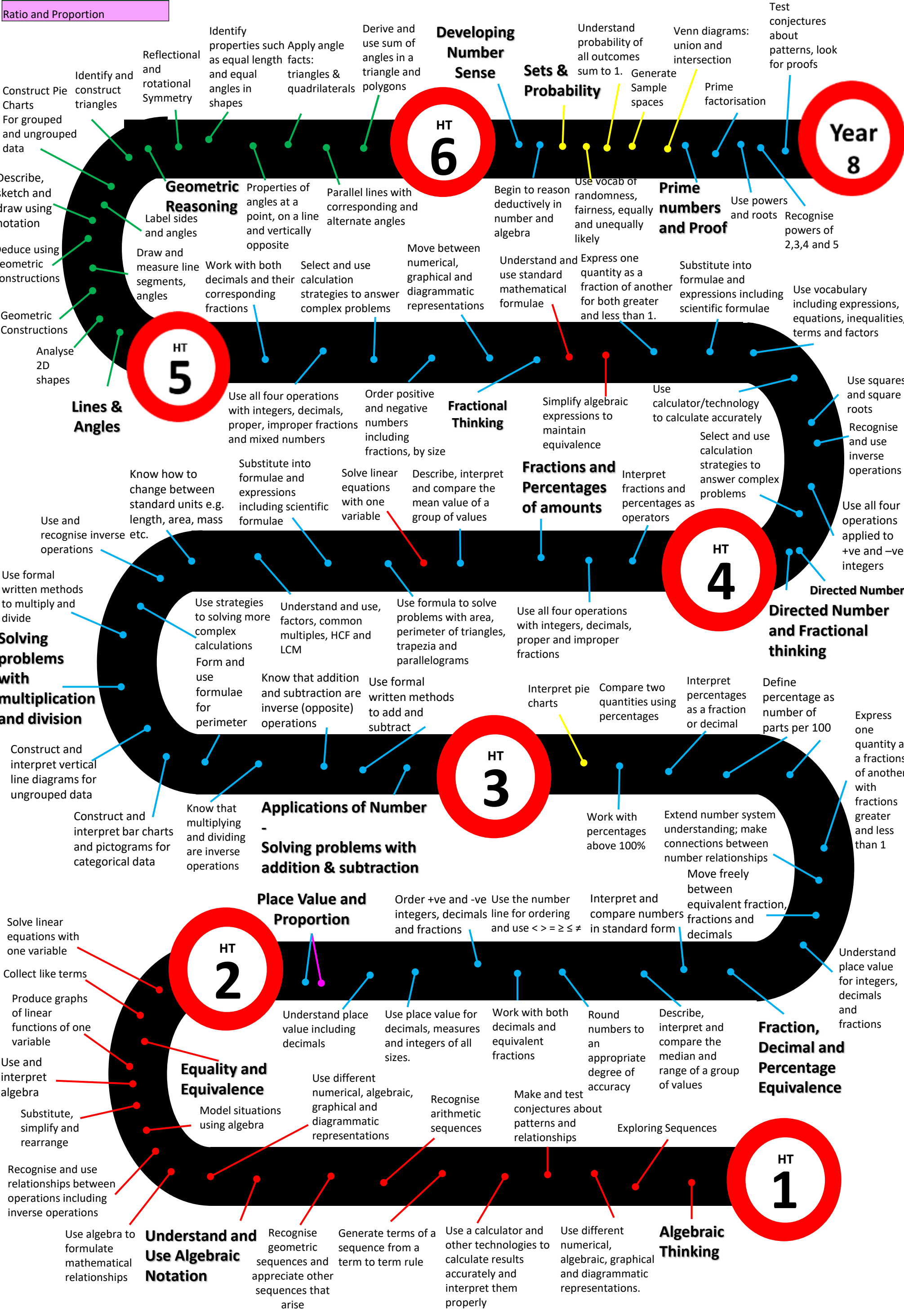
## Year 7

Sept

Develop fluency, reason mathematically, solve problems

July

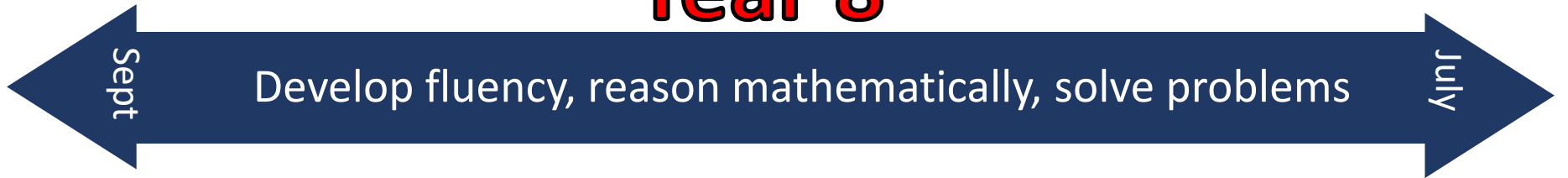
- Number
- Algebra
- Statistic and Probability
- Geometry and Measures
- Ratio and Proportion



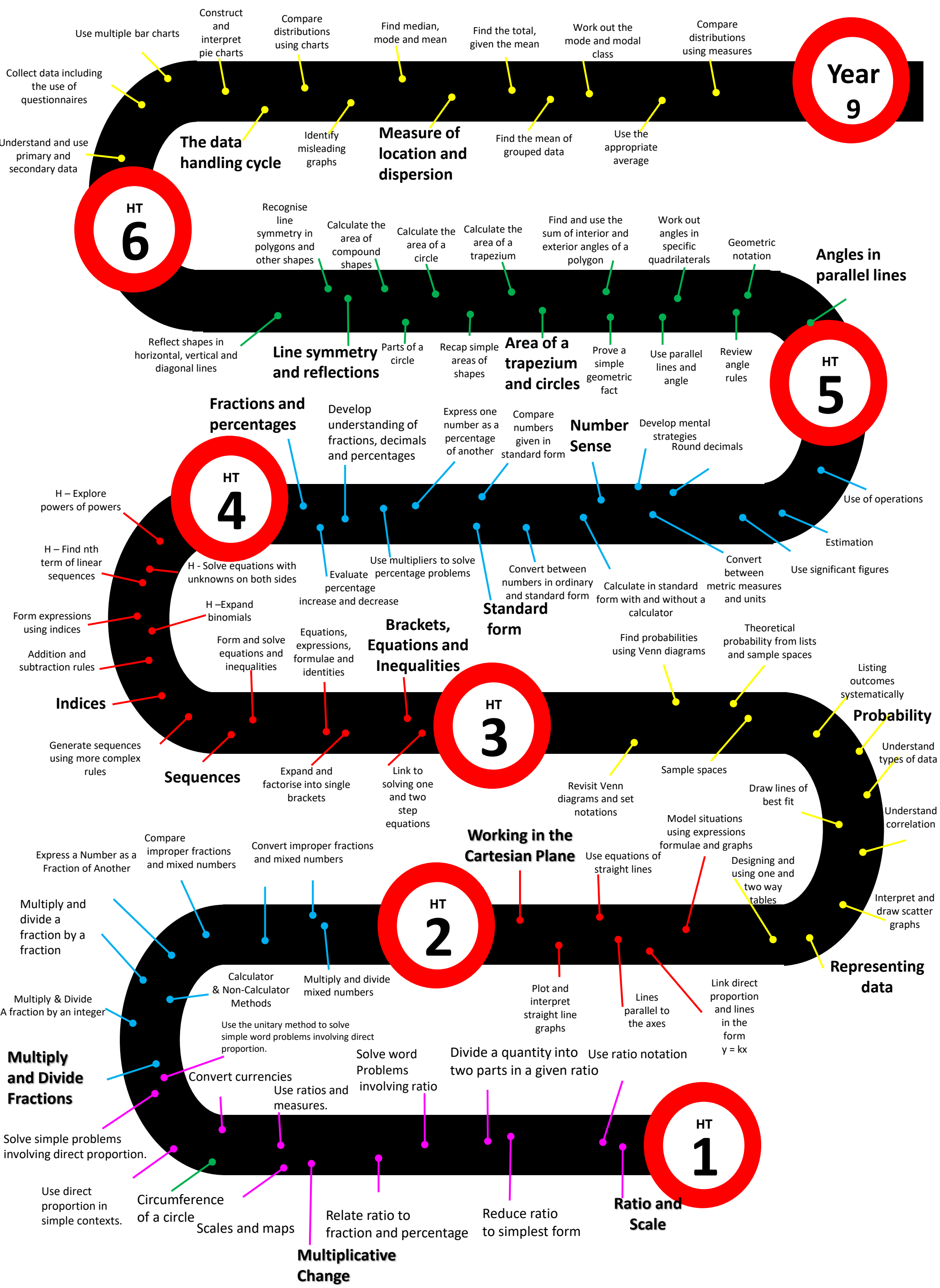
# MATHS LEARNING JOURNEY



## Year 8



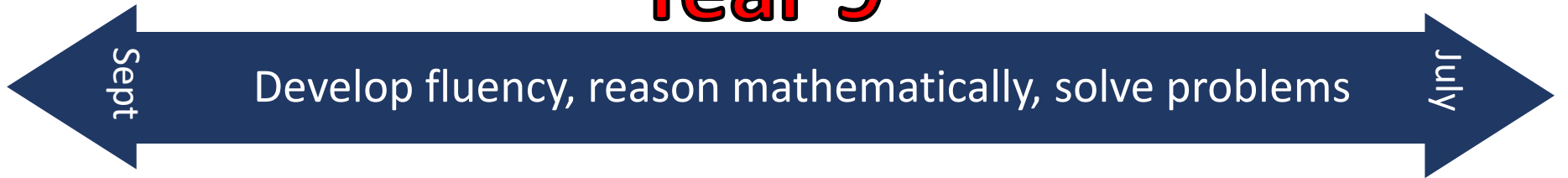
- Number
- Algebra
- Statistic and Probability
- Geometry and Measures
- Ratio and Proportion



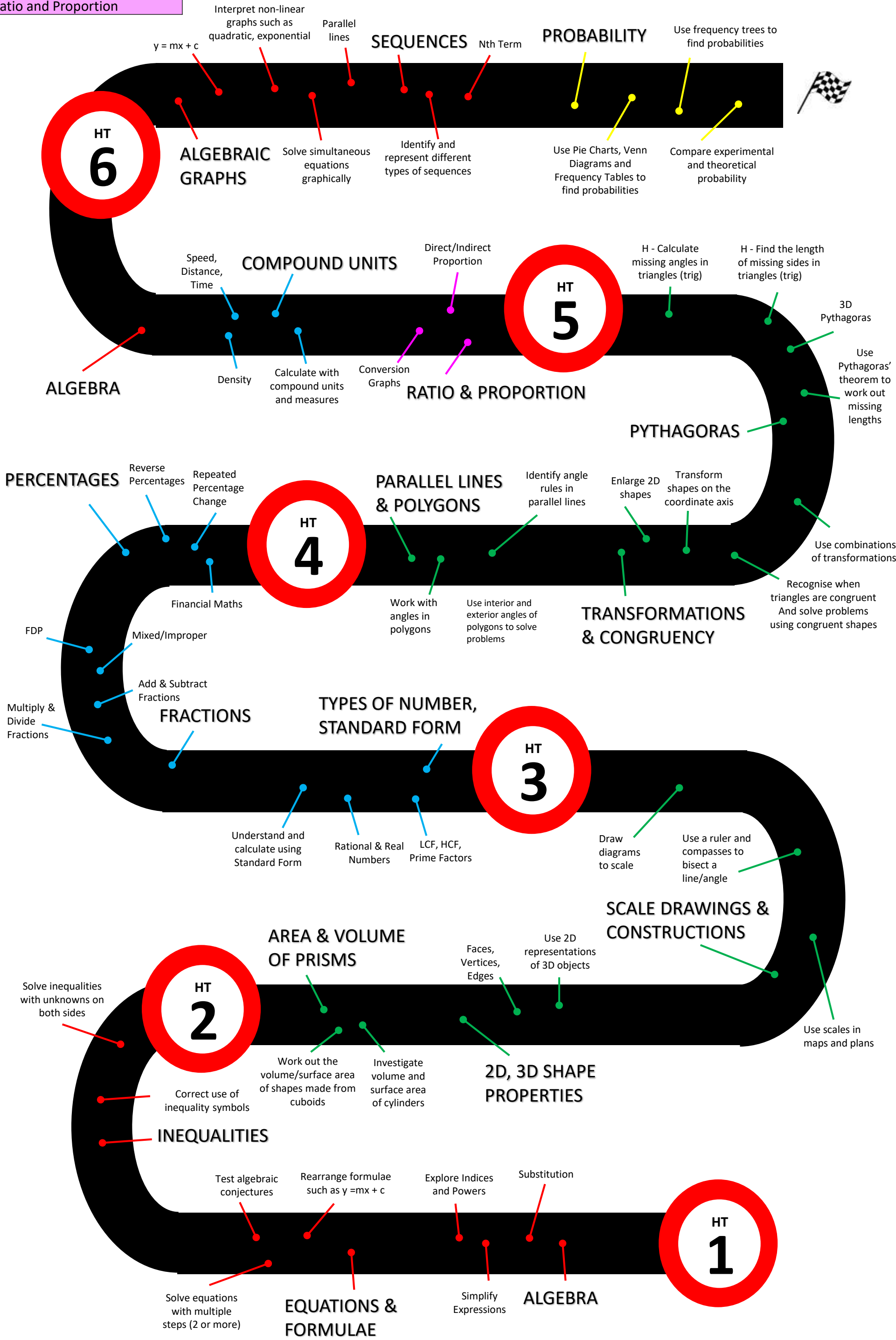
# MATHS LEARNING JOURNEY



## Year 9



- Number
- Algebra
- Statistic and Probability
- Geometry and Measures
- Ratio and Proportion

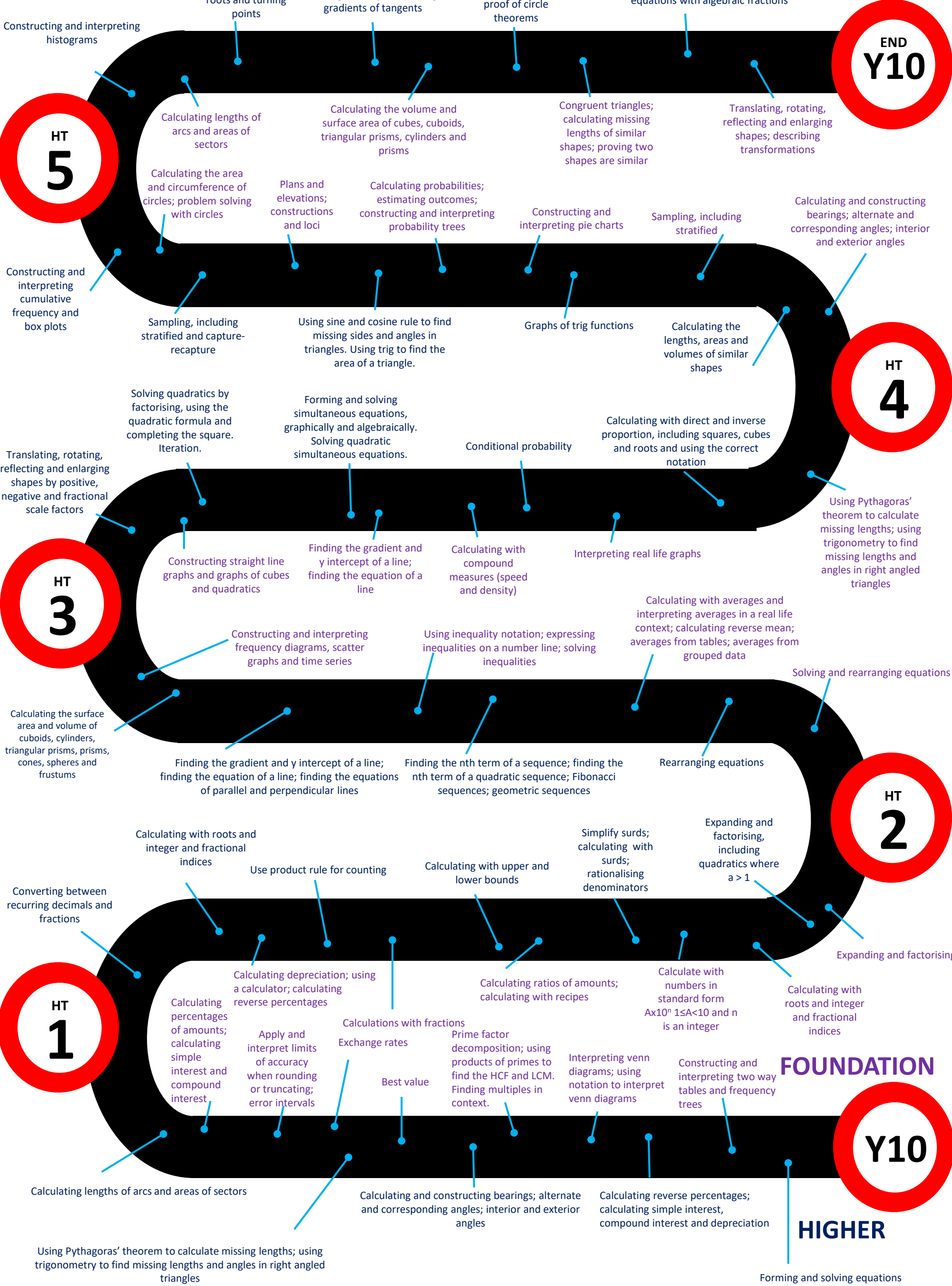


# MATHS LEARNING JOURNEY

## Year 10

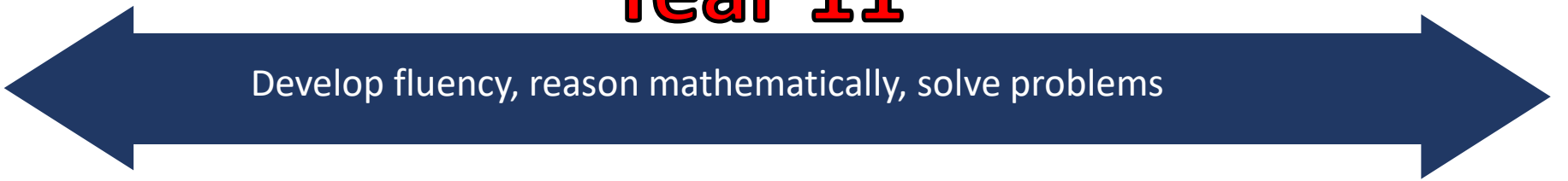


- Number
- Algebra
- Statistic and Probability
- Geometry and Measures
- Ratio and Proportion

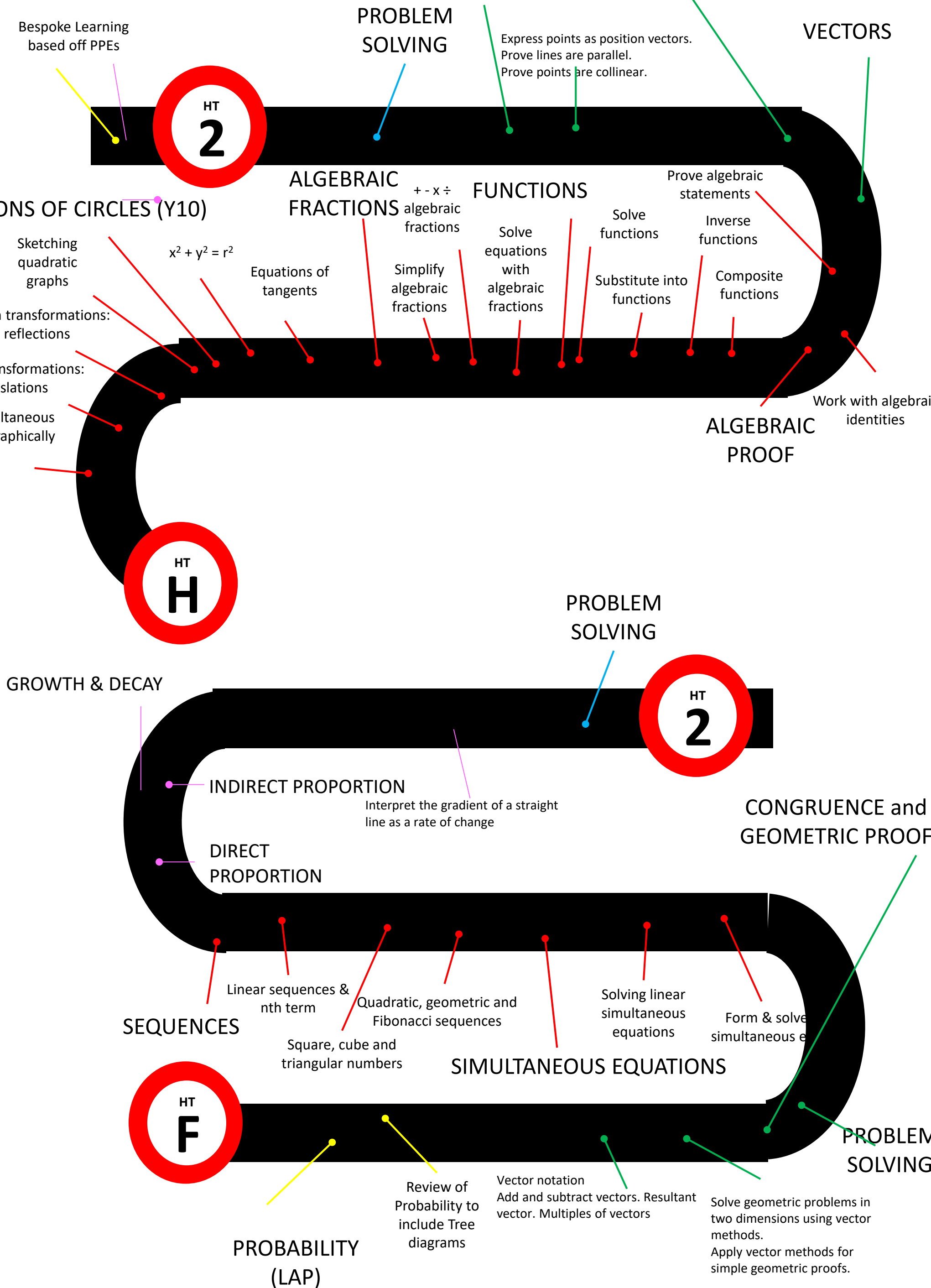


# MATHS LEARNING JOURNEY

## Year 11



|                           |
|---------------------------|
| Number                    |
| Algebra                   |
| Statistic and Probability |
| Geometry and Measures     |
| Ratio and Proportion      |



# MATHS LEARNING JOURNEY



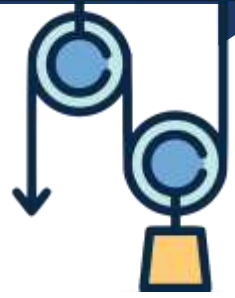
## Year 12

Sept

Develop fluency, reason mathematically, solve problems

June

- MECHANICS
- STATISTICS
- PURE MATHEMATICS



$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

### MODELLING

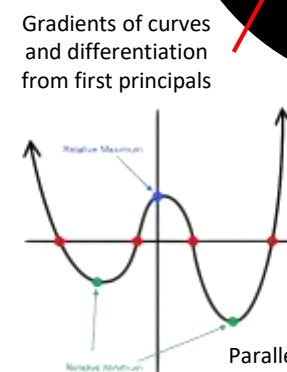
HT 5

END Y12

$$\frac{d^2y}{dx^2}$$

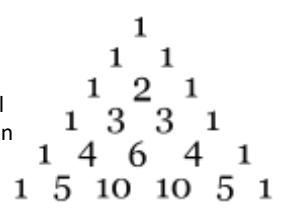
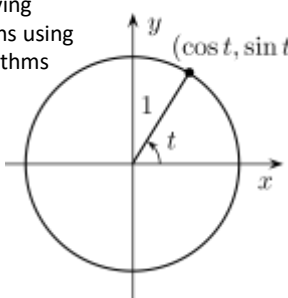
HT 3

HT 4



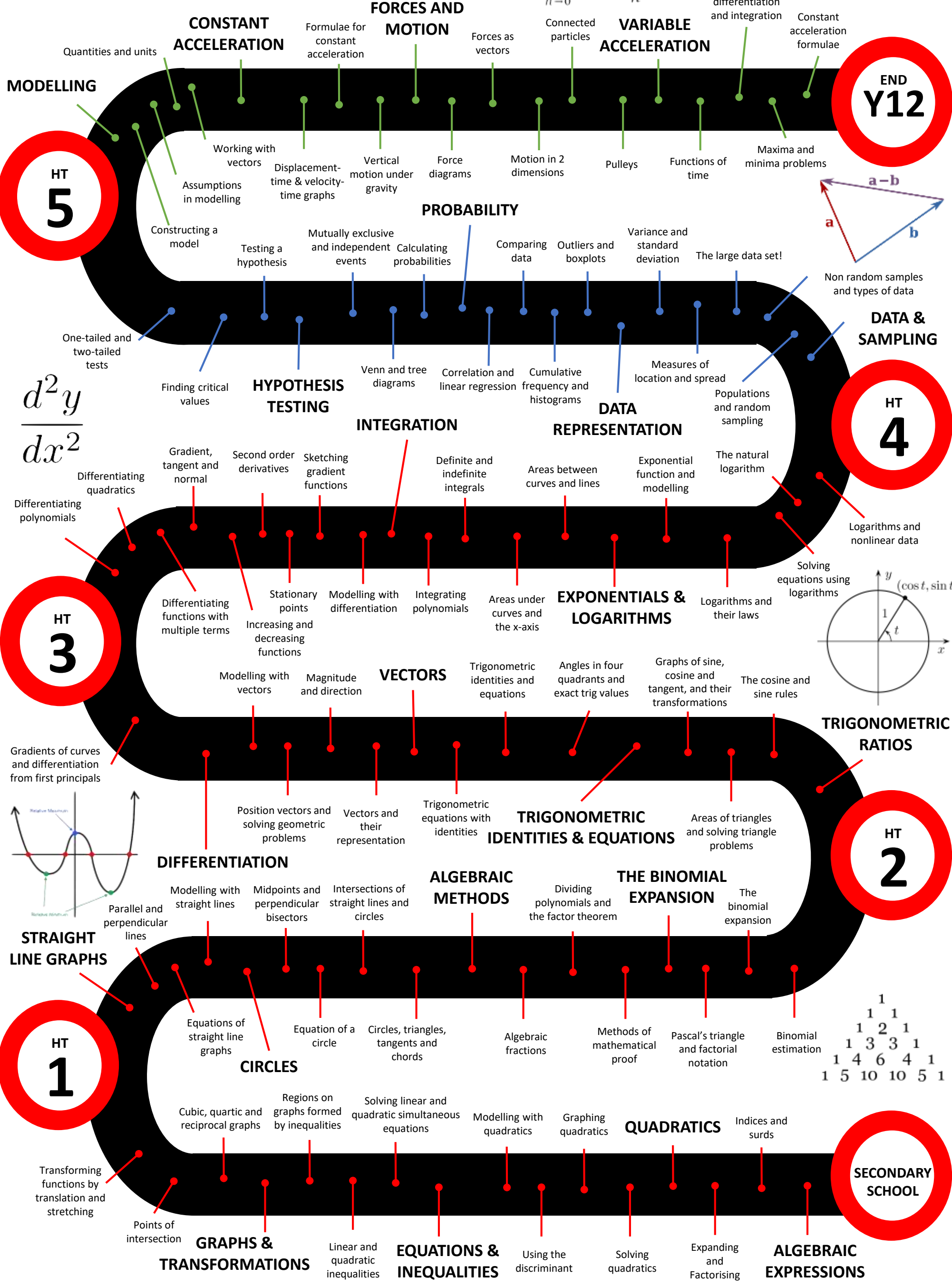
HT 1

HT 2



TRANSFORMING FUNCTIONS

SECONDARY SCHOOL





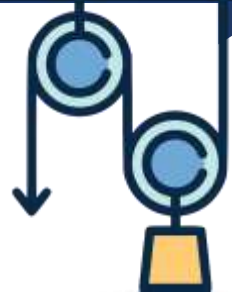
# MATHS LEARNING JOURNEY



## Year 13



- MECHANICS
- STATISTICS
- PURE MATHEMATICS



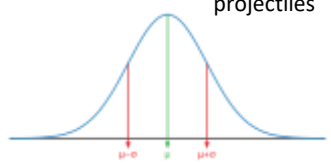
### REVISION & EXAMINATION

END Y13

HT 5

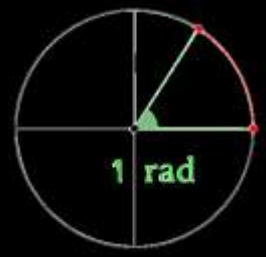
#### FURTHER KINEMATICS

Differentiating and integrating vectors  
Variable acceleration in one dimension



#### REGRESSION & CORRELATION

Application to mechanics  
Solving geometric problems



#### RADIANS

HT 1

#### TRIGONOMETRIC FUNCTIONS

#### BINOMIAL EXPANSION

Using partial fractions

Expanding  $(a + bx)^n$  with fractional indices

Expanding  $(1 + x)^n$

Recurrence relations

A sum to infinity

#### SEQUENCES & SERIES

Combining transformations

Composite functions

#### FUNCTIONS & GRAPHS

Algebraic and partial fractions

#### ALGEBRAIC METHODS

Modelling with series

Sigma notation

Geometric sequences & series

Arithmetic sequences & series

Solving modulus problems

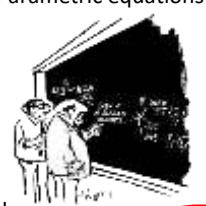
Inverse functions

Functions & mappings

The modulus function

Repeated factors and algebraic division

Proof by contradiction



Y12

#### INTEGRALS

Finding areas and the trapezium rule

Using partial fractions

Using the reverse chain rule

Integrating standard functions

The Newton-Raphson method

Using second derivatives

Differentiating exponentials and logarithms

Differentiating  $\sin x$  and  $\cos x$

#### NUMERICAL METHODS

#### DIFFERENTIATION

Modelling with trigonometric functions

HT 2

Sketching curves and points of intersection

Using trigonometric identities

Parametric equations

#### PARAMETRIC EQUATIONS

Proving trigonometric identities

Solving trigonometric equations

Using the angle addition formulae

Inverse trigonometric functions

Graphing and using  $\sec x$ ,  $\operatorname{cosec} x$  and  $\cot x$

Small angle approximations

Equations

Using radians to measure arc lengths, sectors and segments

$$\frac{dy}{dx} = \frac{dy}{du} \frac{du}{dx}$$

HT 4

Hypothesis testing with the normal distribution

#### MOMENTS

Centres of mass and tilting

Inclined planes

#### PROJECTILES

Horizontal and vertical components

Projectile motion formulae

Static particle and modelling

Static rigid bodies

Connected particles

Vectors in kinematics

Vector methods with projectiles

Equilibrium

Resultant moments

#### FORCES & FRICTION

Resolving forces

Friction

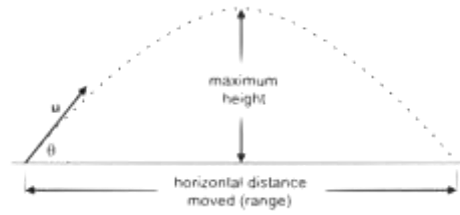
Horizontal projection

Projection at any angle

#### APPLICATIONS OF FORCES

Friction and static particles

Dynamics and inclined planes



HT 3

Exponential models

Hypothesis testing for zero correlation

Set notation and conditional probability

Probability formulae and tree diagrams

The normal distribution

The inverse normal distribution function

Finding  $\mu$  and  $\sigma$

#### INTEGRATION

Vectors in 3D

Solving and modelling with differential equations

Integrating by substitution and by parts

Using trigonometric identities

Applications to modelling

Locating roots and iteration

Rates of change

Parametric and implicit differentiation

Differentiating trigonometric functions

The chain rule, product rule and quotient rule

Differentiating  $\sin x$  and  $\cos x$

HT 2

Sketching curves and points of intersection

Using trigonometric identities

Parametric equations

Y12

# MATHS LEARNING JOURNEY

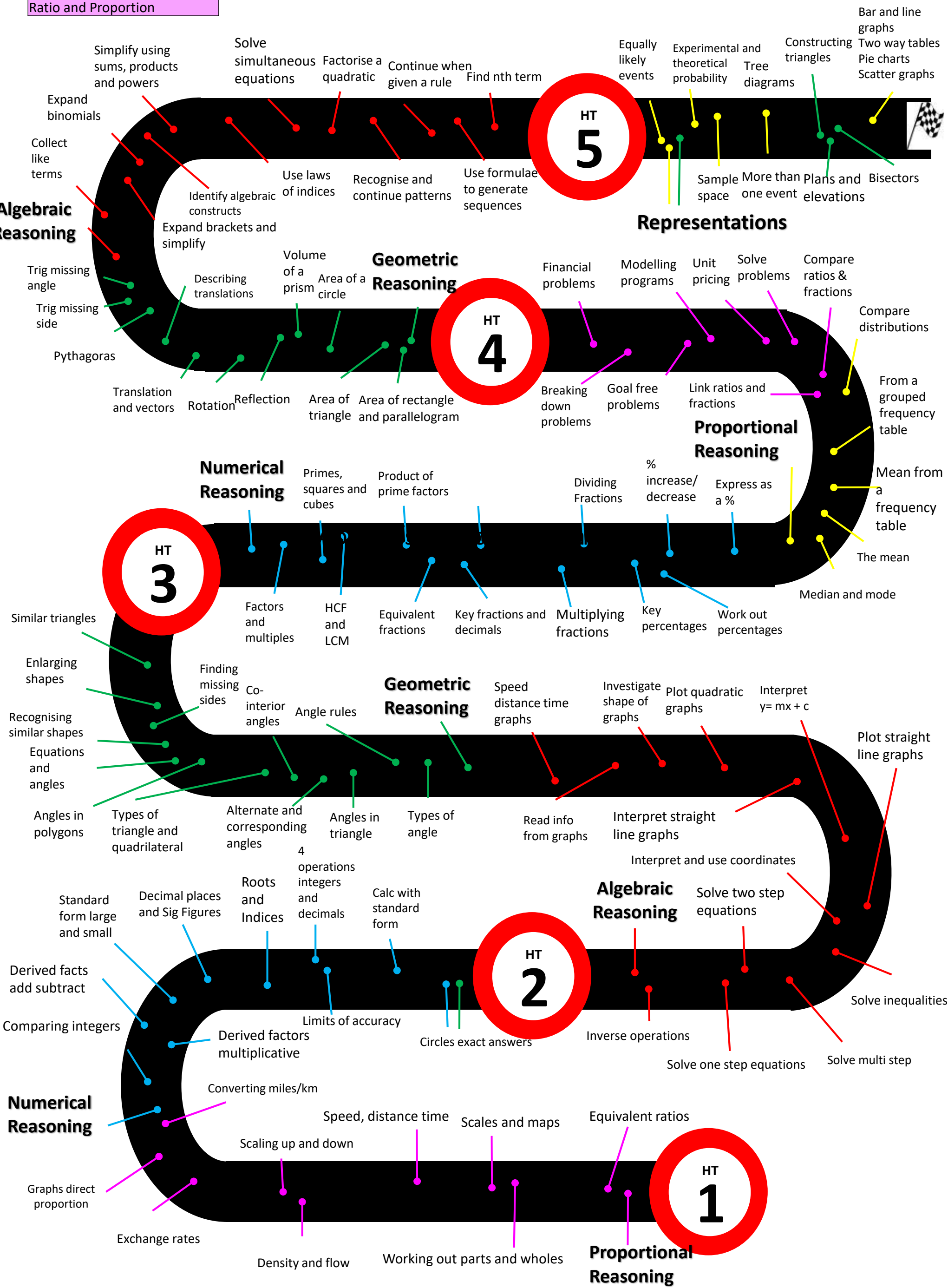
## Year 12/13 GCSE Resit

Sept

Develop fluency, reason mathematically, solve problems

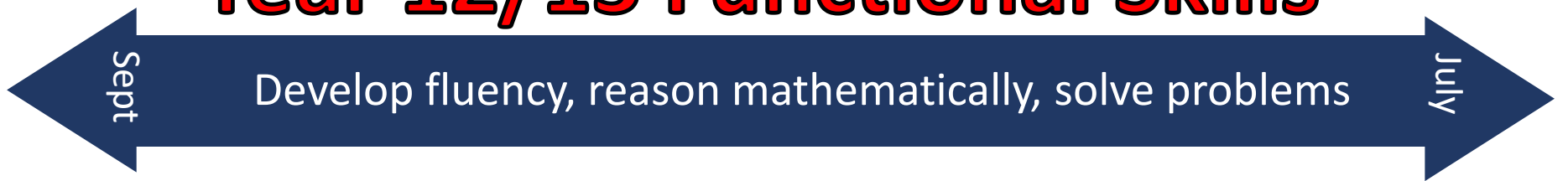
July

|                           |
|---------------------------|
| Number                    |
| Algebra                   |
| Statistic and Probability |
| Geometry and Measures     |
| Ratio and Proportion      |

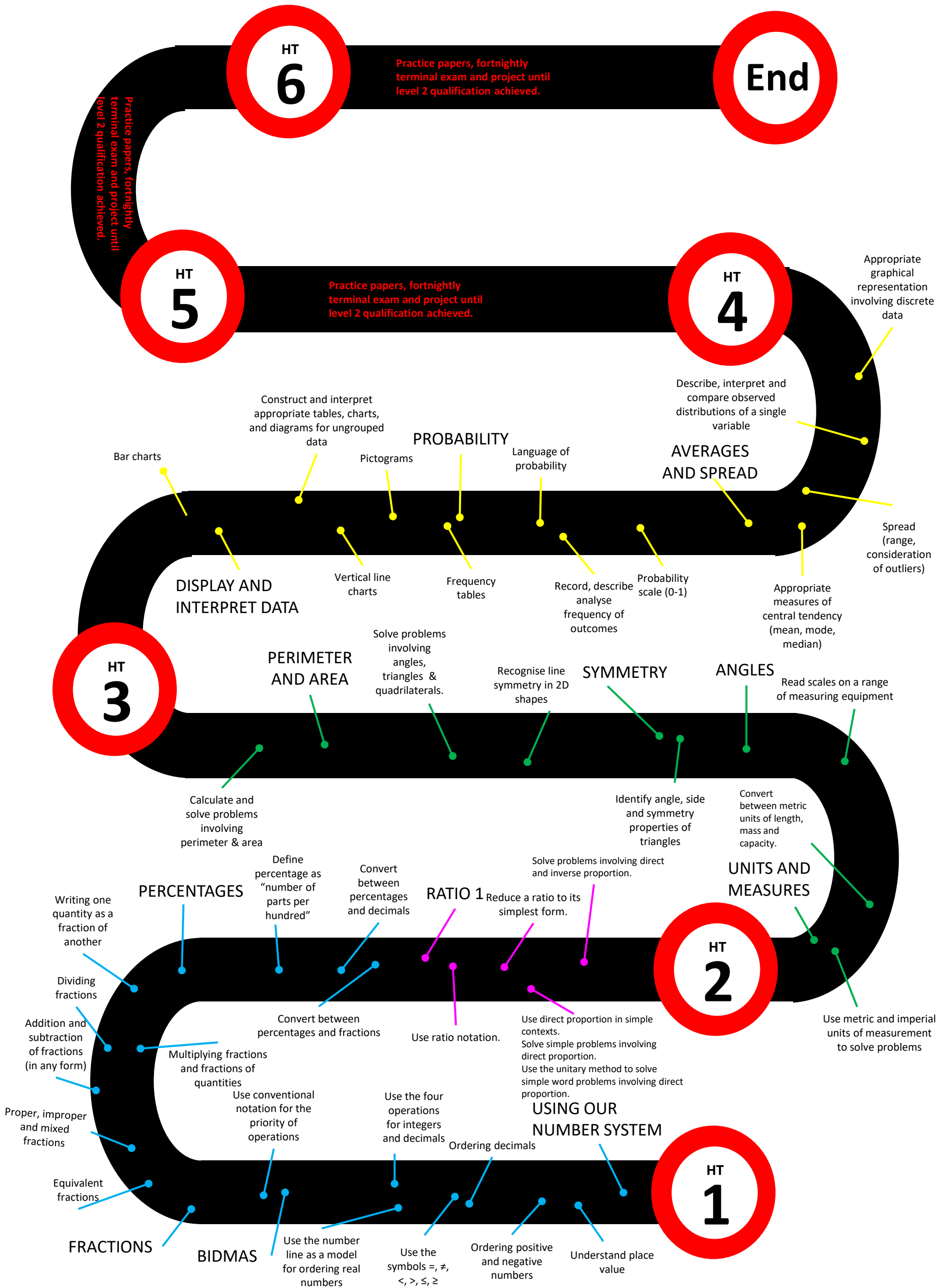


# MATHS LEARNING JOURNEY

## Year 12/13 Functional Skills



|                           |
|---------------------------|
| Number                    |
| Statistic and Probability |
| Geometry and Measures     |
| Ratio and Proportion      |



# Detailed Topic Specific Route- maps for Years 7-11

- Statistics and Probability
- Algebra
- Geometry and Measures
- Ration, Proportion and Rates of Change
- Number

# MATHS LEARNING JOURNEY

## STATISTICS & PROBABILITY

Year 7

Develop fluency, reason mathematically, solve problems

Year 11

**Level 3 Qualifications**  
Core Maths  
A Level Maths  
A Level Further Maths  
**Level 2 Qualifications**  
GCSE Maths Resit  
Functional Skills

**Exam & Post – 16 Destination**

**YEAR 11**

**PROBABILITY (MAP)**

**PROBABILITY (LAP)**

Draw and interpret histograms for unequal grouped data

Review of Probability to include Tree diagrams

NOTE: Personalised SoL may include the revisitation of topics covered after Xmas

Cumulative Frequency, including Box Plots

**STATISTICAL DIAGRAMS**

Sampling

**CONDITIONAL PROBABILITY**

**GROUPED DATA**

**DISPLAY AND INTERPRET DATA**

**YEAR 7**

Construct and interpret appropriate tables, charts, and diagrams for ungrouped data

Real-Life Graphs including Time series

**SCATTER GRAPHS**

Construct, interpret and criticise tables, charts and diagrams inc:- two-way tables, comparative bar-line charts, pictograms, stem-and-leaf diagrams, Venn diagrams; for ungrouped discrete numerical data.

**F**

**H**

**YEAR 10**

**COLLECT & REPRESENT DATA**

Calculate mean, median, mode and range for discrete and continuous data as well as from diagrams

**COLLECT & REPRESENT DATA**

Revisit data charts and graphs including bivariate data

Tables and Timetables

Understanding and interpreting misleading graphs

Interpret graph of any form (exponential, piecewise)

Probability

Revisiting Frequency Trees

Represent word problems in a variety of forms (Graphs, tables, expressions)

**YEAR 9**

**AVERAGES & SPREAD**

**STATISTICAL DIAGRAMS**

**PROBABILITY**

Consider spread, shape and outliers of distributions

Collecting and interpreting data in statistical diagrams

Theoretical probability from lists and sample spaces

Listing outcomes systematically

Calculate and interpret mean, median and mode and range for frequency tables

Dual Bar Charts

Construct and interpret pie charts

**STATISTICAL DIAGRAMS**

Sample spaces

Designing and using one and two way tables

Scatter Graphs and Correlation

**AVERAGES & SPREAD**

Calculate and interpret the mean as an average

Construct and interpret pie charts

Understand and use set notation with venn diagrams, to calculate a probability

**DISPLAY AND INTERPRET DATA**

**YEAR 8**

**DISPLAY AND INTERPRET DATA**

Frequency tables

Vertical line charts

**DISPLAY AND INTERPRET DATA**

**Sets and Probability**

**YEAR 7**

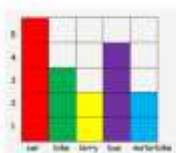
Interpret and construct pie charts and line graphs and use these to solve problems

Calculate and interpret the mean as an average

Complete, read and interpret information in tables

**PRIMARY SCHOOL**

**Statistics & Probability**



| Food    | Votes |
|---------|-------|
| Pizza   |       |
| Burger  |       |
| Pasta   |       |
| Hot Dog |       |



# MATHS LEARNING JOURNEY ALGEBRA

Develop fluency, reason mathematically, solve problems

Year 7

Year 11

Level 3 Qualifications

- Core Maths
  - A level Maths
  - A level Further Maths
- Level 2 Qualifications
- GCSE maths

Exam & Post - 16 Destination

YEAR 11

SEQUENCES

SIMULTANEOUS EQUATIONS

INEQUALITIES

QUADRATIC AND CUBIC GRAPHS

STRAIGHT LINE GRAPHS

EQUATIONS OF CIRCLES (Y10)

ALGEBRAIC FRACTIONS

FUNCTIONS

ALGEBRAIC PROOF

GRAPHS (Y10)

TRIGONOMETRIC GRAPHS

SIMULTANEOUS EQUATIONS

QUADRATICS

GEOMETRY

SEQUENCES

EXPANDING & FACTORISING

FORMING & SOLVING EQUATIONS

ITERATION

REARRANGING FORMULA

YEAR 10

H

F

YEAR 9

ALGEBRAIC TECHNIQUES

BRACKETS, EQUATIONS & INEQUALITIES

STRAIGHT LINE GRAPHS

ALGEBRAIC NOTATION

Form and substitute into expressions

Represent functions graphically

Understand equality

Form and solve one step equations

Collect like terms

Model situations using expressions formulae and graphs

Use equations of straight lines

Expand and factorise into single brackets

Link direct proportion and lines in the form  $y = kx$

Lines parallel to the axes

SEQUENCES

Describe and continue sequences

One and two step function machines

Understand inverse operations

Generate sequences

Use fact families

Equivalence of algebraic expressions

Use simple formulae

Express missing number problems algebraically

Use letters to represent variables

Express missing number problems algebraically

Use simple formulae

Use simple formulae

YEAR 7

Number puzzles

Equivalent expressions

Use letters to represent variables

Express missing number problems algebraically

Use simple formulae

Expressing relationships algebraically

Co-ordinates

Generalising number patterns

Formulae in maths & science

Numbers that satisfy equations with two unknowns

Linear number sequences

PRIMARY SCHOOL

WORKING IN THE CARTESIAN PLANE

$$x = 2x + 4$$

$$(x = ?)$$

algebra



Make an equation the subject of a variable

Forming a range of equations for different situations

Solving any linear equation

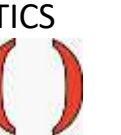
Solve quadratics by factorising

Difference of two squares

Factorising in the form  $x^2 + bx + c$

Expanding double brackets

Expanding & factorising single brackets



Link to solving one and two step equations

Link direct proportion and lines in the form  $y = kx$

Lines parallel to the axes

Plot and interpret straight line graphs



# MATHS LEARNING JOURNEY

## GEOMETRY & MEASURES

Develop fluency, reason mathematically, solve problems

Year 7

Year 11

YEAR 11

Exam & Post – 16 Destination

BESPOKE RETEACHING BASED ON PPE ANALYSIS

F

YEAR 10

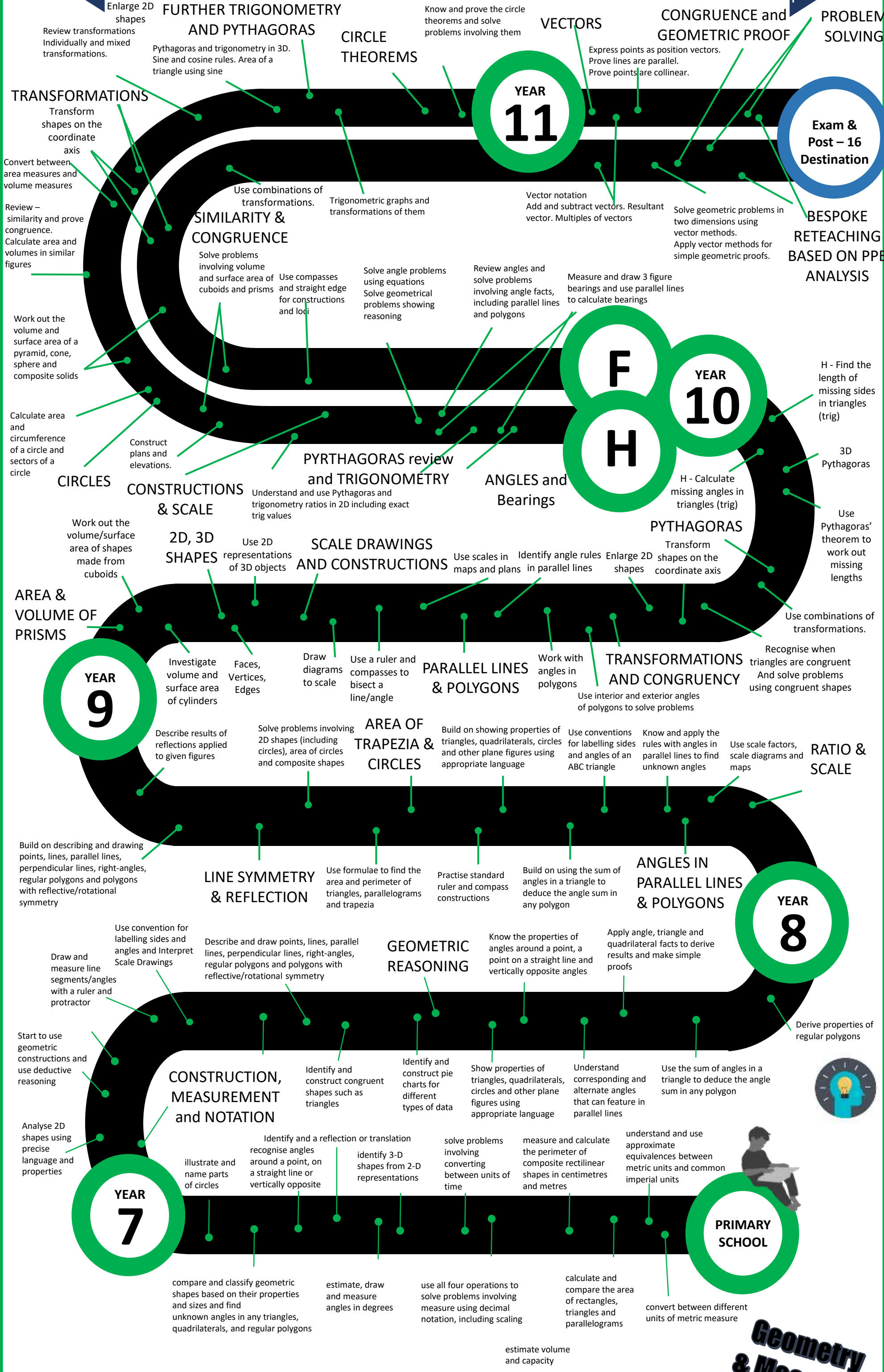
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YEAR 9

YEAR 8

YEAR 7

PRIMARY SCHOOL



Geometry & Measures

# MATHS LEARNING JOURNEY RATIO, PROPORTION AND RATES OF CHANGE

Develop fluency, reason mathematically, solve problems

Year 7

Year 11

Level 3 Qualifications – Core Maths

A level Maths

A level Further Maths

Level 2 Qualifications – GCSE maths

Exam & Post – 16 Destination

## GROWTH & DECAY

Set up, solve and interpret the answers in growth and decay problems, including compound interest

Set up, solve and interpret the answers in growth and decay problems, including compound interest and work with general iterative processes

Interpret the gradient at a point on a curve as the instantaneous rate of change

Apply the concepts of average and instantaneous rates of change (gradients of chords and tangents) in numerical, algebraic and graphical contexts

## RATES OF CHANGE

Recognise and interpret graphs that illustrate direct and inverse proportion

## INDIRECT PROPORTION

Interpret the gradient of a straight line as a rate of change

## DIRECT PROPORTION

## COMPOUND MEASURES

## RATIO WITH RECIPES

## FRACTION WITH RATIO

## PERCENTAGE CALCULATIONS

Solve problems involving percentage change, including : percentage increase / decrease problems; original value problems simple interest, including in financial mathematics; problems set in context using a multiplier

F

YEAR 11

Recognise and interpret graphs that illustrate direct and inverse proportion

Construct and interpret equations that describe direct and inverse proportion

## EQUATIONS FOR DIRECT & INVERSE PROP

Understand that X is inversely proportional to Y is equivalent to X is proportional to  $1/Y$  interpret equations that describe direct and inverse proportion

Understand that X is inversely proportional to Y is equivalent to X is proportional to  $\frac{1}{y}$

## DIRECT & INVERSE PROP

Solve problems involving direct and inverse proportion, including graphical and algebraic representations

Relate ratios to fractions and to linear functions  
Eg Grey paint is made by mixing white paint with black paint in the ratio 4 : 1 Represent this on a straight line graph.

The ratio of left-handed to right-handed people in a class is 2 : 19 What fraction of the class are right-handed?

A coin is biased. The ratio of the p(head) to the p(tail) is 3 : 5 Work out p(tail)  
 $x : y = 1 : 2$  Draw the graph of y as a function of x. What is the equation of your graph?

Express a multiplicative relationship between two quantities as a ratio or fraction

## MEASURES

Use compound units such as speed, rates of pay, unit pricing, density and pressure (including making comparisons)

H

YEAR 10

F

## PROPORTION IN CONTEXT

Understand and use basic proportion  
Eg A car travelled 96 miles on two gallons of petrol. How far can it travel on 9 gallons of petrol and state any assumptions you made.  
12 pencils cost £1.80 How much would 30 pencils cost?  
A television channel shows 12 mins of adverts in each half hour. How many mins of adverts does it show from 5 am to 11 pm?  
15 rulers cost £3. How much do 40 rulers cost?  
The mass of 40 cm<sup>3</sup> of copper is 356 grams. Work out the mass of 90 cm<sup>3</sup> of copper.

Change freely between related standard units (e.g. time, length, area, volume / capacity, mass) and compound units (e.g. speed, rates of pay, prices, density, pressure) in numerical and algebraic contexts

Apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing and concentrations)

## RATIO IN CONTEXT

## RATIO & PROPORTION

Use percentages to describe proportions.  
Use percentages to compare simple proportions.

Use fractions to describe and compare proportions.  
Understand and use the relationship between ratio and proportion.

## RELATING PROPORTION TO F, D, P

YEAR 9

Solve simple word problems involving ratio and direct proportion.

Solving proportion problems involving decimals.

Use direct proportion in simple contexts.  
Solve simple problems involving direct proportion.  
Use the unitary method to solve simple word problems involving direct proportion.

## INTRODUCE DIRECT PROPORTION

## CALCULATING WITH RATIOS

Use ratio notation  
Reduce ratio to simplest form  
Relate ratio to fraction and percentage

Divide a quantity into two parts in a given ratio  
Solve word problems involving ratio

## USE RATIO IN OTHER CONTEXTS

Use ratios and measures.

## INTRODUCING RATIO

YEAR 8

Solve problems involving the calculation of percentages and the use of percentages for comparison

Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples

YEAR 7

Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts

Solve problems involving similar shapes where the scale factor is known or can be found

Key Stage 2



# MATHS LEARNING JOURNEY NUMBER

Develop fluency, reason mathematically, solve problems

Year 7

Year 11

- Level 3 Qualifications  
 – Core Maths  
 – A level Maths  
 – A level Further Maths  
 Level 2 Qualifications  
 – GCSE maths

Exam & Post – 16 Destination

YEAR 11

PROBLEM SOLVING

ROUNDING AND APPROXIMATION

SURDS

Simplify surds

Calculations with surds

Rationalising denominators

Calculating with upper and lower bounds

Apply systems listing strategy

COUNTING

Use product rule for counting

INDICES AND ROOTS

Calculate with roots and integer indices

Calculate with exact values including fractions and multiples of pi

BESPOKE RETEACHING BASED ON PPE ANALYSIS

STANDARD FORM

Calculate with numbers in standard form  $A \times 10^n$   $1 \leq A < 10$  and n is an integer

ROUNDING AND APPROXIMATION

Apply and interpret limits of accuracy when rounding or truncating

EXCHANGE RATES

Apply and interpret limits of accuracy when rounding or truncating

F

YEAR 10

Repeated % Change

Financial Maths

H

FRACTIONS

Calculating simple interest, compound interest and depreciation

PERCENTAGES

Calculating reverse percentages

Reverse Percentages

Fraction Arithmetic

Rational and Real Numbers

HCF and LCM

YEAR 9

Convert Metric Units of Length and Area

Money Calculations

Round numbers  
Decimal Places  
Significant Figures

Use Error Interval Notation

Types of Number

Standard Form

YEAR 8

Find LCM And HCF

Prime Factorisation

Express a quantity as a % of another

Using Multipliers

Express a Number as a Fraction of Another

Use Known Facts

Round to Powers of 10 and 15F

Use of Calculator

Multiply & Divide by Powers of 10

Find Fractions of Amounts

Use Factors and Multiples

Add and Subtract Fractions

Interchange Fractions, Decimals and Percentages

Round to Powers of 10 and 15F

Use of Calculator

Multiply & Divide by Powers of 10

Find Fractions of Amounts

Use Factors and Multiples

Add and Subtract Fractions

Understand Place Value

Compare and Order numbers

Use Four Operations - Integers and Decimals

Order of Operations

Find % of amounts

Order Directed Numbers

Four Operations Directed Numbers

YEAR 7

Understand a fraction as a division

Simplify fractions

Identify prime numbers

Identify common factors and multiples

Multiply a 4 digit number by a 2 digit number

Order numbers up to 10,000,000

PRIMARY SCHOOL

Multiply and divide by 10, 100, 1000

Add, subtract and multiply fractions

Compare/order fractions

Apply BIDMAS to four basic operations

Divide a 4 digit number by a 2 digit number

Round whole numbers

number

