

# Key concepts for GCSE Mathematics

MathsConf32

**What do you think of my list? What would you add? What would you remove?**

## **1. Fluency, vocabulary, properties**

- Key words eg diagonal, perpendicular, expand, etc
- Number bonds for addition and subtraction
- Multiples, factors, primes and square numbers, (cubes, cube roots)
- Evaluate powers and find square roots
- Understands units as the basic element of addition – knows that items must have common units to perform addition – can identify the common unit in an addition – can convert between different bases (eg £ to pence, Km to m) to perform addition – extends this to common terms in algebra
- Equivalence of fractions percentages and decimals
- Given a description, write an algebraic equation or expression; translate algebra back into a words, eg ‘cooking time is 45 mins per kg plus 25 mins’; extend this to linear sequences

## **2. Graphical Representation (maths through pictures)**

- Plot points and read coordinate values
- Read a graph – and understand it’s key elements eg what it shows, understand the scale
- Understand gradient as a rate of change
- Statistical diagrams (pie charts, bar charts etc)
- Conversion charts
- Rates of change (eg acceleration, repeated doubling, filling a conical bottle)
- Trends
- Distance time graphs
- Sequences in diagrams (eg paving-stone problems)
- Interpretation of graphs and diagrams eg derive a value, say which graph matches which description, describe a graph, compare two graphs
- Venn Diagrams
- Carroll diagrams and 2-way tables

## **3. The mathematics of space**

- Key properties (mostly geometry) eg properties of a square, circle, angles, 3D shapes, etc
- Understand the difference between scalars, length, area and volume. Recognise which is which. Calculate perimeters, areas and volumes.
- Angles and lines on a plane
- Congruence and similarity as applied to reflection, rotation, translation and enlargement – preservation of properties
- Dimensions (and links to similarity). Understand that length x area = volume, etc

---

#### 4. The mathematics of arithmetic

- Field axioms (associativity, commutativity, distributivity, identity, inverses) and fundamental rules of calculation (order of operations), extension to fractions, equivalence with area
- Place value (base 10, only as recognition of value and effect or repeated multiplication by powers of 10)
- Equivalence (eg understanding that £1 and 100p are different but equal) and knowing that equivalence is maintained under the same operation ( $£1 \times 2 = (100p \times 2)$ )
- Generalisation of this to algebra and algebraic manipulation and equations

#### 5. Proportional Reasoning

- Working with ratios and proportions eg sharing and arrangement problems, links to fractions
- $a:b = c:d \Leftrightarrow a:c = b:d \Leftrightarrow ad = bc$
- Equivalence of the underlying structures of proportional reasoning ie the same thinking can be applied to multiple contexts
- Proportional change through a multiplier (eg percentage increase, similarity)
- Unitary method eg find 1% and scale – link to base units