

1 · Number

AQA · GCSE · Mathematics

Number: the foundations everything else stands on

- Order and calculate with positives, negatives, decimals and fractions; the four operations with formal written methods.
- Primes, factors, HCF/LCM by prime decomposition; indices, roots, surds (H) and standard form.
- Fractions $\leftrightarrow$ decimals $\leftrightarrow$ percentages as operators; rounding, estimation and bounds (H).

Arithmetic, factors, multiples and primes (N1–N5)

Ordering and symbols: order positive and negative integers, decimals and fractions on a number line; use $=$, $\neq$, $<$, $>$, $\leq$, $\geq$.

The four operations (N2): formal written methods for integers, decimals, **proper and improper fractions and mixed numbers**, all signs – set in context including household finance: **profit, loss, cost price, selling price, debit, credit, balance, income tax, VAT, interest rate.**

Inverse operations and priority (N3): cancellation to simplify; **BIDMAS** – brackets, indices/powers, roots, division/multiplication, addition/subtraction.

Primes and structure (N4): prime numbers, **factors, multiples, common factors, common multiples, HCF, LCM; prime factorisation** in index form (product notation; unique factorisation). Worked pattern:

- $200 = 2^3 \times 5^2$
- HCF = product of the **lowest** powers of common primes; LCM = product of the **highest** powers of all primes.

(N5) systematic listing and the **product rule for counting** (H).

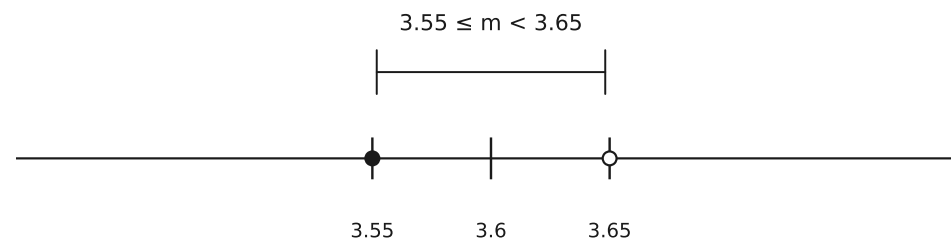
Indices, surds, standard form and bounds (N7–N9, N14–N16)

Indices (N7): laws – $a^m \times a^n = a^{(m+n)}$, $a^m \div a^n = a^{(m-n)}$, $(a^m)^n = a^{(mn)}$, $a^{-n} = 1/a^n$, $a^{(1/2)} = \sqrt{a}$; (H) fractional indices $a^{(m/n)}$ = the n-th root of a^m .

Surds (N8, H): $\sqrt{12} = \sqrt{(4 \times 3)} = 2\sqrt{3}$ – simplify; **rationalise denominators** (multiply by the conjugate: $1/(3+\sqrt{2}) \times (3-\sqrt{2})/(3-\sqrt{2}) = (3-\sqrt{2})/7$).

Standard form (N9): $A \times 10^n$, $1 \leq A < 10$, n an integer – add/subtract (match powers), multiply (multiply coefficients and add exponents), or divide (divide coefficients and subtract exponents); interpret calculator displays.

Estimation (N14): round each value to 1 significant figure, compute, decide over- or under-estimate; check calculations by approximation.



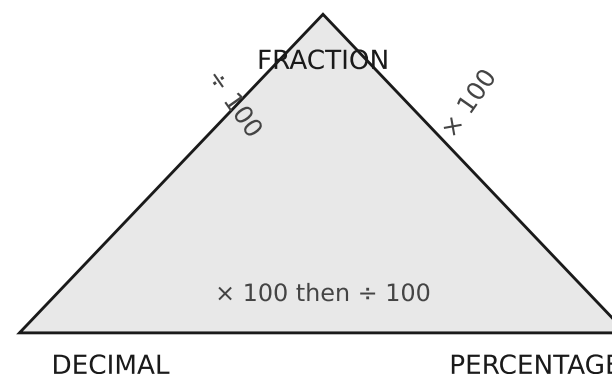
$m = 3.6$ to 1 decimal place: closed at the lower bound, open at the upper

Rounding and error intervals (N15): to decimal places and significant figures (know not to round mid-calculation); (H) inequality notation for error intervals – 3.6 kg to 1 d.p. means $3.55 \leq m < 3.65$; truncation gives $3.6 \leq m < 3.7$.

Bounds (N16, H): upper bound of a length 9 m to the nearest metre is 9.5; in calculations, for positive inputs, an upper product bound uses upper input bounds and an upper quotient bound uses upper numerator divided by lower denominator. Check signs first; these shortcuts need not hold for negative inputs. Track strict endpoints; give the answer to an appropriate degree of accuracy (often the bound width decides).

Fractions, decimals and percentages (N10–N13, R9 links)

$1/2 = 0.5 = 50\%$ — every vertex names the same number



Conversions (N10): $3.5 = 7/2$, $0.375 = 3/8$; (H) recurring decimal

$s \leftrightarrow$

fractions: $0.6 = 6/9 = 2/3$; 0.45 (pair) $\rightarrow 45/99 = 5/11$. Method: $x = 0.6$, $10x = 6.6$, $9x = 6$.

Fractions as operators (N12): “ $3/5$ of 40 ” $= 40 \times 3/5 = 24$; percentage as multiplier – increase by $15\% = \times 1.15$; decrease by $20\% = \times 0.8$; reverse percentage: find the original before the change by dividing by the multiplier.

Units (N13): metric conversions for length, area, volume, capacity; compound measures (speed, density, pressure) link to topic 3.

Checklist before you call this topic done

- Four operations on fractions/mixed numbers and negatives without a calculator; BIDMAS traps.
- Prime decomposition $\rightarrow$ HCF/LCM; product rule for counting (H).
- Index laws including negative and fractional; simplify and rationalise surds (H).
- Standard form arithmetic; rounding and error intervals; upper/lower bounds through a formula (H).
- FDP conversions including recurring decimals (H); percentage multipliers and reverse percentages.