

Weekly Overview (for a 15-year-old GCSE Year 10 student — focus: Number skills) Goal: Build fluency and confidence across core GCSE number topics: factors & primes, fractions/decimals/percentages, ratio & proportion, indices/standard form, and real-world problem solving including bounds and surds. Each day is designed for a 60–90 minute block (can be split) and is flexible to extend or shorten depending on pace.

Day 1 — Factors, Primes, HCF & LCM Lesson Title: Cracking Numbers — Primes, Factors and Multiples

Learning Objectives (SMART)

- By the end of the 60–90 minute lesson the student will be able to:
 - Identify prime numbers up to 200 and list all positive factors of integers to 100 (Specific).
 - Use prime factorization to find the Highest Common Factor (HCF) and Lowest Common Multiple (LCM) of two numbers within 1–100 accurately in under 10 minutes for each pair (Measurable, Time-bound).
 - Apply HCF/LCM to solve one real-world sharing and one scheduling problem correctly (Achievable, Relevant).

Materials Needed

- Paper, pencil, ruler, calculator (scientific optional), coloured pens or highlighters.
- Prime factor trees worksheet (print or draw).
- Small counters/coins or household beads for hands-on grouping.
- Timer (phone/watch).
- Optional: online factorization tool or interactive app (e.g., Corbettmaths videos/exercises).

Lesson Introduction (10 minutes)

- Prompt: “If you had 36 sweets and wanted to share them equally with different sized groups, what group sizes work? Which group sizes don’t?” Use a small pile of counters to try sharing.
- Connect to interests: scheduling repeats (e.g., how often two events coincide — football training every 4 days vs. dance every 6 days).

Instructional Procedures Exploration (15 minutes)

- Hands-on: Use counters to model grouping 36, 48, 60. Ask student to find all group sizes that make equal groups (discover factors).
- Build factor lists for 36 and 48 with coloured pens, comparing.

Explanation (10 minutes)

- Explain prime numbers (definition) and how to test divisibility by small primes (2,3,5,7).
- Demonstrate prime factor trees and how to express numbers as products of primes.

Application (20 minutes)

- Activity 1: Prime factorization practice — give 8 numbers 18–180, student makes factor trees and writes prime factorizations.
- Activity 2: Using prime factors, compute HCF and LCM for 6 pairs (mix easy and medium difficulty). Time two problems to build fluency.
- Real-world problems: one sharing problem (e.g., split gifts into equal identical packs with largest possible pack size — find HCF) and one scheduling problem (next time two cycles coincide — LCM).

Reflection (5–10 minutes)

- Discuss strategies that helped (e.g., divisibility tricks, shortcuts).
- Student explains in their own words how prime factorization is used to find HCF and LCM.

Assessment and Evaluation

- Informal: Observe hands-on grouping, check factor lists and factor trees for correctness.
- Short quiz: 5 quick problems (2 factor lists, 2 HCF/LCM, 1 application) to complete in 10 minutes.
- If student struggles: slow down with more concrete grouping activities and limiting numbers to under 50; use visual prime charts.
- If student excels: extend with three-number HCF/LCM and problems involving prime powers.

Integration with Other Subjects

- History: prime numbers in cryptography (basic intro).
- Computing: algorithms for GCD (Euclid's algorithm) — simple demonstration.
- Art: make factor wheel posters for favourite numbers.

Differentiation and Personalization

- Support: Use manipulatives for all problems; give step-by-step HCF/LCM templates.
- Enrichment: Introduce Euclid's algorithm and ask student to prove $\text{LCM} \times \text{HCF} = \text{product}$ for two numbers.
- Multi-age: Younger sibling can work on simple factor/folder matching game while older student does prime factorization.

Real-Life Applications and Field Activities

- Kitchen activity: Use recipe scaling and grouping utensils to highlight factors.
- Community: Plan a small event where items are arranged in equal groups (e.g., arranging chairs).

Resources for Further Learning

- Corbettmaths videos on HCF/LCM and prime factors, BBC Bitesize GCSE (Number).
- Book: "GCSE Maths Revision Guide" (topic sections on number).
- Apps: HegartyMaths (if available), Khan Academy.

Day 2 — Fractions, Decimals & Percentages (Conversions and Calculations) Lesson Title: Same Number, New Look — Fractions, Decimals and Percentages

Learning Objectives (SMART)

- By the end of the 75 minute lesson the student will:
 - Convert between fractions, decimals and percentages for common forms (e.g., tenths, hundredths, simple fractions) and for recurring decimals up to 3 repeating digits (Specific).
 - Solve percentage increase/decrease and simple percentage of amount problems (e.g., VAT, discounts) with 90% accuracy on a 10-question worksheet (Measurable, Time-bound).
 - Apply conversions to two realistic financial problems (shop discounts, tax) and explain steps (Achievable, Relevant).

Materials Needed

- Calculator, paper, pencils, coloured pens.
- Fraction/decimal/percentage conversion card set (can be homemade).
- Real receipts or supermarket flyers for discount practice.
- Ruler and graph paper for visual fraction bars.

Lesson Introduction (10 minutes)

- Prompt: Show a receipt with a sale: “30% off a £45 jacket — how much now?” Let student estimate first then calculate.
- Connect to personal interests (shopping, sport stats, game discounts).

Instructional Procedures Exploration (15 minutes)

- Card matching: mix fraction, decimal and percentage cards; student matches equivalents (e.g., $\frac{3}{5}$, 0.6, 60%).
- Use fraction bars or graph paper to visualize conversions.

Explanation (15 minutes)

- Show systematic methods: fraction→decimal (divide), decimal→percentage ($\times 100$), percentage→fraction (put over 100 and simplify).
- Explain recurring decimals to fractions (example $0.333\dots = \frac{1}{3}$) using simple algebra trick.

Application (25 minutes)

- Practice set: conversions (6), percentage increase/decrease (4), including real-world problems using the receipt/flyer.
- Extension: Reverse percentage problems (find original price before discount).

Reflection (5–10 minutes)

- Student explains their favourite method for converting, reflects on common errors (misplacing decimal points).

Assessment and Evaluation

- Informal: Check card matching and working methods.
- Formal: 10-question worksheet with mixed conversions and percentage problems.
- Adjustments: For errors with decimal place, do targeted place value activities; for strong students, include compound percentages, interest rates and reverse percentage problems.

Integration with Other Subjects

- Science: convert measurements where decimals and percentages appear.
- Business/PSHE: discuss budgeting, VAT, interest.
- Art: use percentages to mix paint ratios.

Differentiation and Personalization

- Support: Use calculators and step templates; visual aids for recurring decimals.
- Enrichment: Introduce recurring decimal patterns beyond simple ones and compound interest basics.
- Multi-age: Younger child sorts picture fractions while older student handles percentages.

Real-Life Applications and Field Activities

- Grocery shopping task: plan meals within a budget using discounts.
- Online: find three discounted items and compute final prices, savings and percentage saved.

Resources for Further Learning

- BBC Bitesize GCSE: Fractions, Decimals and Percentages.
- YouTube: Corbettmaths videos; Math Antics for visual explanations.
- Practice sheets from Twinkl or GCSE revision sites.

Day 3 — Ratio and Proportion Lesson Title: Sharing and Scaling — Ratios, Proportions and Rates

Learning Objectives (SMART)

- By the end of the 75 minute lesson the student will:
 - Solve direct proportion problems and simplify ratios in context (e.g., recipes, maps) correctly in at least 8 out of 10 varied problems (Measurable).
 - Use unitary method and scale factors to resize recipes or scale drawings and create one scaled recipe/plan (Specific, Achievable, Time-bound).

Materials Needed

- Measuring cups/spoons, kitchen scales (for recipe activity), printed map or graph paper.
- Calculator, pencils, coloured pens.
- Ratio problems worksheet; small objects for grouping.

Lesson Introduction (10 minutes)

- Prompt: “A recipe serves 4, but you need to serve 10 — what do you do?” Start with existing family recipe ingredients and ask to scale.
- Connect to hobbies: model building scale, mixing paint.

Instructional Procedures Exploration (15 minutes)

- Hands-on: Scale a simple pancake recipe (or cookie dough) using measuring tools; discuss multiplying ingredients.
- Use counters to represent ratios (e.g., 3:2 means 3 of A for every 2 of B).

Explanation (15 minutes)

- Explain ratio notation, simplifying ratios, writing ratios as fractions, direct proportion ($y = kx$) and using unitary method.
- Show scale factor use in maps and drawings (linear vs. area scaling briefly).

Application (25 minutes)

- Tasks: simplify ratios, divide quantities in given ratios, scale recipes and drawings, solve proportion equations including word problems (speed = distance/time, currency conversion).
- Challenge: Map problem where student calculates real distance from map scale and converts using proportion.

Reflection (5–10 minutes)

- Ask student to articulate when to use ratio vs fraction, and what mistakes to watch for (e.g., mixing up parts and whole).

Assessment and Evaluation

- Informal observation during kitchen activity and map scaling.
- Worksheet scored: aim for 8/10; review errors immediately.
- Struggling: return to concrete examples, use more physical splitting of items.
- Advanced: introduce inverse proportion problems and area scaling (scale factor squared).

Integration with Other Subjects

- DT/Art: scale drawings and models.
- Geography: map scales.
- Food tech/Home economics: recipe scaling and nutrition per portion.

Differentiation and Personalization

- Support: Provide step-by-step templates for unitary method; use calculators for arithmetic.
- Enrichment: Ratio reasoning puzzles and algebraic proportion problems.

Real-Life Applications and Field Activities

- Cook a meal scaled to the number of guests; calculate cost per serving.
- Measure a room and create a scale floor plan.

Resources for Further Learning

- Corbettmaths ratio and proportion worksheets/videos.
- BBC Bitesize proportion topics and practice questions.

Day 4 — Indices, Roots, Standard Form & Rounding Lesson Title: Big and Small — Indices, Standard Form and Rounding

Learning Objectives (SMART)

- By the end of the 75 minute lesson the student will:
 - Apply index laws (product, quotient, power of a power, zero, negative indices) to simplify expressions correctly in at least 9/10 problems (Measurable).
 - Convert very large and small numbers into standard form and round to specified significant figures/decimal places with 90% accuracy (Specific, Achievable, Time-bound).

Materials Needed

- Scientific calculator, paper, pencil.
- Index laws cheatsheet, practice worksheet with numeric and algebraic questions.
- Real examples (astronomical distances, microscopic sizes printed or online).

Lesson Introduction (10 minutes)

- Prompt: Show contrasting numbers: distance Earth→Sun (~150,000,000 km) and diameter of a cell (~0.00001 m). Ask how to write them in a compact form.
- Relate to science interest: stars, planets, bacteria.

Instructional Procedures Exploration (15 minutes)

- Play with powers: use calculator to compute small powers and negative powers; examine patterns.
- Convert a list of large/small numbers (provided) into standard form by hand, then check with calculator.

Explanation (15 minutes)

- Explicitly teach index laws with simple proofs/examples.
- Demonstrate standard form rules ($1 \leq \text{coefficient} < 10$, times 10^n) and rules for rounding significant figures versus decimal places.
- Discuss roots and fractional indices (e.g., $x^{(1/2)} = \sqrt{x}$).

Application (25 minutes)

- Mixed practice: apply index laws to simplify expressions (including brackets), convert between standard form and ordinary form, round numbers to given significant figures and decimal places, and solve a short applied problem (e.g., compare masses of planets using standard form).
- Extension: simple equation solving involving indices (e.g., $3^x = 81$).

Reflection (5–10 minutes)

- Student summarizes index laws in their own words and explains when to use standard form.

Assessment and Evaluation

- Quick quiz: 10 questions mixing index simplification and standard form conversions.
- Diagnostic: If errors in negative indices, practice converting between positive/negative indices with concrete examples; if rounding errors, practice significant figures rules with visuals.

Integration with Other Subjects

- Science: astronomy (distances), chemistry (Avogadro's number).
- Computing: binary/exponent basics.
- Music: exponential decay in sound amplitude (conceptual link).

Differentiation and Personalization

- Support: Provide stepwise worked examples and limit the number of steps per problem.
- Enrichment: Introduce fractional indices and laws for surds (see Day 5 for deeper surd work).

Real-Life Applications and Field Activities

- Research project: find three real large and small numbers (e.g., distance to nearest star, size of virus), convert to standard form, and present why standard form is useful.

Resources for Further Learning

- Corbettmaths index laws and standard form videos.
- Physics/Astronomy websites for real figures (NASA factsheets).

Day 5 — Bounds, Surds and Problem-Solving Review Lesson Title: Exactly or Approximately? — Bounds, Surds and Exam-Style Problem Solving

Learning Objectives (SMART)

- By the end of the 90 minute lesson the student will:
 - Determine upper and lower bounds for given measurements rounded to specified accuracy (e.g., to nearest 0.1, 1 s.f.) and use bounds to find maximum/minimum possible answers to one applied problem (Specific).
 - Simplify basic surds (e.g., $\sqrt{18}$ to $3\sqrt{2}$) and perform simple operations (addition/subtraction/multiplication by integers) with surds, achieving correct solutions for 8/10 practice problems (Measurable, Time-bound).
 - Apply learned number skills to solve a multi-step GCSE-style question integrating at least two number topics (e.g., standard form, ratio, bounds) (Achievable, Relevant).

Materials Needed

- Calculator (note: students should practice deciding when calculator use is allowed), paper, pencil.
- Worksheets with bounds problems, surd simplification and mixed exam questions.
- Real measurement tools if doing a field measurement (tape measure, ruler).

Lesson Introduction (10 minutes)

- Prompt with measuring task: measure a piece of wood or book to nearest mm/cm — ask what the actual measurement range could be and why bounds matter (e.g., constructing items to fit).
- Discuss surds: show $\sqrt{2} \approx 1.414\dots$ and note that some numbers cannot be written exactly as fractions.

Instructional Procedures Exploration (15 minutes)

- Practical measuring: student measures an object to a specified degree (e.g., to the nearest cm), then calculates upper and lower bounds.
- Investigate simple surds on calculator to see decimal expansion and whether it terminates/repeats.

Explanation (15 minutes)

- Teach bounds rules: understanding rounding rules and how bounds relate to rounding to nearest a (e.g., to 1 dp or to s.f.).
- Show surd simplification: factor inside the root, pull out squares, rationalizing denominators briefly if time allows.

Application (30 minutes)

- Mixed tasks: calculate bounds for area given rounded lengths (use bounds to find maximum/minimum area), simplify and combine surds, and a multi-step problem tying in previous days (e.g., scale factor in standard form then round to appropriate bounds).
- Timed mini exam: 6–8 GCSE-style number questions covering the week's topics.

Reflection (10 minutes)

- Student reviews mistakes from the mini exam and explains corrections.
- Discuss strategies for revising number topics and how to identify when to use bounds/surds in problems.

Assessment and Evaluation

- Mark the mini exam together, noting method accuracy and common errors.
- If frequent errors: create a targeted mini-plan for practice (e.g., more surd simplification or bounds exercises).
- If student does very well: set an extended project applying number skills to a real task (e.g., cost estimation with bounds).

Integration with Other Subjects

- Design & Technology: tolerances in measurements.
- Physics: measurement error and significant figures.
- Art: precise scaling using bounds for framing.

Differentiation and Personalization

- Support: step templates for bounds problems; provide a list of common surd factors.
- Enrichment: rationalizing denominators and surd equations or exploring irrational numbers proofs.

Real-Life Applications and Field Activities

- Building project: use bounds to ensure components fit (e.g., drawer in a frame).
- Science experiment: measure and report with error margins.

Resources for Further Learning

- GCSE past papers (number sections) from exam boards (AQA/Edexcel) for practice.
- Corbettmaths surds and bounds playlists.
- Khan Academy sections on irrational numbers and error bounds.

Weekly Assessment & Next Steps

- End-of-week: review the mini exam and previous day quizzes; create a short targeted practice plan of 15–20 minutes per day focusing on weakest area.
- Suggest scheduling a weekly 30–45 minute review each subsequent week to maintain and build fluency.

Parental/Guardian Role and Tips

- Facilitate materials and household examples (recipes, receipts, tape measures).
- Observe and ask probing questions (How did you decide to use HCF here? Why did you round that way?) rather than giving answers.
- Timekeeping: use a timer for fluency drills and encourage brief typos/mental math practice.
- Encourage use of calculator strategies and when to rely on mental approaches.

Learning Environment Suggestions

- Quiet workspace with a clear surface, good lighting, and access to measuring tools and a calculator.
- A small whiteboard can be useful for working algebraically and erasing quickly.
- Keep manipulatives (counters, beads) and visuals (number line, prime chart) accessible.

Multi-Age Considerations

- If teaching siblings: assign paired activities — younger child can do concrete grouping and fraction

visuals while older does algebraic tasks. Encourage older student to explain concepts aloud (teaching reinforces learning).

- Provide age-appropriate tasks: simpler factor games or fraction pizza for younger learners.

Cultural and Personal Relevance

- Use family-relevant examples (local currency, regional recipes or crafts).
- When discussing examples like recipes or scheduling, adapt contexts to the student's hobbies/interests (sports stats, gaming economics, music timing).

Further Resources (General)

- Corbettmaths (videos & worksheets), BBC Bitesize GCSE Maths, AQA/Edexcel past papers for number sections, Khan Academy, HegartyMaths (if subscribed).
- Recommended book: "GCSE Maths Revision Guide" (topic chapters on Numbers), CGP GCSE Maths workbooks (Numbers).

Notes on Flexibility

- Each lesson can be split into two shorter sessions (e.g., 2 × 30–45 mins) or extended if the student needs deeper practice.
- Swap days depending on immediate needs (e.g., if student struggles with fractions, do Day 2 earlier).
- Use mixed review at the start of each session (10 mins) to keep older topics fresh.

If you'd like, I can:

- Produce printable worksheets and quizzes for each day (with answers).
- Tailor the week to a specific exam board (AQA/Edexcel) or to the student's particular weaknesses (send sample problems they've missed).