

Number

OxfordAQA · International GCSE · Mathematics

OxfordAQA International GCSE Mathematics (9260) unit 3.1 (specification for first assessment 2018). Core rows N1–N20 run from ordering and the four operations through factors and indices, standard form, sets, rounding, FDP operators, percentage change and ratio; the **Extension additions** add index-form factorisation, fractional powers, exact surd work, bounds calculations, recurring decimals, reverse percentages, the compound interest formula and exponential growth and decay. The 2016 specimen pair (1E/2E, Extension tier) samples this unit at HCF, surds, fraction chains, bounds and exponential models; lines the specimens never sample are taught here as specification originals and labelled so.

Must-know for unit 3.1 (NO formulae sheet in 9260 – the recall list is the specification itself):

Family	Formulae
compound interest	$A = P \left(1 + \frac{r}{100}\right)^n$ (Extension)
bounds	value to the nearest unit u : $LB = v - \frac{u}{2}$, $UB = v + \frac{u}{2}$
recurring decimals	$x = 0.\overline{45} \Rightarrow 100x = 45.\overline{45} \Rightarrow x = \frac{45}{99} = \frac{5}{11}$
exponential models	growth $y = a b^t$ with $b > 1$; decay $0 < b < 1$ (Extension)

Ordering and the four operations

Order positive and negative integers, decimals and fractions on the number line with $=$, $\neq$, $<$, $>$ – convert to one form first when comparing ($\frac{3}{5} = 0.6$). The four operations with formal written methods cover integers, decimals, simple fractions proper and improper, and mixed numbers: $2\frac{1}{3} + 1\frac{1}{4} = \frac{28}{12} + \frac{15}{12} = \frac{43}{12} = 3\frac{7}{12}$. Inverse operations cancel and simplify: multiplication undoes division, subtraction undoes addition – use cancellation early ($\frac{15}{28} \times \frac{7}{9} = \frac{15}{4} \times \frac{1}{9} = \frac{5}{12}$ after cancelling the 7 and 3).

$$72 = 2^3 \times 3^2$$

$$90 = 2 \times 3^2 \times 5$$

Shared smallest powers: $2 \times 3^2 = 18$

Original native-lesson illustration; labels belong to its worked example.

Factors, primes, HCF and LCM

Even, odd, prime, factor, multiple, common factor, common multiple – with the **highest common factor** and **lowest common multiple** found from prime factorisations. The Extension addition writes every factor in index form: $504 = 2^3 \times 3^2 \times 7$ and $588 = 2^2 \times 3 \times 7^2$, so the HCF is $2^2 \times 3 \times 7 = 84$ (the 1E specimen's answer) and the LCM is $2^3 \times 3^2 \times 7^2 = 3528$.

Indices, roots and surds

Positive integer powers with square and cube roots ($\sqrt{144} = 12$, $\sqrt[3]{125} = 5$); the index laws multiply and divide by adding and subtracting indices. The Extension addition brings **fractional powers** ($27^{1/3} = 3$, $8^{2/3} = 4$: cube-root then square) and **exact calculation with surds** – simplify by extracting squares and rationalise denominators with conjugates:

$$\sqrt{50} - \sqrt{18} + \sqrt{8} = 5\sqrt{2} - 3\sqrt{2} + 2\sqrt{2} = 4\sqrt{2}, \quad \frac{5}{3 - \sqrt{2}} = \frac{5(3 + \sqrt{2})}{9 - 2} = \frac{5(3 + \sqrt{2})}{7}$$

The 1E specimen's surd answer $4 + 4\sqrt{2}$ comes from this same machinery (family-level citation).

$$0.000072 = 7.2 \times 10^{-5}$$

7.2 is the coefficient; -5 is the power

The coefficient is between 1 and 10

Original native-lesson illustration; labels belong to its worked example.

Standard form, calculators and sets

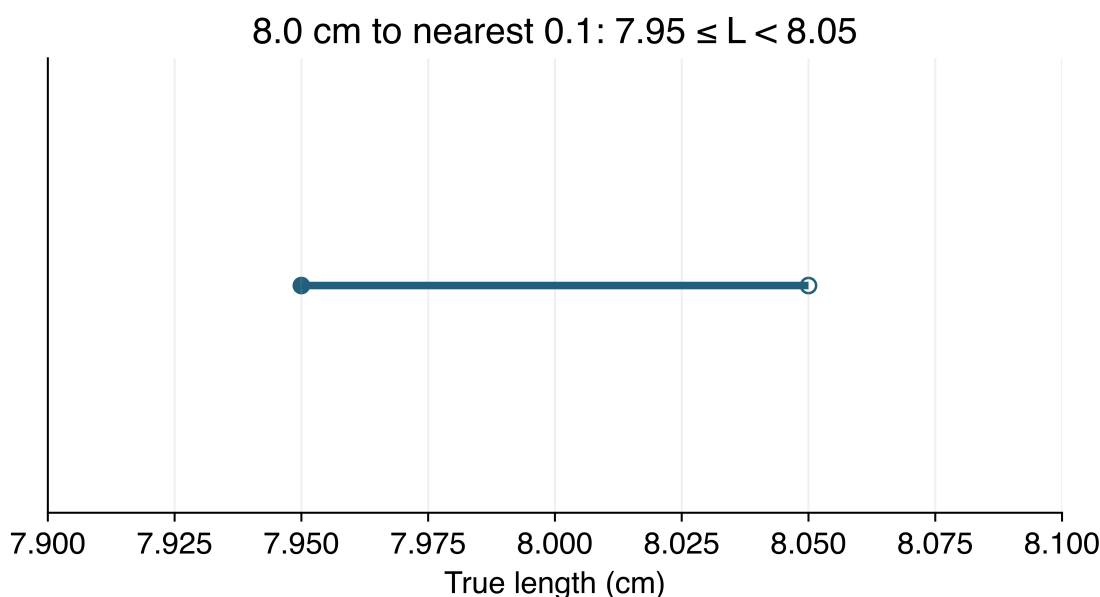
Standard form $A \times 10^n$ with $1 \leq A < 10$ covers very large and very small measurements; the calculator's $\times 10^x$ key keeps arithmetic exact. Use the calculator “effectively and efficiently”: know the trigonometric and square-root functions, keep full precision through the working, and round only at the end.

Sets : the language and notation – $n(A)$ for the count, A' the complement, $A \cup B$ the union, $A \cap B$ the intersection – with Venn diagrams to organise counts (the same toolkit as the probability unit).

Rounding and bounds

Round to an appropriate degree of accuracy – decimal places and significant figures – and know each rounded value carries an interval: to the nearest unit u , the value lies within $\frac{u}{2}$ either side. The Extension addition CALCULATES with upper and lower bounds – the **upper bound** and **lower bound** : choose the extreme the question needs.

Worked example (2E specimen family, adapted). A floor of 96 m^2 is measured to 2 s.f.; a safe occupancy needs 5.1 m^2 per person to 1 d.p. The LEAST number of people that must fit: divide the smallest floor by the largest space – $\text{LB} = 95.5$, $\text{UB per person} = 5.15$, so $\frac{95.5}{5.15} = 18.5 \dots$; you cannot have half a person and everyone must fit, so at least **19** people (the specimen's answer). State which bound each number needs BEFORE dividing.



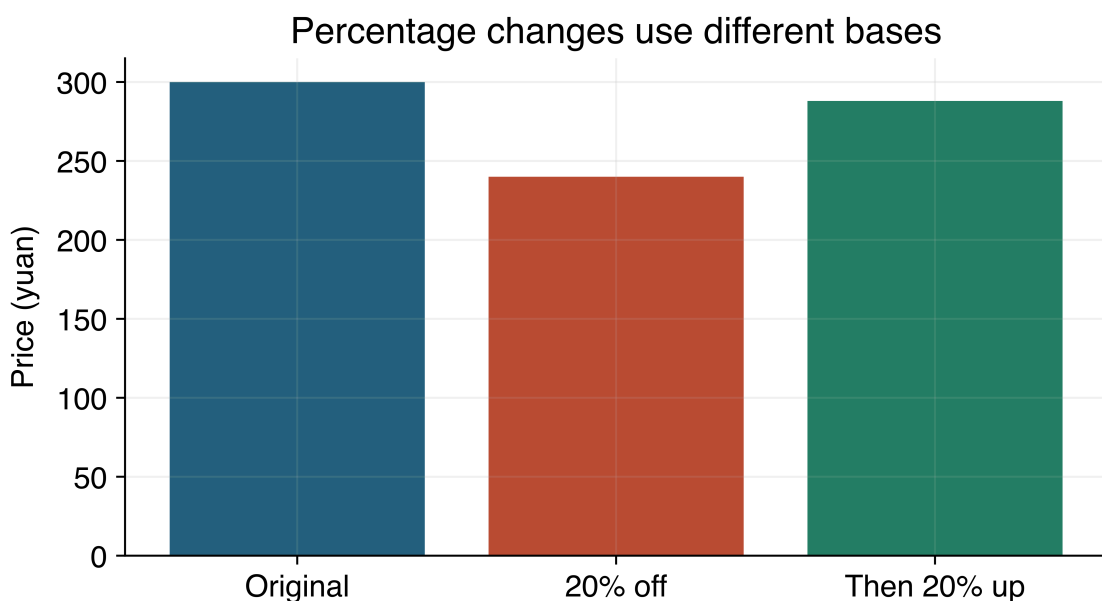
Original native-lesson illustration; labels belong to its worked example.

Fractions, decimals and percentages as operators

Equivalent fractions cancel; fractions, decimals and percentages all act as OPERATORS: 35% of 240 is $0.35 \times 240 = 84$; $\frac{3}{5}$ of a quantity multiplies by $\frac{3}{5}$ and divides by 5. Express one quantity as a fraction or percentage of another: 7 as a percentage of 28 is $\frac{7}{28} \times 100 = 25\%$. The Extension addition converts between fractions and **recurring decimals** in both directions – $0.\overline{45} = \frac{45}{99} = \frac{5}{11}$ by the algebraic shift-and-subtract method (specification line, not sampled by the specimens).

Percentage change and compound interest

Percentage change uses multipliers: increase by 12% is $\times 1.12$; decrease by 17% is $\times 0.83$. The Extension additions cover **reverse percentage** (percentages) problems and the **compound interest formula** $A = P \left(1 + \frac{r}{100}\right)^n$: £2000 at 3% for 4 years gives $2000 \times 1.03^4 = \text{£}2251.02$; reverse: a £92 price after a 15% increase means an original of $92 \div 1.15 = \text{£}80$ (specification lines, not sampled by the specimens).



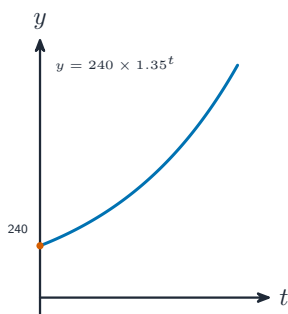
Original native-lesson illustration; labels belong to its worked example.

Ratio, rate and proportion

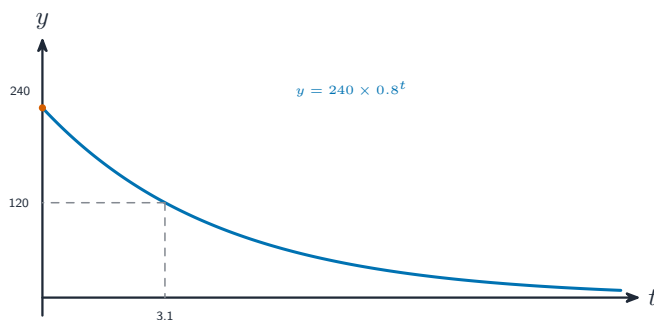
Ratio notation simplifies by dividing through and links to fractions (share £350 in 2 : 5: parts of $\frac{2}{7}$ and $\frac{5}{7}$ – £100 and £250); apply ratio to problems (recipes, maps, mixtures) and use common **rates** including rates of pay (£9.20 per hour for 7.5 hours = £69) and best-buy comparisons (unit pricing – specification lines, not sampled). Direct proportion scales both quantities ($y = kx$); inverse proportion scales them oppositely ($y = \frac{k}{x}$).

Exponential growth and decay

The final Extension addition models **exponential** growth and decay: $y = ab^t$ with $b > 1$ growing and $0 < b < 1$ decaying. The 2E specimen fits a decay model from data – successive values 240, 192, 153.6 have ratio 0.8, so $y = 240 \times 0.8^t$ (the specimen's fitted a -family) – and SOLVES with it: £12000 losing 20% per year, $V = 12000 \times 0.8^t$, first falls below £2500 when $0.8^t < 0.2083$, i.e. $t > \ln 0.2083 / \ln 0.8 \approx 7.0$: during the 8th year (the specimen's "how many years" answer family). Growth works identically: £1200 at 7% passes £2000 after $\ln(5/3) / \ln 1.07 \approx 7.6$, i.e. 8 full years.



growth: the step
itself grows each year



decay: multiplies by 0.8 each
year, never reaching zero

Checklist

- Order integers, decimals and fractions with $=$, $\neq$, $<$, $>$ on the number line (N1).
- Four operations with formal methods on integers, decimals, fractions, mixed numbers; inverse-operation cancellation (N2, N3).
- Even/odd/prime/factors/multiples vocabulary; HCF and LCM from index-form prime factorisations (N4, Extension; 1E specimen HCF 84).
- Integer powers and roots; index laws; fractional powers; exact surd arithmetic incl. rationalising (N5–N7, Extension).
- Standard form; effective calculator use (N8, N10).
- Sets: $n(A)$, A' , $\cup$, $\cap$ with Venn diagrams (N9).
- Rounding to appropriate accuracy; upper/lower bound calculations choosing the right extremes (N11, Extension; 2E specimen 19).
- Equivalent fractions; FDP as operators; fraction/percentage of; recurring decimal conversions (N12–N14, Extension).
- Percentage change with multipliers; reverse percentage; compound interest formula (N15, Extension).
- Ratio notation and sharing; ratio problems; rates of pay and unit pricing (N16–N19).
- Direct and inverse proportion; exponential growth and decay models fitted and solved (N20, Extension; 2E specimen family).

Boundary notes: NO formulae sheet is provided in 9260 – the recall list above is examinable as memory. Lines marked “not sampled” (fractional powers, recurring decimals, reverse percentage, rates of pay and best buys) are taught from the specification text as originals; the specimen pair is Extension-tier only, so Core-tier demand (papers 1–2 Core, 1 h 30, 80 marks) has NO local evidence and holds to spec-text teaching only. Worked examples are adapted from the 2016 specimen pair or original.