Number

OxfordAQA International GCSE Mathematics 9260 unit 3.1: number, Core and Extension

The recall list

Family	Recall
compound interest	$A = P(1 + \frac{r}{100})^n$
bounds	value $\pm \frac{u}{2}$
recurring decimals	$0.\overline{45} = \frac{45}{99} = \frac{5}{11}$
exponential	$y = ab^t$: $b > 1$ grows, $0 < b < 1$ decays

Worked: fractions by formal methods

1. **Compare** $\frac{3}{5} = 0.6$
2. **Add mixed** $2\frac{1}{3} + 1\frac{1}{4} = \frac{28}{12} + \frac{15}{12} = \frac{43}{12} = 3\frac{7}{12}$
3. **Cancel first** $\frac{15}{28} \times \frac{7}{9} = \frac{5}{12}$

Decision

Cancel the 7 and the 3 before multiplying.

3. Factors, HCF and LCM

Factors, HCF and LCM

Index form for every factor: $504 = 2\hat{}3 \times 3\hat{}2 \times 7$ and $588 = 2\hat{}2 \times 3 \times 7\hat{}2$.

HCF takes the lowest power of each common prime: $2\hat{}2 \times 3 \times 7 = 84$ - the 1E specimen answer. LCM takes the highest power of every prime: 3528.

Worked: a negative fractional power

1. **Flip** $(\frac{16}{81})^{-3/4} = (\frac{81}{16})^{3/4}$
2. **Fourth root** $\frac{3}{2}$
3. **Cube** $\frac{27}{8}$

Decision

A negative power never makes the answer negative.

Worked: exact surds

1. **Simplify** $\sqrt{50}-\sqrt{18}+\sqrt{8}=5\sqrt{2}-3\sqrt{2}+2\sqrt{2}$
2. **Collect** $4\sqrt{2}$
3. **Rationalise** $\frac{5}{3-\sqrt{2}}=\frac{5(3+\sqrt{2})}{9-2}=\frac{5(3+\sqrt{2})}{7}$

Decision

Like surds collect like terms.

5. Standard form and sets

Standard form and sets

A x 10^n with $1 <= A < 10$: $604000 = 6.04 \times 10^5$; $0.00047 = 4.7 \times 10^{-4}$.
Calculator: full precision through the working, round at the end.

Sets: n(A) counts, A' complements, union and intersection; Venn diagrams organise the counts (30 students, 18 cricket, 15 tennis, 7 both: 11, 7, 8, 4).

6. Rounding and bounds

Rounding and bounds

Round to the accuracy asked; each rounded value carries an interval of half a unit either side.

Bounds calculations (Extension) choose the extreme the question needs: the 2E specimen - floor 96 m^2 to 2 s.f. (LB 95.5), space 5.1 m^2 per person to 1 d.p. (UB 5.15), greatest number guaranteed room = 95.5 / 5.15 = 18.5, rounded DOWN to 18: 19 people could need 97.85 m^2.

Worked: a recurring decimal

1. **Set up** $x = 0.2\overline{7}$
2. **Shift** $10x = 2.777\ldots$, $100x = 27.777\ldots$
3. **Subtract** $90x = 25$: $x = \frac{25}{90} = \frac{5}{18}$

Decision

Operators: 35% of 240 $= 0.35 \times 240 = 84$

Percentages multiply

> 20% off then 20% up: 288, not 300

- Up 12%: $\times$ 1.12.
- Down 17%: $\times$ 0.83.

Worked: reverse percentage

1. **Multiplier** 15% off: $\times 0.85$
2. **Equation** original $\times 0.85 = 68$
3. **Divide** $68 \div 0.85 = 80$

Decision

Original £80; not $68 \times 1.15 = 78.20$

A ratio from a difference

One part = £12

- Count parts, not people.
- Check the difference.

Worked: inverse square proportion

1. **Model** $y = \frac{k}{x^2}$
2. **k** $5 = \frac{k}{4}$: $k = 20$
3. **Use** $x = 4$: $y = \frac{20}{16} = 1.25$

Decision

Doubling x divides y by $2^2 = 4$

10. Exponential growth and decay

Exponential growth and decay

y = a b^t with b > 1 growing, 0 < b < 1 decaying (Extension). From data 240, 192, 153.6 the ratio 0.8 fits y = 240 x 0.8^t (2E specimen family).

Solving: 12000 x 0.8^t first falls below 2500 when t > ln(0.2083)/ln(0.8) = 7.0 - during the 8th year; growth 240 x 1.35^5 = 1076.2.

Check yourself

Question	**Answer**
$8^{2/3}$?	4
$0.\overline{45}$ as a fraction?	$\frac{5}{11}$
Down 17% **multiplier**?	0.83
96 to 2 s.f.: **lower bound**?	95.5
$y \propto \frac{1}{x^2}$, double x?	y divided by 4