

Numbers and the number system – supported focus

Pearson Edexcel · International GCSE · Mathematics A

Supported teaching and tier boundary

4MA1: Numbers and the number system. Version: Issue 2, November 2017; first assessment June 2018; linear Mathematics A.

Foundation teaching and Higher additions are labelled below. This reference packages the existing native-lesson crosswalk. It does not certify unreviewed specification rows or a whole qualification. Original diagnostics are separate and are not reproduced.

■ Exact arithmetic and estimation · Foundation

Prime factors reveal shared structure. Use the smallest common prime powers for the HCF and the largest for the LCM. Estimate before calculating; use brackets to preserve the order of operations.

$$72 = 2^3 \times 3^2, \quad 90 = 2 \times 3^2 \times 5, \quad \text{HCF} = 18$$

$72=2^3 \times 3^2$ and $90=2 \times 3^2 \times 5$. Their HCF is $2 \times 9=18$. Make 18 bags with 4 pencils and 5 pens each. Their LCM is $2^3 \times 3^2 \times 5=360$.

The HCF divides both numbers; the LCM is a multiple of both. They answer different questions. A decimal estimate is not an exact fraction.

For a non-calculator paper, keep fractions exact and show cancellation. For a calculator paper, enter the full expression and compare with your estimate.

■ Exact arithmetic and estimation · Higher

Prime factors reveal shared structure. Use the smallest common prime powers for the HCF and the largest for the LCM. Estimate before calculating; use brackets to preserve the order of operations.

$$a = \prod p_i^{\alpha_i}, \quad b = \prod p_i^{\beta_i}, \quad \text{HCF}(a, b) = \prod p_i^{\min(\alpha_i, \beta_i)}$$

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

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

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

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

■ Integer indices and standard form · Foundation

Use integer powers, square and cube roots and standard form with $1 \leq a < 10$. In multiplying powers with the same base, add indices; in division, subtract them.

$$a^m a^n = a^{m+n}$$

$0.000072=7.2 \times 10^{-5}$. Also $2^3 \times 2^4=2^7=128$. The square root of 81 is 9. Check a standard-form answer by writing it out as a decimal.

Index laws do not turn a sum into a single power: $2^3+2^4=24$, not 2^7 . Do not round a surd when an exact answer is requested.

This Foundation/Core lesson excludes fractional powers and surd rationalisation. Estimate a result before using a calculator and retain the required precision.

■ Indices, surds and standard form · Higher

For the same positive base, multiplication adds indices and division subtracts them. A negative index means reciprocal; a fractional index represents a root. Standard form has $1 \leq a < 10$.

$$a^m a^n = a^{m+n}, \quad a^{-n} = \frac{1}{a^n}, \quad a^{m/n} = (\sqrt[n]{a})^m$$

$0.000072=7.2 \times 10^{-5}$. Also $16^{(3/4)}=(16^{(1/4)})^3=2^3=8$. Simplify $\sqrt{72}=6\sqrt{2}$, then rationalise $1/\sqrt{2}=\sqrt{2}/2$.

Index laws do not turn a sum into a single power: $2^3+2^4=24$, not 2^7 . Do not round a surd when an exact answer is requested.

Check powers of ten against the original quantity. Use surds for exact geometry, and round only the final length when the question asks for a decimal.

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

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.

■ Percentages, ratio and proportional reasoning · Foundation

A p% increase has multiplier $1+p/100$; a decrease has multiplier $1-p/100$. Reverse a percentage by dividing by the multiplier. In a ratio, first find the total number of parts.

$$P_{\text{new}} = P_{\text{old}} \left(1 + \frac{r}{100}\right)$$

Let the original price be P. The model is sale price=0.8P. Hence $P=240/0.8=300$. A later 20% increase gives $240 \times 1.2=288$, so the two changes do not cancel.

A percentage uses a stated base. Subtracting the percentages loses that base. For compound change, multiply the multipliers; do not add the percentages.

Use percentage multipliers and divide a total into ratio parts. This Foundation/Core lesson uses linear proportional contexts, not the advanced regression methods.

■ Percentages, ratio and proportional reasoning · Higher

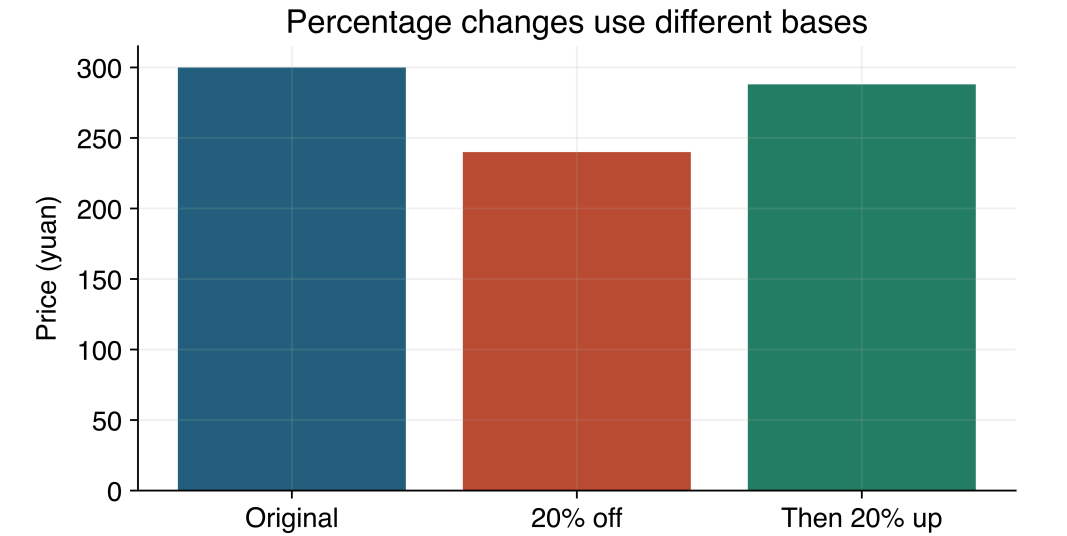
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A percentage uses a stated base. Subtracting the percentages loses that base. For compound change, multiply the multipliers; do not add the percentages.

For direct proportion use $y=kx$; for inverse proportion use $y=k/x$. Calculate k from a known pair before using a new value. State what you held constant.



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

■ Accuracy, bounds and compound measures · Higher

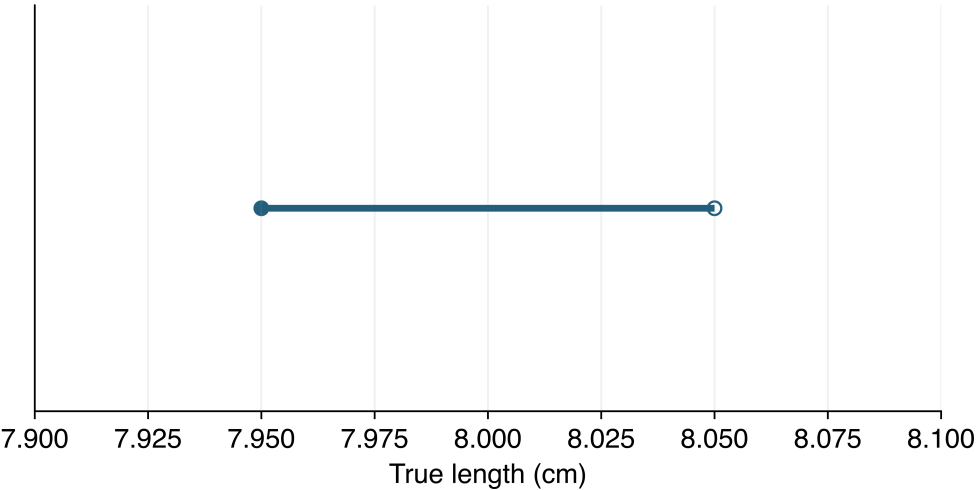
A value rounded to the nearest unit u lies from stated value-u/2 up to, but usually not including, stated value+u/2. For positive quantities, combine extremes according to the operation.

$$A = LW, \quad v = \frac{d}{t}$$

The lengths satisfy $7.95 \leq L < 8.05$ and $4.95 \leq W < 5.05$. Since $A=LW$, $39.3525 \leq A < 40.6525$. For speed d/t , the largest speed uses the largest distance and smallest positive time.

An upper bound is not automatically achieved. Dividing upper distance by upper time does not give the largest speed. Keep enough digits in intermediate calculations. Distinguish measurement uncertainty from arithmetic rounding. A sensible reported precision cannot be finer than the measurements justify.

8.0 cm to nearest 0.1: $7.95 \leq L < 8.05$



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Remaining qualification limits

Official question-bank boundaries, scheme alignment and all objective-level teaching coverage require the recorded review; no practice registry promotion.

The authored diagnostic assessments are not full-length qualification mocks.

Only the mapped native skills are supplied here. Objective rows marked formula-review-required are not promoted to complete coverage by these print companions.

Terms

- prime factor .
- index .
- multiplier .
- lower bound .