

GCSE MATHEMATICS

FOUNDATION TIER

COMPREHENSIVE LESSON NOTEBOOK

UNIT 1 | NUMBER

TEACH-FROM-SCRATCH • PUBLICATION EDITION

10 detailed chapters • original diagrams • worked examples • guided practice • answers

INDEPENDENT PUBLICATION NOTICE

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COMPREHENSIVE LESSON NOTEBOOK

How to learn from this notebook

Meaning first. Method second. Practice third.

FIVE-PASS ROUTINE

1 Read the key idea without a calculator. 2 Cover each worked solution and reproduce it. 3 Complete practice independently. 4 Mark in a different colour and repair errors. 5 Retest after 2–7 days.

What a complete mathematics answer contains

- A clear model or calculation, not only a calculator display.
- Enough working for another person to follow the reasoning.
- Exact values until approximation is requested.
- Units and sensible rounding in context.
- A final statement when interpretation is required.

Error loop

REPAIR, DO NOT MERELY CORRECT

Label each error: concept, operation, arithmetic, calculator entry, accuracy, unit or interpretation. Write the corrected step and one sentence explaining the change.

Foundation does not mean superficial

OCR Foundation questions can combine familiar skills in unfamiliar contexts. Grade 4–5 success depends on selecting a method, connecting several steps and deciding whether the answer is reasonable.

COMPREHENSIVE LESSON NOTEBOOK

Unit 1 coverage map

OCR J560 Number content organised into a teachable sequence.

CH 01 **OCR 1.01a** Calculations with integers

CH 02 **OCR 1.02a-1.02b** Number properties and place value

CH 03 **OCR 1.02c** Prime factors, HCF and LCM

CH 04 **OCR 1.03a-1.04a** Order and inverse operations

CH 05 **OCR 2.01** Fractions and mixed numbers

CH 06 **OCR 2.02** Decimals and conversions

CH 07 **OCR 2.03-2.04** Percentages and ordering FDP

CH 08 **OCR 3.01** Powers, roots and index notation

CH 09 **OCR 3.02-3.03** Standard form and exact calculation

CH 10 **OCR 4.01** Rounding, estimation and accuracy

IMPORTANT TIER NOTE

This notebook covers OCR J560 sections 1–4 at Foundation Tier. Ratio and proportion are developed separately in Unit 2. Specification references are identifiers, not copied specification wording.

COMPREHENSIVE LESSON NOTEBOOK

Fast-reference method bank

Understand each relationship before memorising it.

Percentage of amount

percentage $\div$ 100 $\times$ amount

Percentage change

change $\div$ original $\times$ 100%

Reverse percentage

known amount $\div$ known multiplier

Fraction of amount

fraction $\times$ amount

Standard form

$A \times 10^n$, $1 \leq A < 10$

HCF

common primes with smallest powers

LCM

all required primes with greatest powers

Index product

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

Index quotient

$a^m \div a^n = a^{m-n}$

Error interval

rounded value $\pm$ half-unit

CURRENT ASSESSMENT NOTE

OCR has announced Foundation and Higher formula sheets for GCSE Mathematics examinations in 2025, 2026 and 2027. Use the current official OCR sheet alongside this learning bank and check OCR for later exam-series arrangements.

COMPREHENSIVE LESSON NOTEBOOK

Calculations with integers

Apply all four operations to positive and negative integers.

SPECIFICATION FOCUS

OCR reference OCR 1.01a. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Integers are whole numbers, including zero and negatives. Operations describe changes and combinations. A negative value is a position below a chosen zero; its magnitude is its distance from zero. Subtraction measures a directed difference, so subtracting a negative reverses direction and becomes addition.

KEY VOCABULARY

integer • operation • sum • difference • product • quotient • magnitude • directed number



Why the method works

- Addition and subtraction are inverse operations.
- A negative multiplied by a negative is positive because reversing direction twice restores the original direction.
- An estimate of sign and size checks a written or calculator result.

CHECK BEFORE MOVING ON

Answer mentally: Work out $4,806 + 7,395$. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Calculations with integers — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Subtracting means adding the opposite.
- Equal signs multiply or divide to positive; different signs give negative.

WORKED EXAMPLE 1

Work out $4,806 + 7,395$.

SOLUTION

1. $4,806 + 7,395 = 12,201$

ANSWER: 12,201

WORKED EXAMPLE 2

Work out $15,000 - 8,764$.

SOLUTION

1. $15,000 - 8,764 = 6,236$

ANSWER: 6,236

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Calculations with integers — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Bank balances, temperatures, elevation and profit/loss all use signed quantities. Define what positive and negative mean before combining changes.

Common misconceptions

- Treating -18 as larger than -7 because 18 is larger than 7 .
- Forgetting that subtracting a negative means adding.
- Dropping the negative sign after multiplication or division.

GUIDED TRY

Calculate $-18 + 35 - 27$. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Explain why the product of three negative numbers is negative. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Calculations with integers

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. Work out $4,806 + 7,395$.**[1]**

2. Work out $15,000 - 8,764$.**[1]**

3. Calculate $-18 + 35 - 27$.**[2]**

4. Calculate $(-14) \times 9 + 30$.**[2]**

5. A submarine is at -85 m. It rises 37 m and then descends 24 m. Find its final depth.**[3]**

6. The temperature changes from -7°C to 11°C . Find the increase.**[2]**

7. Find the missing integer: $-12 \times \square = 180$.**[2]**

8. Explain why the product of three negative numbers is negative.**[2]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Number properties and place value

Recognise place value, factors, multiples, primes, squares and cubes.

SPECIFICATION FOCUS

OCR reference OCR 1.02a-1.02b. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Our base-ten system assigns a value to each digit according to position. Number properties describe structure: factors divide exactly, multiples are generated by multiplication, primes have exactly two positive factors, and square or cube numbers arise from repeated equal factors.

KEY VOCABULARY

digit • place value • factor • multiple • prime • composite • square • cube

factor**multiple****prime****square**

Why the method works

- Placeholders preserve position: 4.05 is not 4.5.
- Factor pairs provide a complete list when checked up to the square root.
- A prime test only needs possible prime divisors up to the square root.

CHECK BEFORE MOVING ON

Answer mentally: State the value of 7 in 5,073,412. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Number properties and place value — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- A prime has exactly two positive factors.
- The value of a digit depends on its position.

WORKED EXAMPLE 1

State the value of 7 in 5,073,412.

SOLUTION

1. The 7 is in the ten-thousands column.

ANSWER: 70,000

WORKED EXAMPLE 2

List all factors of 48.

SOLUTION

1. Use pairs 1x48, 2x24, 3x16, 4x12 and 6x8.

ANSWER: 1, 2, 3, 4, 6, 8, 12, 16, 24, 48

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Number properties and place value — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Packaging, timetables and digital systems depend on divisibility. Place value also controls money, measurement and calculator input.

Common misconceptions

- Calling 1 a prime number.
- Confusing a factor with a multiple.
- Omitting factor pairs after reaching the square root.

GUIDED TRY

Write the first five positive multiples of 18. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Write 144 as a square and as a product of two unequal factors. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Number properties and place value

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. State the value of 7 in 5,073,412.

[1]

2. List all factors of 48.

[2]

3. Write the first five positive multiples of 18.

[1]

4. Is 97 prime? Justify your answer.

[2]

5. Find the smallest three-digit multiple of 17.

[2]

6. A number is odd, a multiple of 9 and between 50 and 80. Find it.

[2]

7. A student says 1 is prime. Explain the error.

[2]

8. Write 144 as a square and as a product of two unequal factors.

[2]

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Prime factors, HCF and LCM

Use prime structure for grouping and repeating-event problems.

SPECIFICATION FOCUS

OCR reference OCR 1.02c. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Every integer greater than 1 has a unique prime factorisation apart from factor order. HCF selects the greatest structure shared by two numbers. LCM builds the smallest number containing all prime factors needed by both.

KEY VOCABULARY

prime factorisation • factor tree • HCF • LCM • coprime • exponent

2

2

3

5

Why the method works

- HCF uses common primes with the smallest powers.
- LCM uses every required prime with the greatest powers.
- For positive integers a and b , $\text{HCF}(a,b) \times \text{LCM}(a,b) = ab$.

CHECK BEFORE MOVING ON

Answer mentally: Write 360 as a product of prime factors. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Prime factors, HCF and LCM — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- HCF uses common primes with smallest powers.
- LCM uses all required primes with greatest powers.

WORKED EXAMPLE 1

Write 360 as a product of prime factors.

SOLUTION

1. $360 = 36 \times 10$
2. $36 = 2^2 \times 3^2$ and $10 = 2 \times 5$
3. Combine equal prime factors.

ANSWER: $2^3 \times 3^2 \times 5$

WORKED EXAMPLE 2

Find the HCF of 84 and 126.

SOLUTION

1. $84 = 2^2 \times 3 \times 7$; $126 = 2 \times 3^2 \times 7$
2. $\text{HCF} = 2 \times 3 \times 7 = 42$

ANSWER: 42

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Prime factors, HCF and LCM — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

HCF gives the largest equal group or cut. LCM gives the first time repeating cycles coincide.

Common misconceptions

- Using the largest powers for HCF.
- Using only common primes when finding LCM.
- Choosing HCF for a repeating-time problem.

GUIDED TRY

Find the LCM of 36 and 90. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Explain why 35 and 64 are coprime. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Prime factors, HCF and LCM

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. Write 360 as a product of prime factors.

[3]

2. Find the HCF of 84 and 126.

[2]

3. Find the LCM of 36 and 90.

[2]

4. Bells ring every 28 and 42 minutes. They ring together at 09:00. When next?

[3]

5. Ribbons 168 cm and 252 cm long are cut into the longest equal pieces. Find the length.

[3]

6. Find the smallest multiplier that makes 75 a square number.

[3]

7. HCF=6, LCM=180 and one number is 30. Find the other.

[3]

8. Explain why 35 and 64 are coprime.

[2]

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Order and inverse operations

Interpret mixed calculations and use inverses to check or solve.

SPECIFICATION FOCUS

OCR reference OCR 1.03a-1.04a. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

A mixed expression is a hierarchy, not a sentence read only from left to right. Brackets identify grouped work; indices describe powers. Multiplication and division share a level, as do addition and subtraction, so equal-priority operations proceed from left to right.

KEY VOCABULARY

expression • bracket • index • priority • inverse • operation • equation

Brackets**Indices****÷ and ×****+ and -**

Why the method works

- A fixed order gives every unambiguous expression one value.
- Inverse operations undo one another and support checking.
- Brackets change structure and therefore may change the result.

CHECK BEFORE MOVING ON

Answer mentally: Work out $7 + 5 \times 8$. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Order and inverse operations — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Brackets, indices, division/multiplication, addition/subtraction.
- Equal-priority operations proceed left to right.

WORKED EXAMPLE 1

Work out $7 + 5 \times 8$.

SOLUTION

1. $5 \times 8 = 40$ first
2. $7 + 40 = 47$

ANSWER: 47

WORKED EXAMPLE 2

Work out $(7 + 5) \times 8$.

SOLUTION

1. Brackets: $7 + 5 = 12$
2. $12 \times 8 = 96$

ANSWER: 96

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Order and inverse operations — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Spreadsheets, formulas and computer code rely on explicit operation structure. One missing bracket can change a financial or scientific result.

Common misconceptions

- Multiplying before an earlier division.
- Ignoring brackets around a complete expression.
- Undoing operations in the wrong reverse order.

GUIDED TRY

Calculate $72 \div 6 \times 3$. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Explain why $30 \div 5 \times 2$ is not $30 \div (5 \times 2)$. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Order and inverse operations

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. Work out $7 + 5 \times 8$.

[1]

2. Work out $(7 + 5) \times 8$.

[1]

3. Calculate $72 \div 6 \times 3$.

[2]

4. Calculate $4^2 + 3 \times (11 - 7)$.

[2]

5. Insert brackets to make $6 + 2 \times 5$ equal 40.

[2]

6. Find the missing number: $7 \times \square - 9 = 54$.

[2]

7. Use an inverse operation to check $924 \div 28 = 33$.

[2]

8. Explain why $30 \div 5 \times 2$ is not $30 \div (5 \times 2)$.

[2]

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Fractions and mixed numbers

Represent, compare and calculate with fractions exactly.

SPECIFICATION FOCUS

OCR reference OCR 2.01. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

A fraction is a number, a division and an operator. Equivalent fractions name the same point on a number line. Addition requires equal-sized parts; multiplication scales; division asks how many groups of the divisor fit.

KEY VOCABULARY

numerator • denominator • equivalent • improper • mixed number • reciprocal • common denominator



3 shaded equal parts out of 8 = $\frac{3}{8}$

Why the method works

- Multiplying numerator and denominator by the same non-zero value multiplies by 1.
- A common denominator creates equal-sized parts.
- Dividing by a fraction multiplies by its reciprocal.

CHECK BEFORE MOVING ON

Answer mentally: Simplify $\frac{84}{126}$. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Fractions and mixed numbers — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Use a common denominator for addition/subtraction.
- To divide by a fraction, multiply by its reciprocal.

WORKED EXAMPLE 1

Simplify $84/126$.

SOLUTION

1. $\text{HCF}=42$
2. $84 \div 42$ over $126 \div 42 = 2/3$

ANSWER: $2/3$

WORKED EXAMPLE 2

Order $3/5$, $7/12$ and $5/8$ from smallest to largest.

SOLUTION

1. Use denominator 120: $72/120$, $70/120$, $75/120$.
2. Order the numerators.

ANSWER: $7/12$, $3/5$, $5/8$

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Fractions and mixed numbers — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Recipes, scale, probability and sharing use fractions. Exact fractional work prevents rounding errors from accumulating.

Common misconceptions

- Adding denominators when adding fractions.
- Cancelling terms joined by addition.
- Forgetting to convert mixed numbers before multiplication or division.

GUIDED TRY

Calculate $\frac{5}{6} + \frac{7}{15}$. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Find a fraction between $\frac{5}{8}$ and $\frac{2}{3}$. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Fractions and mixed numbers

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. Simplify $84/126$.**[2]**

2. Order $3/5$, $7/12$ and $5/8$ from smallest to largest.**[3]**

3. Calculate $5/6 + 7/15$.**[2]**

4. Calculate $11/12 - 5/18$.**[2]**

5. Calculate $7/9 \times 27/35$.**[2]**

6. Calculate $4/7 \div 10/21$.**[2]**

7. A tank is $3/5$ full. Adding 84 litres makes it $9/10$ full. Find capacity.**[4]**

8. Find a fraction between $5/8$ and $2/3$.**[2]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Decimals and conversions

Calculate with decimals and convert between fractions and decimals.

SPECIFICATION FOCUS

OCR reference OCR 2.02. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Decimals are fractions with denominators based on powers of ten. Column alignment keeps equal place values together. A simplified fraction terminates only when its denominator contains no prime factors other than 2 and 5.

KEY VOCABULARY

decimal place • terminating • recurring • equivalent • place holder • decimal point

$$0.3 = \frac{3}{10} = 30\%$$

three equivalent representations of one value

Why the method works

- Moving one place right divides place value by ten.
- Scaling both dividend and divisor by the same power of ten preserves a quotient.
- The denominator test predicts whether division ends or repeats.

CHECK BEFORE MOVING ON

Answer mentally: Write $47/1000$ as a decimal. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Decimals and conversions — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Align decimal points for addition/subtraction.
- A terminating denominator contains only factors 2 and/or 5.

WORKED EXAMPLE 1

Write $47/1000$ as a decimal.

SOLUTION

1. 47 thousandths = 0.047.

ANSWER: 0.047

WORKED EXAMPLE 2

Write 0.375 as a fraction in simplest form.

SOLUTION

1. $0.375 = 375/1000$
2. Divide by 125.

ANSWER: $3/8$

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Decimals and conversions — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Money and measurements are often decimal quantities. Reliable placement is essential when totals combine different numbers of decimal places.

Common misconceptions

- Aligning the final digits rather than decimal points.
- Moving only one decimal point in division.
- Assuming every fraction has a terminating decimal.

GUIDED TRY

Calculate $18.7 + 0.965 + 4.08$. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Is $7/30$ terminating or recurring? Explain. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Decimals and conversions

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. Write $47/1000$ as a decimal.

[1]

2. Write 0.375 as a fraction in simplest form.

[2]

3. Calculate $18.7 + 0.965 + 4.08$.

[2]

4. Calculate 4.8×0.35 .

[3]

5. Calculate $6.72 \div 0.8$.

[2]

6. Order 0.405, 0.45, 0.045 and 0.504.

[2]

7. A 2.4 kg bag is divided into 0.075 kg portions. How many?

[3]

8. Is $7/30$ terminating or recurring? Explain.

[2]

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Percentages and ordering FDP

Convert, compare and solve percentage problems.

SPECIFICATION FOCUS

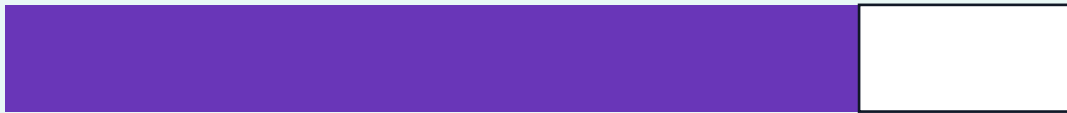
OCR reference OCR 2.03-2.04. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

A percentage compares an amount with 100 and acts as a multiplier. Percentage change always compares the change with the original amount. Reverse percentage problems identify the known amount as a percentage of an unknown original.

KEY VOCABULARY

percentage • multiplier • original value • change • increase • decrease • reverse percentage



80% known amount → divide by 0.8 to recover 100%

Why the method works

- An increase of $p\%$ uses multiplier $1 + p/100$.
- A decrease of $p\%$ uses multiplier $1 - p/100$.
- Successive changes multiply because each acts on a new base.

CHECK BEFORE MOVING ON

Answer mentally: Write 0.62 as a percentage. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Percentages and ordering FDP — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- $p\%$ of an amount = $p/100 \times \text{amount}$.
- Use a multiplier for increases, decreases and reverse percentages.

WORKED EXAMPLE 1

Write 0.62 as a percentage.

SOLUTION

1. Multiply by 100.

ANSWER: 62%

WORKED EXAMPLE 2

Write 45% as a fraction in simplest form.

SOLUTION

1. $45\% = 45/100$
2. Divide by 5.

ANSWER: 9/20

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Percentages and ordering FDP — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Discounts, tax, inflation and interest depend on the correct original base. Multiplier models make repeated changes transparent.

Common misconceptions

- Using the final value as the denominator for percentage change.
- Subtracting the percentage number instead of a percentage amount.
- Assuming equal percentage rise and fall cancel.

GUIDED TRY

Order $\frac{3}{8}$, 0.42, 41% and 0.405. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

A price rises 10% then falls 10%. Find the overall change. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Percentages and ordering FDP

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. Write 0.62 as a percentage.**[1]**

2. Write 45% as a fraction in simplest form.**[2]**

3. Order $\frac{3}{8}$, 0.42, 41% and 0.405.**[3]**

4. Find 18% of £650.**[2]**

5. Increase £480 by 12%.**[3]**

6. A coat costs £72 after a 20% reduction. Find the original price.**[3]**

7. A population rises from 12,500 to 13,350. Find percentage increase.**[3]**

8. A price rises 10% then falls 10%. Find the overall change.**[4]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Powers, roots and index notation

Use powers, roots and Foundation index laws.

SPECIFICATION FOCUS

OCR reference OCR 3.01. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

A power abbreviates repeated multiplication. Index laws count or cancel repeated factors of the same base. Roots reverse powers: a square root produces the non-negative value whose square is the given number.

KEY VOCABULARY

base • index • power • square root • cube root • zero index • reciprocal

$$a^3 \times a^5 = a^8$$

three copies plus five copies gives eight copies of the same base

Why the method works

- Multiplication joins copies of a base, so indices add.
- Division cancels copies, so indices subtract.
- A power of a power repeats a repeated product, so indices multiply.

CHECK BEFORE MOVING ON

Answer mentally: Evaluate 6^3 . Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Powers, roots and index notation — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- $a^m \times a^n = a^{(m+n)}$; $a^m \div a^n = a^{(m-n)}$.
- $(a^m)^n = a^{(mn)}$; $a^0=1$ for a non-zero.

WORKED EXAMPLE 1

Evaluate 6^3 .

SOLUTION

1. $6 \times 6 \times 6 = 216$.

ANSWER: 216

WORKED EXAMPLE 2

Find $\sqrt{576}$.

SOLUTION

1. $24 \times 24 = 576$.

ANSWER: 24

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Powers, roots and index notation — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Area, volume, population scale and computer storage use powers. Roots recover a dimension from an area or volume.

Common misconceptions

- Adding indices when bases differ.
- Multiplying indices when multiplying powers.
- Losing brackets around a negative base.

GUIDED TRY

Find the cube root of 1728. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Explain why $(-5)^2$ and -5^2 differ. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Powers, roots and index notation

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. Evaluate 6^3 .

[1]

2. Find $\sqrt{576}$.

[1]

3. Find the cube root of 1728.

[1]

4. Simplify $3^5 \times 3^2$.

[1]

5. Simplify $7^9 \div 7^4$.

[1]

6. Simplify $(x^3)^4$.

[1]

7. A square has area 450 cm^2 . Bound its side between consecutive integers.

[3]

8. Explain why $(-5)^2$ and -5^2 differ.

[2]

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Standard form and exact calculation

Use standard form and preserve exact values.

SPECIFICATION FOCUS

OCR reference OCR 3.02-3.03. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Standard form separates a significant coefficient from a power-of-ten scale. Exact answers preserve mathematical value without rounding, often using fractions or pi. Addition in standard form first requires a common power of ten.

KEY VOCABULARY

standard form • coefficient • power of ten • order of magnitude • exact • approximation • pi

$$4,200,000 = 4.2 \times 10^6$$

coefficient between 1 and 10 • scale recorded by the exponent

Why the method works

- Moving the decimal left increases the exponent; moving it right decreases it.
- Multiplication adds powers of ten and division subtracts them.
- Keeping pi exact avoids approximation drift.

CHECK BEFORE MOVING ON

Answer mentally: Write 5,720,000 in standard form. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Standard form and exact calculation — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- $A \times 10^n$ with $1 \leq A < 10$.
- Multiply coefficients and add powers; divide and subtract powers.

WORKED EXAMPLE 1

Write 5,720,000 in standard form.

SOLUTION

1. Move the decimal 6 places left.

ANSWER: 5.72×10^6

WORKED EXAMPLE 2

Write 3.84×10^{-5} as an ordinary number.

SOLUTION

1. Move the decimal 5 places left.

ANSWER: 0.0000384

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Standard form and exact calculation — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Astronomy and microscopic science compare extreme magnitudes. Geometry calculations often remain exact until a final decimal is requested.

Common misconceptions

- Leaving a coefficient outside $1 \leq A < 10$.
- Adding coefficients with different powers of ten.
- Replacing π with 3.14 when an exact answer is required.

GUIDED TRY

Calculate $(4 \times 10^5)(3 \times 10^{-2})$. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Explain why 2π is more accurate than 6.28. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Standard form and exact calculation

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. Write 5,720,000 in standard form.

[1]

2. Write 3.84×10^{-5} as an ordinary number.

[1]

3. Calculate $(4 \times 10^5)(3 \times 10^{-2})$.

[2]

4. Calculate $(8.4 \times 10^7) \div (2 \times 10^3)$.

[2]

5. Calculate $6.2 \times 10^5 + 9 \times 10^4$.

[2]

6. One particle has mass 2.5×10^{-7} g. Find mass of 6×10^8 particles.

[3]

7. A circle has radius 5 cm. Give its area exactly.

[2]

8. Explain why 2π is more accurate than 6.28.

[2]

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Rounding, estimation and accuracy

Round, estimate and interpret limits of accuracy.

SPECIFICATION FOCUS

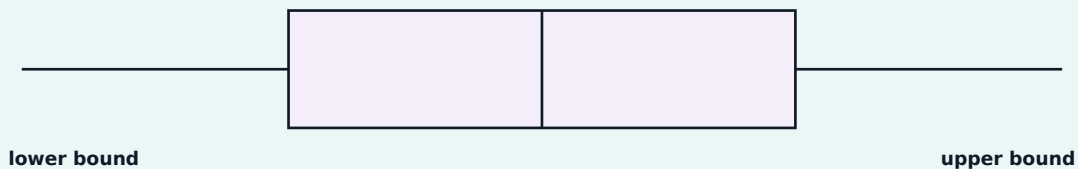
OCR reference OCR 4.01. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Rounding replaces a range of possible values by one reported value. An estimate uses convenient nearby values to check order of magnitude. An error interval describes every original value that would round to the stated result.

KEY VOCABULARY

rounding • significant figure • decimal place • estimate • lower bound • upper bound • error interval



Why the method works

- Nearest unit u creates a half-unit boundary on each side.
- The lower endpoint is included; the upper endpoint is excluded.
- For a whole-number count, convert the open upper boundary to the greatest permitted integer.

CHECK BEFORE MOVING ON

Answer mentally: Round 58,746 to the nearest thousand. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Rounding, estimation and accuracy — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Nearest unit u gives half-width $u/2$.
- Percentage error = $\text{absolute error} \div \text{exact value} \times 100\%$.

WORKED EXAMPLE 1

Round 58,746 to the nearest thousand.

SOLUTION

1. The hundreds digit is 7, so round up.

ANSWER: 59,000

WORKED EXAMPLE 2

Round 0.007846 to 3 significant figures.

SOLUTION

1. The first three significant digits are 7,8,4.
2. The next digit 6 rounds 4 up to 5.

ANSWER: 0.00785

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Rounding, estimation and accuracy — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Manufacturing tolerances, measured quantities and population reports require values that reflect the precision of the source data.

Common misconceptions

- Counting leading zeros as significant figures.
- Using the rounded value itself as a boundary.
- Including the upper endpoint of an error interval.

GUIDED TRY

Estimate $(19.8 \times 0.503) \div 4.92$. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

An exact value 48 is estimated as 50. Find percentage error. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Rounding, estimation and accuracy

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. Round 58,746 to the nearest thousand.

[1]

2. Round 0.007846 to 3 significant figures.

[2]

3. Estimate $(19.8 \times 0.503) \div 4.92$.

[3]

4. A length is 7.4 cm to nearest 0.1 cm. Write its error interval.

[2]

5. A mass is 260 g to nearest 10 g. State its bounds.

[2]

6. A length is 6.8 cm correct to the nearest 0.1 cm. Write its error interval.

[3]

7. A population is stated as 42,000 correct to the nearest thousand. State the least and greatest possible whole-number populations.

[3]

8. An exact value 48 is estimated as 50. Find percentage error.

[3]

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Calculations with integers

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. Work out $4,806 + 7,395$.

ANSWER: 12,201

Method cue: $4,806 + 7,395 = 12,201$ Check sign, size, accuracy and units.

2. Work out $15,000 - 8,764$.

ANSWER: 6,236

Method cue: $15,000 - 8,764 = 6,236$ Check sign, size, accuracy and units.

3. Calculate $-18 + 35 - 27$.

ANSWER: -10

Method cue: $-18 + 35 = 17$ Check sign, size, accuracy and units.

4. Calculate $(-14) \times 9 + 30$.

ANSWER: -96

Method cue: $(-14) \times 9 = -126$ Check sign, size, accuracy and units.

5. A submarine is at -85 m. It rises 37 m and then descends 24 m. Find its final depth.

ANSWER: -72 m

Method cue: $-85 + 37 = -48$ Check sign, size, accuracy and units.

6. The temperature changes from -7°C to 11°C . Find the increase.

ANSWER: 18°C

Method cue: Increase = final - initial Check sign, size, accuracy and units.

7. Find the missing integer: $-12 \times \square = 180$.

ANSWER: -15

Method cue: Divide by -12 Check sign, size, accuracy and units.

8. Explain why the product of three negative numbers is negative.

ANSWER: Two negatives give a positive; the third negative makes the product negative.

Method cue: $(-a)(-b)=ab$ Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Number properties and place value

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. State the value of 7 in 5,073,412.

ANSWER: 70,000

Method cue: The 7 is in the ten-thousands column. Check sign, size, accuracy and units.

2. List all factors of 48.

ANSWER: 1, 2, 3, 4, 6, 8, 12, 16, 24, 48

Method cue: Use pairs 1x48, 2x24, 3x16, 4x12 and 6x8. Check sign, size, accuracy and units.

3. Write the first five positive multiples of 18.

ANSWER: 18, 36, 54, 72, 90

Method cue: Multiply 18 by 1, 2, 3, 4 and 5. Check sign, size, accuracy and units.

4. Is 97 prime? Justify your answer.

ANSWER: Yes

Method cue: Check prime divisors up to $\sqrt{97}$. Check sign, size, accuracy and units.

5. Find the smallest three-digit multiple of 17.

ANSWER: 102

Method cue: $17 \times 5 = 85$ is two-digit. Check sign, size, accuracy and units.

6. A number is odd, a multiple of 9 and between 50 and 80. Find it.

ANSWER: 63

Method cue: Multiples are 54, 63 and 72. Check sign, size, accuracy and units.

7. A student says 1 is prime. Explain the error.

ANSWER: 1 is not prime because it has only one positive factor.

Method cue: A prime needs exactly two positive factors: 1 and itself. Check sign, size, accuracy and units.

8. Write 144 as a square and as a product of two unequal factors.

ANSWER: 12^2 and, for example, 9×16

Method cue: $12 \times 12 = 144$ Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Prime factors, HCF and LCM

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. Write 360 as a product of prime factors.

ANSWER: $2^3 \times 3^2 \times 5$

Method cue: $360 = 36 \times 10$ Check sign, size, accuracy and units.

2. Find the HCF of 84 and 126.

ANSWER: 42

Method cue: $84 = 2^2 \times 3 \times 7$; $126 = 2 \times 3^2 \times 7$ Check sign, size, accuracy and units.

3. Find the LCM of 36 and 90.

ANSWER: 180

Method cue: $36 = 2^2 \times 3^2$; $90 = 2 \times 3^2 \times 5$ Check sign, size, accuracy and units.

4. Bells ring every 28 and 42 minutes. They ring together at 09:00. When next?

ANSWER: 10:24

Method cue: $\text{LCM}(28, 42) = 84$ minutes Check sign, size, accuracy and units.

5. Ribbons 168 cm and 252 cm long are cut into the longest equal pieces. Find the length.

ANSWER: 84 cm

Method cue: The longest equal length is $\text{HCF}(168, 252)$. Check sign, size, accuracy and units.

6. Find the smallest multiplier that makes 75 a square number.

ANSWER: 3

Method cue: $75 = 3 \times 5^2$ Check sign, size, accuracy and units.

7. HCF=6, LCM=180 and one number is 30. Find the other.

ANSWER: 36

Method cue: Product of numbers = $\text{HCF} \times \text{LCM}$ Check sign, size, accuracy and units.

8. Explain why 35 and 64 are coprime.

ANSWER: They have HCF 1.

Method cue: $35 = 5 \times 7$ and $64 = 2^6$. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Order and inverse operations

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. Work out $7 + 5 \times 8$.

ANSWER: 47

Method cue: $5 \times 8 = 40$ first Check sign, size, accuracy and units.

2. Work out $(7 + 5) \times 8$.

ANSWER: 96

Method cue: Brackets: $7 + 5 = 12$ Check sign, size, accuracy and units.

3. Calculate $72 \div 6 \times 3$.

ANSWER: 36

Method cue: Work left to right: $72 \div 6 = 12$ Check sign, size, accuracy and units.

4. Calculate $4^2 + 3 \times (11 - 7)$.

ANSWER: 28

Method cue: $4^2 = 16$ and $11 - 7 = 4$ Check sign, size, accuracy and units.

5. Insert brackets to make $6 + 2 \times 5$ equal 40.

ANSWER: $(6 + 2) \times 5$

Method cue: The bracketed sum is 8; $8 \times 5 = 40$. Check sign, size, accuracy and units.

6. Find the missing number: $7 \times \square - 9 = 54$.

ANSWER: 9

Method cue: Add 9 to get $7 \times \square = 63$ Check sign, size, accuracy and units.

7. Use an inverse operation to check $924 \div 28 = 33$.

ANSWER: $33 \times 28 = 924$

Method cue: $33 \times (30 - 2) = 990 - 66 = 924$. Check sign, size, accuracy and units.

8. Explain why $30 \div 5 \times 2$ is not $30 \div (5 \times 2)$.

ANSWER: The values are 12 and 3.

Method cue: Without brackets: $30 \div 5 \times 2 = 6 \times 2 = 12$. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Fractions and mixed numbers

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. Simplify $84/126$.

ANSWER: $2/3$

Method cue: HCF=42 Check sign, size, accuracy and units.

2. Order $3/5$, $7/12$ and $5/8$ from smallest to largest.

ANSWER: $7/12$, $3/5$, $5/8$

Method cue: Use denominator 120: $72/120$, $70/120$, $75/120$. Check sign, size, accuracy and units.

3. Calculate $5/6 + 7/15$.

ANSWER: $13/10$ or $1\ 3/10$

Method cue: LCM=30 Check sign, size, accuracy and units.

4. Calculate $11/12 - 5/18$.

ANSWER: $23/36$

Method cue: LCM=36 Check sign, size, accuracy and units.

5. Calculate $7/9 \times 27/35$.

ANSWER: $3/5$

Method cue: Cancel $27 \div 9=3$ and $7/35=1/5$. Check sign, size, accuracy and units.

6. Calculate $4/7 \div 10/21$.

ANSWER: $6/5$

Method cue: Multiply by reciprocal: $4/7 \times 21/10$. Check sign, size, accuracy and units.

7. A tank is $3/5$ full. Adding 84 litres makes it $9/10$ full. Find capacity.

ANSWER: 280 litres

Method cue: Added fraction= $9/10-6/10=3/10$. Check sign, size, accuracy and units.

8. Find a fraction between $5/8$ and $2/3$.

ANSWER: For example $31/48$

Method cue: $5/8=30/48$ and $2/3=32/48$. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Decimals and conversions

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. Write 47/1000 as a decimal.

ANSWER: 0.047

Method cue: 47 thousandths = 0.047. Check sign, size, accuracy and units.

2. Write 0.375 as a fraction in simplest form.

ANSWER: 3/8

Method cue: 0.375=375/1000 Check sign, size, accuracy and units.

3. Calculate 18.7 + 0.965 + 4.08.

ANSWER: 23.745

Method cue: Align decimal points. Check sign, size, accuracy and units.

4. Calculate 4.8 x 0.35.

ANSWER: 1.68

Method cue: 48x35=1680. Check sign, size, accuracy and units.

5. Calculate 6.72 ÷ 0.8.

ANSWER: 8.4

Method cue: Multiply both numbers by 10. Check sign, size, accuracy and units.

6. Order 0.405, 0.45, 0.045 and 0.504.

ANSWER: 0.045, 0.405, 0.45, 0.504

Method cue: Write as 0.045, 0.405, 0.450, 0.504. Check sign, size, accuracy and units.

7. A 2.4 kg bag is divided into 0.075 kg portions. How many?

ANSWER: 32

Method cue: 2.4÷0.075=2400÷75 Check sign, size, accuracy and units.

8. Is 7/30 terminating or recurring? Explain.

ANSWER: Recurring

Method cue: 30=2x3x5 contains a factor 3. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Percentages and ordering FDP

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. Write 0.62 as a percentage.

ANSWER: 62%

Method cue: Multiply by 100. Check sign, size, accuracy and units.

2. Write 45% as a fraction in simplest form.

ANSWER: 9/20

Method cue: $45\% = 45/100$ Check sign, size, accuracy and units.

3. Order $3/8$, 0.42, 41% and 0.405.

ANSWER: $3/8$, 0.405, 41%, 0.42

Method cue: Convert to 0.375, 0.42, 0.41, 0.405. Check sign, size, accuracy and units.

4. Find 18% of £650.

ANSWER: £117

Method cue: $10\% = £65$, $5\% = £32.50$, $3\% = £19.50$. Check sign, size, accuracy and units.

5. Increase £480 by 12%.

ANSWER: £537.60

Method cue: 12% of 480 = 57.60. Check sign, size, accuracy and units.

6. A coat costs £72 after a 20% reduction. Find the original price.

ANSWER: £90

Method cue: £72 is 80% of original. Check sign, size, accuracy and units.

7. A population rises from 12,500 to 13,350. Find percentage increase.

ANSWER: 6.8%

Method cue: Increase = 850. Check sign, size, accuracy and units.

8. A price rises 10% then falls 10%. Find the overall change.

ANSWER: 1% decrease

Method cue: Combined multiplier = $1.10 \times 0.90 = 0.99$. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Powers, roots and index notation

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. Evaluate 6^3 .

ANSWER: 216

Method cue: $6 \times 6 \times 6 = 216$. Check sign, size, accuracy and units.

2. Find $\sqrt{576}$.

ANSWER: 24

Method cue: $24 \times 24 = 576$. Check sign, size, accuracy and units.

3. Find the cube root of 1728.

ANSWER: 12

Method cue: $12 \times 12 \times 12 = 1728$. Check sign, size, accuracy and units.

4. Simplify $3^5 \times 3^2$.

ANSWER: 3^7

Method cue: Add indices: $5 + 2 = 7$. Check sign, size, accuracy and units.

5. Simplify $7^9 \div 7^4$.

ANSWER: 7^5

Method cue: Subtract indices: $9 - 4 = 5$. Check sign, size, accuracy and units.

6. Simplify $(x^3)^4$.

ANSWER: x^{12}

Method cue: Multiply indices: $3 \times 4 = 12$. Check sign, size, accuracy and units.

7. A square has area 450 cm^2 . Bound its side between consecutive integers.

ANSWER: 21 cm and 22 cm

Method cue: $21^2 = 441$ and $22^2 = 484$. Check sign, size, accuracy and units.

8. Explain why $(-5)^2$ and -5^2 differ.

ANSWER: 25 and -25

Method cue: Brackets make -5 the full base. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Standard form and exact calculation

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. Write 5,720,000 in standard form.

ANSWER: 5.72×10^6

Method cue: Move the decimal 6 places left. Check sign, size, accuracy and units.

2. Write 3.84×10^{-5} as an ordinary number.

ANSWER: 0.0000384

Method cue: Move the decimal 5 places left. Check sign, size, accuracy and units.

3. Calculate $(4 \times 10^5)(3 \times 10^{-2})$.

ANSWER: 1.2×10^4

Method cue: Coefficients: $4 \times 3 = 12$; powers: 10^3 . Check sign, size, accuracy and units.

4. Calculate $(8.4 \times 10^7) \div (2 \times 10^3)$.

ANSWER: 4.2×10^4

Method cue: $8.4 \div 2 = 4.2$. Check sign, size, accuracy and units.

5. Calculate $6.2 \times 10^5 + 9 \times 10^4$.

ANSWER: 7.1×10^5

Method cue: $9 \times 10^4 = 0.9 \times 10^5$. Check sign, size, accuracy and units.

6. One particle has mass 2.5×10^{-7} g. Find mass of 6×10^8 particles.

ANSWER: 150 g

Method cue: $(2.5 \times 6) \times 10^{(-7+8)} = 15 \times 10^1$. Check sign, size, accuracy and units.

7. A circle has radius 5 cm. Give its area exactly.

ANSWER: $25\pi \text{ cm}^2$

Method cue: $\text{Area} = \pi r^2$. Check sign, size, accuracy and units.

8. Explain why 2π is more accurate than 6.28.

ANSWER: 2π is exact; 6.28 is rounded.

Method cue: Replacing π by 3.14 introduces approximation. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Rounding, estimation and accuracy

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. Round 58,746 to the nearest thousand.

ANSWER: 59,000

Method cue: The hundreds digit is 7, so round up. Check sign, size, accuracy and units.

2. Round 0.007846 to 3 significant figures.

ANSWER: 0.00785

Method cue: The first three significant digits are 7,8,4. Check sign, size, accuracy and units.

3. Estimate $(19.8 \times 0.503) \div 4.92$.

ANSWER: About 2

Method cue: Use $20 \times 0.5 \div 5$. Check sign, size, accuracy and units.

4. A length is 7.4 cm to nearest 0.1 cm. Write its error interval.

ANSWER: $7.35 \leq L < 7.45$

Method cue: Half of 0.1 is 0.05. Check sign, size, accuracy and units.

5. A mass is 260 g to nearest 10 g. State its bounds.

ANSWER: $255 \leq m < 265$ g

Method cue: Half of 10 is 5. Check sign, size, accuracy and units.

6. A length is 6.8 cm correct to the nearest 0.1 cm. Write its error interval.

ANSWER: $6.75 \leq L < 6.85$

Method cue: Half of 0.1 is 0.05. Check sign, size, accuracy and units.

7. A population is stated as 42,000 correct to the nearest thousand. State the least and gr...

ANSWER: 41,500 and 42,499

Method cue: The rounding interval is $41,500 \leq P < 42,500$. Check sign, size, accuracy and units.

8. An exact value 48 is estimated as 50. Find percentage error.

ANSWER: 4.17% approximately

Method cue: Absolute error=2. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Independent authorship and release check

OCR Foundation Mathematics • Unit 1 Number

ORIGINAL-CONTENT STATEMENT

This publication contains independently written teaching explanations, examples, practice questions, numerical data, diagrams and solutions. OCR is referenced solely to identify the J560 qualification. No OCR logo, official assessment question, mark scheme, examiner-report text or protected assessment layout is reproduced.

Release checklist

- 10 publisher-organised chapters mapped to OCR J560 sections 1–4.
- Every chapter begins on a new page and contains conceptual explanation.
- Original vector diagrams and two worked examples appear in every chapter.
- Applications, misconceptions, guided reasoning and independent practice are included.
- Answers are collected at the end with method cues.
- Copyright, trademark and non-endorsement wording included.

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