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GCSE MATHEMATICS AND NUMERACY DOUBLE AWARD

FOUNDATION

COMPREHENSIVE LESSON NOTEBOOK

UNIT 1: NUMBER

Mapped independently to WJEC qualification 3320QD • 18 detailed chapters

concept teaching • worked methods • reasoning • guided practice • independent practice • worked answers

Student: _____

Class: _____ Target grade: _____ Start date: _____

EXAM-BOARD INDEPENDENCE

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COMPREHENSIVE LESSON NOTEBOOK

How to learn from this notebook

Meaning first. Method second. Reasoning throughout.

1 • UNDERSTAND

Read the definition and big idea. Redraw or annotate the representation, then answer the checkpoint without looking back.

2 • BUILD THE METHOD

Cover each next line of the example. Predict it, reveal it and explain why the transformation or calculation is permitted.

3 • CONNECT AND REASON

Use the misconception analysis and guided task to decide which method fits, not merely how to execute it.

4 • PRACTISE INDEPENDENTLY

Show the decisive setup, accurate progress and a supported conclusion. Do not replace mathematical communication with a calculator display.

5 • DIAGNOSE AND REVISIT

Mark from the worked answer. Record whether an error came from interpretation, structure, arithmetic, accuracy, unit or communication.

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COMPREHENSIVE LESSON NOTEBOOK

Number unit map

18 chapters mapped to current WJEC content headings.

CH 01	1.1	Number and rounding: core concepts and methods
CH 02	1.1	Number and rounding: applications and reasoning
CH 03	1.2	Number properties and prime composition: core concepts and methods
CH 04	1.2	Number properties and prime composition: applications and reasoning
CH 05	1.3	Indices and standard form: core concepts and methods
CH 06	1.3	Indices and standard form: applications and reasoning
CH 07	1.4	Fractions, decimals, percentages and ratio: core concepts and methods
CH 08	1.4	Fractions, decimals, percentages and ratio: applications and reasoning
CH 09	1.5	Proficiency in calculations: core concepts and methods
CH 10	1.5	Proficiency in calculations: applications and reasoning
CH 11	1.6	Limits of accuracy: core concepts and methods
CH 12	1.6	Limits of accuracy: applications and reasoning
CH 13	1.7	Information and mathematical communication: core concepts and methods
CH 14	1.7	Information and mathematical communication: applications and reasoning
CH 15	1.8	Personal, household finance and enterprise: core concepts and methods
CH 16	1.8	Personal, household finance and enterprise: applications and reasoning
CH 17	1.9	Rational and irrational numbers: core concepts and methods
CH 18	1.9	Rational and irrational numbers: applications and reasoning

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COMPREHENSIVE LESSON NOTEBOOK

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 1: Number and rounding: core concepts and methods

Read, order, compare, approximate and calculate with directed numbers.

SPECIFICATION ALIGNMENT

Independent teaching summary for current WJEC content heading 1.1. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Read, order, compare, approximate and calculate with directed numbers. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this core concepts lesson, first identify the quantities, structures or events involved; then connect the words to notation, a diagram, a table or a graph. A reliable solution preserves that meaning at every step and ends with an answer that fits the original context.

KEY VOCABULARY

place value; directed number; magnitude; significant figure; decimal place; estimate

Three controlling ideas

- Use place value to compare digits in the same position.
- For directed numbers, move right to increase and left to decrease.
- Round by inspecting the first discarded digit; 5 or more rounds up.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “Order -3.7, -3.07, 0.37 and -0.73 from least to greatest.”, and predict the form or approximate size of the answer? Repair any weakness before continuing.

CHECKPOINT

Explain one method condition in a complete sentence. Give a simple valid example and one non-example that breaks the condition.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 1: Build the method

Number and rounding: core concepts and methods

Reliable routine

- Interpret: name the target, given information, conditions and units.
- Represent: write an equation, diagram, table, graph or exact numerical structure.
- Execute: show valid transformations or calculations in a readable order.
- Verify: test size, sign, units, domain, accuracy and contextual meaning.

WORKED EXAMPLE 1

Order -3.7, -3.07, 0.37 and -0.73 from least to greatest.

WORKED REASONING

1. Place the negatives on a number line; numbers farther left are smaller.

Conclusion: -3.7, -3.07, -0.73, 0.37

WORKED EXAMPLE 2

Round 58 746 to 2 significant figures.

WORKED REASONING

1. Keep 5 and 8; the next digit is 7, so round 58 up to 59.

Conclusion: 59 000

SELF-EXPLANATION PROMPT

Which line contains the main mathematical decision? Which line checks interpretation, reasonableness or accuracy? Explain how the method would change if one condition changed.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 1: Connect and reason

Number and rounding: core concepts and methods

Why the method works

The method works because each stage preserves the defining relationship in the problem. A calculation is not merely a sequence of button presses: it is a chain in which every symbol, operation and representation has a stated meaning. An independent check uses a different feature - such as an inverse operation, an alternative representation, a bound, a unit or a limiting case - so it can reveal an error rather than repeat it.

COMMON MISCONCEPTION

A common error is to use a familiar rule before checking its conditions. For 1.1, this can produce a plausible-looking answer with the wrong structure, scale, sign, unit or interpretation. State the condition first, then apply the rule.

GUIDED REASONING TASK

The temperature rises from -6 C to 9 C. Find the increase. Before calculating, write: (a) what is known, (b) what is required, (c) the controlling relationship, and (d) one check. Then complete the solution.

COMMUNICATION STANDARD

Use one mathematical statement per line. Define symbols, label units and diagrams, retain exact values until approximation is requested, and close with a sentence that answers the actual question.

EXTENSION OR REPAIR

Change one value or condition in the guided task. Predict which steps remain valid and which must change. This is the difference between memorising a routine and understanding number and rounding: core concepts and methods.

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COMPREHENSIVE LESSON NOTEBOOK

Independent practice

1.1 • Number and rounding: core concepts and methods

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official WJEC marks.

1. **Order -3.7, -3.07, 0.37 and -0.73 from least to greatest.** **[4]**

2. **Round 58 746 to 2 significant figures.** **[4]**

3. **The temperature rises from -6 C to 9 C. Find the increase.** **[4]**

4. **Estimate 19.8 x 4.12 by rounding each value to 1 significant figure.** **[4]**

REFLECTION

Record the question number of your least secure answer. Name the error type and write the first corrected line that would repair it.

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COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

1.1 • Number and rounding: core concepts and methods

1. WORKED ANSWER

Method: Place the negatives on a number line; numbers farther left are smaller. Answer: -3.7, -3.07, -0.73, 0.37 Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: Keep 5 and 8; the next digit is 7, so round 58 up to 59. Answer: 59 000 Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: Calculate 9-(-6)=15. Answer: 15 C Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: 20 x 4=80. Answer: 80 Check: confirm the result against the original conditions, units and expected scale.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 2: Number and rounding: applications and reasoning

Read, order, compare, approximate and calculate with directed numbers.

SPECIFICATION ALIGNMENT

Independent teaching summary for current WJEC content heading 1.1. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Read, order, compare, approximate and calculate with directed numbers. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this applications and reasoning lesson, first identify the quantities, structures or events involved; then connect the words to notation, a diagram, a table or a graph. A reliable solution preserves that meaning at every step and ends with an answer that fits the original context.

KEY VOCABULARY

place value; directed number; magnitude; significant figure; decimal place; estimate

Three controlling ideas

- Use place value to compare digits in the same position.
- For directed numbers, move right to increase and left to decrease.
- Round by inspecting the first discarded digit; 5 or more rounds up.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “Write 0.00654 correct to 2 significant figures.”, and predict the form or approximate size of the answer? Repair any weakness before continuing.

CHECKPOINT

Explain one method condition in a complete sentence. Give a simple valid example and one non-example that breaks the condition.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 2: Build the method

Number and rounding: applications and reasoning

Reliable routine

- Interpret: name the target, given information, conditions and units.
- Represent: write an equation, diagram, table, graph or exact numerical structure.
- Execute: show valid transformations or calculations in a readable order.
- Verify: test size, sign, units, domain, accuracy and contextual meaning.

WORKED EXAMPLE 1

Write 0.00654 correct to 2 significant figures.

WORKED REASONING

1. The first significant digit is 6; the next discarded digit is 4.

Conclusion: 0.0065

WORKED EXAMPLE 2

A lift moves from floor 7 to floor -2. How many floors does it descend?

WORKED REASONING

1. The distance is 7-(-2)=9.

Conclusion: 9 floors

SELF-EXPLANATION PROMPT

Which line contains the main mathematical decision? Which line checks interpretation, reasonableness or accuracy? Explain how the method would change if one condition changed.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 2: Connect and reason

Number and rounding: applications and reasoning

Why the method works

The method works because each stage preserves the defining relationship in the problem. A calculation is not merely a sequence of button presses: it is a chain in which every symbol, operation and representation has a stated meaning. An independent check uses a different feature - such as an inverse operation, an alternative representation, a bound, a unit or a limiting case - so it can reveal an error rather than repeat it.

COMMON MISCONCEPTION

A common error is to use a familiar rule before checking its conditions. For 1.1, this can produce a plausible-looking answer with the wrong structure, scale, sign, unit or interpretation. State the condition first, then apply the rule.

GUIDED REASONING TASK

Put <, > or = between -4.08 and -4.8. Before calculating, write: (a) what is known, (b) what is required, (c) the controlling relationship, and (d) one check. Then complete the solution.

COMMUNICATION STANDARD

Use one mathematical statement per line. Define symbols, label units and diagrams, retain exact values until approximation is requested, and close with a sentence that answers the actual question.

EXTENSION OR REPAIR

Change one value or condition in the guided task. Predict which steps remain valid and which must change. This is the difference between memorising a routine and understanding number and rounding: applications and reasoning.

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COMPREHENSIVE LESSON NOTEBOOK

Independent practice

1.1 • Number and rounding: applications and reasoning

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official WJEC marks.

1. **Write 0.00654 correct to 2 significant figures.** **[4]**

2. **A lift moves from floor 7 to floor -2. How many floors does it descend?** **[4]**

3. **Put <, > or = between -4.08 and -4.8.** **[4]**

4. **A crowd is reported as 36 000 to the nearest thousand. Give one possible actual whole-number attendance.** **[4]**

REFLECTION

Record the question number of your least secure answer. Name the error type and write the first corrected line that would repair it.

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COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

1.1 • Number and rounding: applications and reasoning

1. WORKED ANSWER

Method: The first significant digit is 6; the next discarded digit is 4. Answer: 0.0065 Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: The distance is 7-(-2)=9. Answer: 9 floors Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: -4.08 lies to the right of -4.8. Answer: -4.08 > -4.8 Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: Half a thousand is 500. Answer: Any integer from 35 500 to 36 499 Check: confirm the result against the original conditions, units and expected scale.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 3: Number properties and prime composition: core concepts and methods

Use factors, multiples, primes, powers, roots, HCF and LCM.

SPECIFICATION ALIGNMENT

Independent teaching summary for current WJEC content heading 1.2. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Use factors, multiples, primes, powers, roots, HCF and LCM. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this core concepts lesson, first identify the quantities, structures or events involved; then connect the words to notation, a diagram, a table or a graph. A reliable solution preserves that meaning at every step and ends with an answer that fits the original context.

KEY VOCABULARY

factor; multiple; prime; square; cube; HCF; LCM; prime composition

Three controlling ideas

- List factor pairs systematically.
- Use prime factor trees until every branch ends in a prime.
- For HCF take shared prime factors; for LCM take every required prime factor.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “Write 180 as a product of prime factors.”, and predict the form or approximate size of the answer? Repair any weakness before continuing.

CHECKPOINT

Explain one method condition in a complete sentence. Give a simple valid example and one non-example that breaks the condition.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 3: Build the method

Number properties and prime composition: core concepts and methods

Reliable routine

- Interpret: name the target, given information, conditions and units.
- Represent: write an equation, diagram, table, graph or exact numerical structure.
- Execute: show valid transformations or calculations in a readable order.
- Verify: test size, sign, units, domain, accuracy and contextual meaning.

WORKED EXAMPLE 1

Write 180 as a product of prime factors.

WORKED REASONING

1. 180=18x10=(2x3^2)(2x5).

Conclusion: 2^2 x 3^2 x 5

WORKED EXAMPLE 2

Find the HCF and LCM of 36 and 48.

WORKED REASONING

1. 36=2^2x3^2 and 48=2^4x3.
2. HCF uses minimum powers; LCM uses maximum powers.

Conclusion: HCF 12; LCM 144

SELF-EXPLANATION PROMPT

Which line contains the main mathematical decision? Which line checks interpretation, reasonableness or accuracy? Explain how the method would change if one condition changed.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 3: Connect and reason

Number properties and prime composition: core concepts and methods

Why the method works

The method works because each stage preserves the defining relationship in the problem. A calculation is not merely a sequence of button presses: it is a chain in which every symbol, operation and representation has a stated meaning. An independent check uses a different feature - such as an inverse operation, an alternative representation, a bound, a unit or a limiting case - so it can reveal an error rather than repeat it.

COMMON MISCONCEPTION

A common error is to use a familiar rule before checking its conditions. For 1.2, this can produce a plausible-looking answer with the wrong structure, scale, sign, unit or interpretation. State the condition first, then apply the rule.

GUIDED REASONING TASK

List all factors of 42. Before calculating, write: (a) what is known, (b) what is required, (c) the controlling relationship, and (d) one check. Then complete the solution.

COMMUNICATION STANDARD

Use one mathematical statement per line. Define symbols, label units and diagrams, retain exact values until approximation is requested, and close with a sentence that answers the actual question.

EXTENSION OR REPAIR

Change one value or condition in the guided task. Predict which steps remain valid and which must change. This is the difference between memorising a routine and understanding number properties and prime composition: core concepts and methods.

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COMPREHENSIVE LESSON NOTEBOOK

Independent practice

1.2 • Number properties and prime composition: core concepts and methods

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official WJEC marks.

1. **Write 180 as a product of prime factors.** **[4]**

2. **Find the HCF and LCM of 36 and 48.** **[4]**

3. **List all factors of 42.** **[4]**

4. **Is 221 prime? Show a factorisation or justify your answer.** **[4]**

REFLECTION

Record the question number of your least secure answer. Name the error type and write the first corrected line that would repair it.

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COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

1.2 • Number properties and prime composition: core concepts and methods

1. WORKED ANSWER

Method: 180=18x10=(2x3^2)(2x5). Answer: 2^2 x 3^2 x 5 Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: 36=2^2x3^2 and 48=2^4x3. HCF uses minimum powers; LCM uses maximum powers. Answer: HCF 12; LCM 144 Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: Use factor pairs: 1x42, 2x21, 3x14, 6x7. Answer: 1, 2, 3, 6, 7, 14, 21, 42 Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: Test prime divisors up to sqrt(221), then identify 13. Answer: No; 221=13x17 Check: confirm the result against the original conditions, units and expected scale.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 4: Number properties and prime composition: applications and reasoning

Use factors, multiples, primes, powers, roots, HCF and LCM.

SPECIFICATION ALIGNMENT

Independent teaching summary for current WJEC content heading 1.2. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Use factors, multiples, primes, powers, roots, HCF and LCM. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this applications and reasoning lesson, first identify the quantities, structures or events involved; then connect the words to notation, a diagram, a table or a graph. A reliable solution preserves that meaning at every step and ends with an answer that fits the original context.

KEY VOCABULARY

factor; multiple; prime; square; cube; HCF; LCM; prime composition

Three controlling ideas

- List factor pairs systematically.
- Use prime factor trees until every branch ends in a prime.
- For HCF take shared prime factors; for LCM take every required prime factor.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “Find sqrt(196) and cube root of 125.”, and predict the form or approximate size of the answer? Repair any weakness before continuing.

CHECKPOINT

Explain one method condition in a complete sentence. Give a simple valid example and one non-example that breaks the condition.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 4: Build the method

Number properties and prime composition: applications and reasoning

Reliable routine

- Interpret: name the target, given information, conditions and units.
- Represent: write an equation, diagram, table, graph or exact numerical structure.
- Execute: show valid transformations or calculations in a readable order.
- Verify: test size, sign, units, domain, accuracy and contextual meaning.

WORKED EXAMPLE 1

Find sqrt(196) and cube root of 125.

WORKED REASONING

1. 14^2=196 and 5^3=125.

Conclusion: 14 and 5

WORKED EXAMPLE 2

Two alarms repeat every 18 and 24 minutes. They sound together now. When next?

WORKED REASONING

1. LCM(18,24)=72.

Conclusion: 72 minutes

SELF-EXPLANATION PROMPT

Which line contains the main mathematical decision? Which line checks interpretation, reasonableness or accuracy? Explain how the method would change if one condition changed.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 4: Connect and reason

Number properties and prime composition: applications and reasoning

Why the method works

The method works because each stage preserves the defining relationship in the problem. A calculation is not merely a sequence of button presses: it is a chain in which every symbol, operation and representation has a stated meaning. An independent check uses a different feature - such as an inverse operation, an alternative representation, a bound, a unit or a limiting case - so it can reveal an error rather than repeat it.

COMMON MISCONCEPTION

A common error is to use a familiar rule before checking its conditions. For 1.2, this can produce a plausible-looking answer with the wrong structure, scale, sign, unit or interpretation. State the condition first, then apply the rule.

GUIDED REASONING TASK

Find the smallest number divisible by 8, 12 and 15. Before calculating, write: (a) what is known, (b) what is required, (c) the controlling relationship, and (d) one check. Then complete the solution.

COMMUNICATION STANDARD

Use one mathematical statement per line. Define symbols, label units and diagrams, retain exact values until approximation is requested, and close with a sentence that answers the actual question.

EXTENSION OR REPAIR

Change one value or condition in the guided task. Predict which steps remain valid and which must change. This is the difference between memorising a routine and understanding number properties and prime composition: applications and reasoning.

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COMPREHENSIVE LESSON NOTEBOOK

Independent practice

1.2 • Number properties and prime composition: applications and reasoning

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official WJEC marks.

1. **Find sqrt(196) and cube root of 125.** **[4]**

2. **Two alarms repeat every 18 and 24 minutes. They sound together now. When next?** **[4]**

3. **Find the smallest number divisible by 8, 12 and 15.** **[4]**

4. **Explain why 51 is not prime.** **[4]**

REFLECTION

Record the question number of your least secure answer. Name the error type and write the first corrected line that would repair it.

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COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

1.2 • Number properties and prime composition: applications and reasoning

1. WORKED ANSWER

Method: 14^2=196 and 5^3=125. Answer: 14 and 5 Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: LCM(18,24)=72. Answer: 72 minutes Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: LCM=2^3x3x5=120. Answer: 120 Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: Its digits sum to 6, so it is divisible by 3. Answer: 51=3x17 Check: confirm the result against the original conditions, units and expected scale.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 5: Indices and standard form: core concepts and methods

Use index notation and express very large or small values efficiently.

SPECIFICATION ALIGNMENT

Independent teaching summary for current WJEC content heading 1.3. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Use index notation and express very large or small values efficiently. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this core concepts lesson, first identify the quantities, structures or events involved; then connect the words to notation, a diagram, a table or a graph. A reliable solution preserves that meaning at every step and ends with an answer that fits the original context.

KEY VOCABULARY

base; index; power; reciprocal; standard form; coefficient; magnitude

Three controlling ideas

- A positive integer index records repeated multiplication.
- For the same base, add indices when multiplying and subtract when dividing.
- Standard form is A x 10^n where 1 <= A < 10.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “Simplify 2^3 x 2^5.”, and predict the form or approximate size of the answer? Repair any weakness before continuing.

CHECKPOINT

Explain one method condition in a complete sentence. Give a simple valid example and one non-example that breaks the condition.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 5: Build the method

Indices and standard form: core concepts and methods

Reliable routine

- Interpret: name the target, given information, conditions and units.
- Represent: write an equation, diagram, table, graph or exact numerical structure.
- Execute: show valid transformations or calculations in a readable order.
- Verify: test size, sign, units, domain, accuracy and contextual meaning.

WORKED EXAMPLE 1

Simplify 2^3 x 2^5.

WORKED REASONING

1. Add the powers because the base is the same.

Conclusion: 2^8=256

WORKED EXAMPLE 2

Simplify y^9 / y^4.

WORKED REASONING

1. Subtract the indices: 9-4=5.

Conclusion: y^5

SELF-EXPLANATION PROMPT

Which line contains the main mathematical decision? Which line checks interpretation, reasonableness or accuracy? Explain how the method would change if one condition changed.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 5: Connect and reason

Indices and standard form: core concepts and methods

Why the method works

The method works because each stage preserves the defining relationship in the problem. A calculation is not merely a sequence of button presses: it is a chain in which every symbol, operation and representation has a stated meaning. An independent check uses a different feature - such as an inverse operation, an alternative representation, a bound, a unit or a limiting case - so it can reveal an error rather than repeat it.

COMMON MISCONCEPTION

A common error is to use a familiar rule before checking its conditions. For 1.3, this can produce a plausible-looking answer with the wrong structure, scale, sign, unit or interpretation. State the condition first, then apply the rule.

GUIDED REASONING TASK

Write 5 720 000 in standard form. Before calculating, write: (a) what is known, (b) what is required, (c) the controlling relationship, and (d) one check. Then complete the solution.

COMMUNICATION STANDARD

Use one mathematical statement per line. Define symbols, label units and diagrams, retain exact values until approximation is requested, and close with a sentence that answers the actual question.

EXTENSION OR REPAIR

Change one value or condition in the guided task. Predict which steps remain valid and which must change. This is the difference between memorising a routine and understanding indices and standard form: core concepts and methods.

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COMPREHENSIVE LESSON NOTEBOOK

Independent practice

1.3 • Indices and standard form: core concepts and methods

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official WJEC marks.

1. **Simplify 2^3 x 2^5.** **[4]**

2. **Simplify y^9 / y^4.** **[4]**

3. **Write 5 720 000 in standard form.** **[4]**

4. **Write 3.48 x 10^-4 as an ordinary decimal.** **[4]**

REFLECTION

Record the question number of your least secure answer. Name the error type and write the first corrected line that would repair it.

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COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

1.3 • Indices and standard form: core concepts and methods

1. WORKED ANSWER

Method: Add the powers because the base is the same. Answer: 2^8=256 Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: Subtract the indices: 9-4=5. Answer: y^5 Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: Move the decimal six places left. Answer: 5.72 x 10^6 Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: A power of -4 moves the decimal four places left. Answer: 0.000348 Check: confirm the result against the original conditions, units and expected scale.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 6: Indices and standard form: applications and reasoning

Use index notation and express very large or small values efficiently.

SPECIFICATION ALIGNMENT

Independent teaching summary for current WJEC content heading 1.3. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Use index notation and express very large or small values efficiently. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this applications and reasoning lesson, first identify the quantities, structures or events involved; then connect the words to notation, a diagram, a table or a graph. A reliable solution preserves that meaning at every step and ends with an answer that fits the original context.

KEY VOCABULARY

base; index; power; reciprocal; standard form; coefficient; magnitude

Three controlling ideas

- A positive integer index records repeated multiplication.
- For the same base, add indices when multiplying and subtract when dividing.
- Standard form is A x 10^n where 1 <= A < 10.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “Calculate (6 x 10^5) + (2.3 x 10^5).”, and predict the form or approximate size of the answer? Repair any weakness before continuing.

CHECKPOINT

Explain one method condition in a complete sentence. Give a simple valid example and one non-example that breaks the condition.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 6: Build the method

Indices and standard form: applications and reasoning

Reliable routine

- Interpret: name the target, given information, conditions and units.
- Represent: write an equation, diagram, table, graph or exact numerical structure.
- Execute: show valid transformations or calculations in a readable order.
- Verify: test size, sign, units, domain, accuracy and contextual meaning.

WORKED EXAMPLE 1

Calculate (6 x 10^5) + (2.3 x 10^5).

WORKED REASONING

1. The powers match, so add 6+2.3.

Conclusion: 8.3 x 10^5

WORKED EXAMPLE 2

Calculate (4 x 10^3)(2 x 10^2).

WORKED REASONING

1. Multiply coefficients and add powers.

Conclusion: 8 x 10^5

SELF-EXPLANATION PROMPT

Which line contains the main mathematical decision? Which line checks interpretation, reasonableness or accuracy? Explain how the method would change if one condition changed.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 6: Connect and reason

Indices and standard form: applications and reasoning

Why the method works

The method works because each stage preserves the defining relationship in the problem. A calculation is not merely a sequence of button presses: it is a chain in which every symbol, operation and representation has a stated meaning. An independent check uses a different feature - such as an inverse operation, an alternative representation, a bound, a unit or a limiting case - so it can reveal an error rather than repeat it.

COMMON MISCONCEPTION

A common error is to use a familiar rule before checking its conditions. For 1.3, this can produce a plausible-looking answer with the wrong structure, scale, sign, unit or interpretation. State the condition first, then apply the rule.

GUIDED REASONING TASK

Write 0.000072 in standard form. Before calculating, write: (a) what is known, (b) what is required, (c) the controlling relationship, and (d) one check. Then complete the solution.

COMMUNICATION STANDARD

Use one mathematical statement per line. Define symbols, label units and diagrams, retain exact values until approximation is requested, and close with a sentence that answers the actual question.

EXTENSION OR REPAIR

Change one value or condition in the guided task. Predict which steps remain valid and which must change. This is the difference between memorising a routine and understanding indices and standard form: applications and reasoning.

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COMPREHENSIVE LESSON NOTEBOOK

Independent practice

1.3 • Indices and standard form: applications and reasoning

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official WJEC marks.

1. **Calculate (6 x 10^5) + (2.3 x 10^5).** **[4]**

2. **Calculate (4 x 10^3)(2 x 10^2).** **[4]**

3. **Write 0.000072 in standard form.** **[4]**

4. **A file contains 2.5 x 10^6 bytes. Write this as an ordinary number.** **[4]**

REFLECTION

Record the question number of your least secure answer. Name the error type and write the first corrected line that would repair it.

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COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

1.3 • Indices and standard form: applications and reasoning

1. WORKED ANSWER

Method: The powers match, so add 6+2.3. Answer: 8.3 x 10^5 Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: Multiply coefficients and add powers. Answer: 8 x 10^5 Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: Move the decimal five places right to make 7.2. Answer: 7.2 x 10^-5 Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: A positive power of 6 moves the decimal right. Answer: 2 500 000 bytes Check: confirm the result against the original conditions, units and expected scale.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 7: Fractions, decimals, percentages and ratio: core concepts and methods

Connect equivalent forms and solve proportional problems.

SPECIFICATION ALIGNMENT

Independent teaching summary for current WJEC content heading 1.4. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Connect equivalent forms and solve proportional problems. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this core concepts lesson, first identify the quantities, structures or events involved; then connect the words to notation, a diagram, a table or a graph. A reliable solution preserves that meaning at every step and ends with an answer that fits the original context.

KEY VOCABULARY

equivalent; numerator; denominator; percentage; ratio; proportion; multiplier

Three controlling ideas

- Use a common denominator before adding fractions.
- Percentage means per hundred; convert to a multiplier when finding a percentage.
- For ratio sharing, add the parts, find one part, then scale.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “Calculate 3/4 + 5/6.”, and predict the form or approximate size of the answer? Repair any weakness before continuing.

CHECKPOINT

Explain one method condition in a complete sentence. Give a simple valid example and one non-example that breaks the condition.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 7: Build the method

Fractions, decimals, percentages and ratio: core concepts and methods

Reliable routine

- Interpret: name the target, given information, conditions and units.
- Represent: write an equation, diagram, table, graph or exact numerical structure.
- Execute: show valid transformations or calculations in a readable order.
- Verify: test size, sign, units, domain, accuracy and contextual meaning.

WORKED EXAMPLE 1

Calculate 3/4 + 5/6.

WORKED REASONING

1. Use denominator 12: 9/12+10/12=19/12.

Conclusion: 19/12 or 1 7/12

WORKED EXAMPLE 2

Find 17.5% of GBP 240.

WORKED REASONING

1. 0.175x240=42.

Conclusion: GBP 42

SELF-EXPLANATION PROMPT

Which line contains the main mathematical decision? Which line checks interpretation, reasonableness or accuracy? Explain how the method would change if one condition changed.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 7: Connect and reason

Fractions, decimals, percentages and ratio: core concepts and methods

Why the method works

The method works because each stage preserves the defining relationship in the problem. A calculation is not merely a sequence of button presses: it is a chain in which every symbol, operation and representation has a stated meaning. An independent check uses a different feature - such as an inverse operation, an alternative representation, a bound, a unit or a limiting case - so it can reveal an error rather than repeat it.

COMMON MISCONCEPTION

A common error is to use a familiar rule before checking its conditions. For 1.4, this can produce a plausible-looking answer with the wrong structure, scale, sign, unit or interpretation. State the condition first, then apply the rule.

GUIDED REASONING TASK

Share GBP 420 in the ratio 3:4. Before calculating, write: (a) what is known, (b) what is required, (c) the controlling relationship, and (d) one check. Then complete the solution.

COMMUNICATION STANDARD

Use one mathematical statement per line. Define symbols, label units and diagrams, retain exact values until approximation is requested, and close with a sentence that answers the actual question.

EXTENSION OR REPAIR

Change one value or condition in the guided task. Predict which steps remain valid and which must change. This is the difference between memorising a routine and understanding fractions, decimals, percentages and ratio: core concepts and methods.

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COMPREHENSIVE LESSON NOTEBOOK

Independent practice

1.4 • Fractions, decimals, percentages and ratio: core concepts and methods

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official WJEC marks.

1. **Calculate 3/4 + 5/6.** **[4]**

2. **Find 17.5% of GBP 240.** **[4]**

3. **Share GBP 420 in the ratio 3:4.** **[4]**

4. **Express 0.375 as a fraction in simplest form.** **[4]**

REFLECTION

Record the question number of your least secure answer. Name the error type and write the first corrected line that would repair it.

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COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

1.4 • Fractions, decimals, percentages and ratio: core concepts and methods

1. WORKED ANSWER

Method: Use denominator 12: 9/12+10/12=19/12. Answer: 19/12 or 1 7/12 Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: 0.175x240=42. Answer: GBP 42 Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: There are 7 parts; one part is GBP 60. Answer: GBP 180 and GBP 240 Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: 0.375=375/1000; divide by 125. Answer: 3/8 Check: confirm the result against the original conditions, units and expected scale.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 8: Fractions, decimals, percentages and ratio: applications and reasoning

Connect equivalent forms and solve proportional problems.

SPECIFICATION ALIGNMENT

Independent teaching summary for current WJEC content heading 1.4. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Connect equivalent forms and solve proportional problems. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this applications and reasoning lesson, first identify the quantities, structures or events involved; then connect the words to notation, a diagram, a table or a graph. A reliable solution preserves that meaning at every step and ends with an answer that fits the original context.

KEY VOCABULARY

equivalent; numerator; denominator; percentage; ratio; proportion; multiplier

Three controlling ideas

- Use a common denominator before adding fractions.
- Percentage means per hundred; convert to a multiplier when finding a percentage.
- For ratio sharing, add the parts, find one part, then scale.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “A price of GBP 80 increases by 12%. Find the new price.”, and predict the form or approximate size of the answer? Repair any weakness before continuing.

CHECKPOINT

Explain one method condition in a complete sentence. Give a simple valid example and one non-example that breaks the condition.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 8: Build the method

Fractions, decimals, percentages and ratio: applications and reasoning

Reliable routine

- Interpret: name the target, given information, conditions and units.
- Represent: write an equation, diagram, table, graph or exact numerical structure.
- Execute: show valid transformations or calculations in a readable order.
- Verify: test size, sign, units, domain, accuracy and contextual meaning.

WORKED EXAMPLE 1

A price of GBP 80 increases by 12%. Find the new price.

WORKED REASONING

1. Use multiplier 1.12: 80x1.12.

Conclusion: GBP 89.60

WORKED EXAMPLE 2

Simplify the ratio 1.2 kg : 450 g.

WORKED REASONING

1. Convert 1.2 kg to 1200 g, then divide by 150.

Conclusion: 8:3

SELF-EXPLANATION PROMPT

Which line contains the main mathematical decision? Which line checks interpretation, reasonableness or accuracy? Explain how the method would change if one condition changed.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 8: Connect and reason

Fractions, decimals, percentages and ratio: applications and reasoning

Why the method works

The method works because each stage preserves the defining relationship in the problem. A calculation is not merely a sequence of button presses: it is a chain in which every symbol, operation and representation has a stated meaning. An independent check uses a different feature - such as an inverse operation, an alternative representation, a bound, a unit or a limiting case - so it can reveal an error rather than repeat it.

COMMON MISCONCEPTION

A common error is to use a familiar rule before checking its conditions. For 1.4, this can produce a plausible-looking answer with the wrong structure, scale, sign, unit or interpretation. State the condition first, then apply the rule.

GUIDED REASONING TASK

Five notebooks cost GBP 13.75. Find the cost of eight at the same rate. Before calculating, write: (a) what is known, (b) what is required, (c) the controlling relationship, and (d) one check. Then complete the solution.

COMMUNICATION STANDARD

Use one mathematical statement per line. Define symbols, label units and diagrams, retain exact values until approximation is requested, and close with a sentence that answers the actual question.

EXTENSION OR REPAIR

Change one value or condition in the guided task. Predict which steps remain valid and which must change. This is the difference between memorising a routine and understanding fractions, decimals, percentages and ratio: applications and reasoning.

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COMPREHENSIVE LESSON NOTEBOOK

Independent practice

1.4 • Fractions, decimals, percentages and ratio: applications and reasoning

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official WJEC marks.

1. **A price of GBP 80 increases by 12%. Find the new price.** **[4]**

2. **Simplify the ratio 1.2 kg : 450 g.** **[4]**

3. **Five notebooks cost GBP 13.75. Find the cost of eight at the same rate.** **[4]**

4. **Arrange 0.62, 5/8 and 61% in ascending order.** **[4]**

REFLECTION

Record the question number of your least secure answer. Name the error type and write the first corrected line that would repair it.

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COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

1.4 • Fractions, decimals, percentages and ratio: applications and reasoning

1. WORKED ANSWER

Method: Use multiplier 1.12: 80x1.12. Answer: GBP 89.60 Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: Convert 1.2 kg to 1200 g, then divide by 150. Answer: 8:3 Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: One costs GBP 2.75; multiply by 8. Answer: GBP 22.00 Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: Convert to decimals: 0.61, 0.62, 0.625. Answer: 61%, 0.62, 5/8 Check: confirm the result against the original conditions, units and expected scale.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 9: Proficiency in calculations: core concepts and methods

Choose efficient written, mental and calculator methods and check results.

SPECIFICATION ALIGNMENT

Independent teaching summary for current WJEC content heading 1.5. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Choose efficient written, mental and calculator methods and check results. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this core concepts lesson, first identify the quantities, structures or events involved; then connect the words to notation, a diagram, a table or a graph. A reliable solution preserves that meaning at every step and ends with an answer that fits the original context.

KEY VOCABULARY

operation; inverse; hierarchy; exact; approximation; reasonableness

Three controlling ideas

- Apply brackets, indices, division/multiplication, then addition/subtraction.
- Estimate first so a calculator entry can be checked.
- Keep unrounded values until the final stated accuracy.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “Calculate 18-3(4+2).”, and predict the form or approximate size of the answer? Repair any weakness before continuing.

CHECKPOINT

Explain one method condition in a complete sentence. Give a simple valid example and one non-example that breaks the condition.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 9: Build the method

Proficiency in calculations: core concepts and methods

Reliable routine

- Interpret: name the target, given information, conditions and units.
- Represent: write an equation, diagram, table, graph or exact numerical structure.
- Execute: show valid transformations or calculations in a readable order.
- Verify: test size, sign, units, domain, accuracy and contextual meaning.

WORKED EXAMPLE 1

Calculate 18-3(4+2).

WORKED REASONING

1. Brackets first: 4+2=6; then 3x6=18.

Conclusion: 0

WORKED EXAMPLE 2

Calculate 7.2/0.06.

WORKED REASONING

1. Scale both numbers by 100: 720/6.

Conclusion: 120

SELF-EXPLANATION PROMPT

Which line contains the main mathematical decision? Which line checks interpretation, reasonableness or accuracy? Explain how the method would change if one condition changed.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 9: Connect and reason

Proficiency in calculations: core concepts and methods

Why the method works

The method works because each stage preserves the defining relationship in the problem. A calculation is not merely a sequence of button presses: it is a chain in which every symbol, operation and representation has a stated meaning. An independent check uses a different feature - such as an inverse operation, an alternative representation, a bound, a unit or a limiting case - so it can reveal an error rather than repeat it.

COMMON MISCONCEPTION

A common error is to use a familiar rule before checking its conditions. For 1.5, this can produce a plausible-looking answer with the wrong structure, scale, sign, unit or interpretation. State the condition first, then apply the rule.

GUIDED REASONING TASK

Work out 2 1/3 x 1 1/2. Before calculating, write: (a) what is known, (b) what is required, (c) the controlling relationship, and (d) one check. Then complete the solution.

COMMUNICATION STANDARD

Use one mathematical statement per line. Define symbols, label units and diagrams, retain exact values until approximation is requested, and close with a sentence that answers the actual question.

EXTENSION OR REPAIR

Change one value or condition in the guided task. Predict which steps remain valid and which must change. This is the difference between memorising a routine and understanding proficiency in calculations: core concepts and methods.

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COMPREHENSIVE LESSON NOTEBOOK

Independent practice

1.5 • Proficiency in calculations: core concepts and methods

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official WJEC marks.

1. **Calculate 18-3(4+2).** **[4]**

2. **Calculate 7.2/0.06.** **[4]**

3. **Work out 2 1/3 x 1 1/2.** **[4]**

4. **A coach holds 53 people. How many coaches are needed for 418 people?** **[4]**

REFLECTION

Record the question number of your least secure answer. Name the error type and write the first corrected line that would repair it.

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COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

1.5 • Proficiency in calculations: core concepts and methods

1. WORKED ANSWER

Method: Brackets first: 4+2=6; then 3x6=18. Answer: 0 Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: Scale both numbers by 100: 720/6. Answer: 120 Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: Convert to 7/3 x 3/2=7/2. Answer: 3 1/2 Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: 418/53 is between 7 and 8; a partial coach still requires one whole coach. Answer: 8 coaches Check: confirm the result against the original conditions, units and expected scale.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 10: Proficiency in calculations: applications and reasoning

Choose efficient written, mental and calculator methods and check results.

SPECIFICATION ALIGNMENT

Independent teaching summary for current WJEC content heading 1.5. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Choose efficient written, mental and calculator methods and check results. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this applications and reasoning lesson, first identify the quantities, structures or events involved; then connect the words to notation, a diagram, a table or a graph. A reliable solution preserves that meaning at every step and ends with an answer that fits the original context.

KEY VOCABULARY

operation; inverse; hierarchy; exact; approximation; reasonableness

Three controlling ideas

- Apply brackets, indices, division/multiplication, then addition/subtraction.
- Estimate first so a calculator entry can be checked.
- Keep unrounded values until the final stated accuracy.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “Estimate sqrt(52.3).”, and predict the form or approximate size of the answer? Repair any weakness before continuing.

CHECKPOINT

Explain one method condition in a complete sentence. Give a simple valid example and one non-example that breaks the condition.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 10: Build the method

Proficiency in calculations: applications and reasoning

Reliable routine

- Interpret: name the target, given information, conditions and units.
- Represent: write an equation, diagram, table, graph or exact numerical structure.
- Execute: show valid transformations or calculations in a readable order.
- Verify: test size, sign, units, domain, accuracy and contextual meaning.

WORKED EXAMPLE 1

Estimate sqrt(52.3).

WORKED REASONING

1. sqrt(49)=7 and sqrt(64)=8; calculator value is about 7.23.

Conclusion: About 7.2

WORKED EXAMPLE 2

Calculate 4.8-(-2.7)+1.5.

WORKED REASONING

1. Subtracting a negative adds: 4.8+2.7+1.5.

Conclusion: 9

SELF-EXPLANATION PROMPT

Which line contains the main mathematical decision? Which line checks interpretation, reasonableness or accuracy? Explain how the method would change if one condition changed.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 10: Connect and reason

Proficiency in calculations: applications and reasoning

Why the method works

The method works because each stage preserves the defining relationship in the problem. A calculation is not merely a sequence of button presses: it is a chain in which every symbol, operation and representation has a stated meaning. An independent check uses a different feature - such as an inverse operation, an alternative representation, a bound, a unit or a limiting case - so it can reveal an error rather than repeat it.

COMMON MISCONCEPTION

A common error is to use a familiar rule before checking its conditions. For 1.5, this can produce a plausible-looking answer with the wrong structure, scale, sign, unit or interpretation. State the condition first, then apply the rule.

GUIDED REASONING TASK

A 2.4 kg bag is divided equally into 16 portions. Find each mass. Before calculating, write: (a) what is known, (b) what is required, (c) the controlling relationship, and (d) one check. Then complete the solution.

COMMUNICATION STANDARD

Use one mathematical statement per line. Define symbols, label units and diagrams, retain exact values until approximation is requested, and close with a sentence that answers the actual question.

EXTENSION OR REPAIR

Change one value or condition in the guided task. Predict which steps remain valid and which must change. This is the difference between memorising a routine and understanding proficiency in calculations: applications and reasoning.

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COMPREHENSIVE LESSON NOTEBOOK

Independent practice

1.5 • Proficiency in calculations: applications and reasoning

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official WJEC marks.

1. **Estimate sqrt(52.3).** **[4]**

2. **Calculate 4.8-(-2.7)+1.5.** **[4]**

3. **A 2.4 kg bag is divided equally into 16 portions. Find each mass.** **[4]**

4. **Explain why 39.6 x 5.1 should be close to 200.** **[4]**

REFLECTION

Record the question number of your least secure answer. Name the error type and write the first corrected line that would repair it.

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COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

1.5 • Proficiency in calculations: applications and reasoning

1. WORKED ANSWER

Method: sqrt(49)=7 and sqrt(64)=8; calculator value is about 7.23. Answer: About 7.2 Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: Subtracting a negative adds: 4.8+2.7+1.5. Answer: 9 Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: 2.4/16=0.15 kg=150 g. Answer: 150 g Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: Round both factors to one significant figure. Answer: 40x5=200 Check: confirm the result against the original conditions, units and expected scale.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 11: Limits of accuracy: core concepts and methods

Interpret rounding, error intervals and the effect of measurement accuracy.

SPECIFICATION ALIGNMENT

Independent teaching summary for current WJEC content heading 1.6. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Interpret rounding, error intervals and the effect of measurement accuracy. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this core concepts lesson, first identify the quantities, structures or events involved; then connect the words to notation, a diagram, a table or a graph. A reliable solution preserves that meaning at every step and ends with an answer that fits the original context.

KEY VOCABULARY

rounding unit; lower bound; upper bound; error interval; truncation

Three controlling ideas

- A value rounded to a unit lies within half a unit of the stated value.
- The lower boundary is included; the upper boundary is excluded.
- Use the context to decide whether to round up, down or to the nearest value.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “A length is 8.4 cm to the nearest 0.1 cm. State its error interval.”, and predict the form or approximate size of the answer? Repair any weakness before continuing.

CHECKPOINT

Explain one method condition in a complete sentence. Give a simple valid example and one non-example that breaks the condition.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 11: Build the method

Limits of accuracy: core concepts and methods

Reliable routine

- Interpret: name the target, given information, conditions and units.
- Represent: write an equation, diagram, table, graph or exact numerical structure.
- Execute: show valid transformations or calculations in a readable order.
- Verify: test size, sign, units, domain, accuracy and contextual meaning.

WORKED EXAMPLE 1

A length is 8.4 cm to the nearest 0.1 cm. State its error interval.

WORKED REASONING

1. Half of 0.1 is 0.05.

Conclusion: 8.35 <= L < 8.45

WORKED EXAMPLE 2

A population is 23 000 to the nearest thousand. Give the lower and upper bounds.

WORKED REASONING

1. Half of 1000 is 500; upper bound is excluded.

Conclusion: 22 500 and 23 500

SELF-EXPLANATION PROMPT

Which line contains the main mathematical decision? Which line checks interpretation, reasonableness or accuracy? Explain how the method would change if one condition changed.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 11: Connect and reason

Limits of accuracy: core concepts and methods

Why the method works

The method works because each stage preserves the defining relationship in the problem. A calculation is not merely a sequence of button presses: it is a chain in which every symbol, operation and representation has a stated meaning. An independent check uses a different feature - such as an inverse operation, an alternative representation, a bound, a unit or a limiting case - so it can reveal an error rather than repeat it.

COMMON MISCONCEPTION

A common error is to use a familiar rule before checking its conditions. For 1.6, this can produce a plausible-looking answer with the wrong structure, scale, sign, unit or interpretation. State the condition first, then apply the rule.

GUIDED REASONING TASK

A bus seats 48. How many buses are needed for 289 passengers? Before calculating, write: (a) what is known, (b) what is required, (c) the controlling relationship, and (d) one check. Then complete the solution.

COMMUNICATION STANDARD

Use one mathematical statement per line. Define symbols, label units and diagrams, retain exact values until approximation is requested, and close with a sentence that answers the actual question.

EXTENSION OR REPAIR

Change one value or condition in the guided task. Predict which steps remain valid and which must change. This is the difference between memorising a routine and understanding limits of accuracy: core concepts and methods.

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COMPREHENSIVE LESSON NOTEBOOK

Independent practice

1.6 • Limits of accuracy: core concepts and methods

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official WJEC marks.

1. **A length is 8.4 cm to the nearest 0.1 cm. State its error interval.** **[4]**

2. **A population is 23 000 to the nearest thousand. Give the lower and upper bounds.** **[4]**

3. **A bus seats 48. How many buses are needed for 289 passengers?** **[4]**

4. **A plank of 2.8 m is cut into 0.6 m lengths. How many complete lengths?** **[4]**

REFLECTION

Record the question number of your least secure answer. Name the error type and write the first corrected line that would repair it.

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COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

1.6 • Limits of accuracy: core concepts and methods

1. WORKED ANSWER

Method: Half of 0.1 is 0.05. Answer: 8.35 <= L < 8.45 Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: Half of 1000 is 500; upper bound is excluded. Answer: 22 500 and 23 500 Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: 289/48=6 remainder 1, so round up. Answer: 7 buses Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: 2.8/0.6=4.66..., so only four complete pieces. Answer: 4 Check: confirm the result against the original conditions, units and expected scale.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 12: Limits of accuracy: applications and reasoning

Interpret rounding, error intervals and the effect of measurement accuracy.

SPECIFICATION ALIGNMENT

Independent teaching summary for current WJEC content heading 1.6. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Interpret rounding, error intervals and the effect of measurement accuracy. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this applications and reasoning lesson, first identify the quantities, structures or events involved; then connect the words to notation, a diagram, a table or a graph. A reliable solution preserves that meaning at every step and ends with an answer that fits the original context.

KEY VOCABULARY

rounding unit; lower bound; upper bound; error interval; truncation

Three controlling ideas

- A value rounded to a unit lies within half a unit of the stated value.
- The lower boundary is included; the upper boundary is excluded.
- Use the context to decide whether to round up, down or to the nearest value.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “Round 6.7849 to 3 decimal places.”, and predict the form or approximate size of the answer? Repair any weakness before continuing.

CHECKPOINT

Explain one method condition in a complete sentence. Give a simple valid example and one non-example that breaks the condition.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 12: Build the method

Limits of accuracy: applications and reasoning

Reliable routine

- Interpret: name the target, given information, conditions and units.
- Represent: write an equation, diagram, table, graph or exact numerical structure.
- Execute: show valid transformations or calculations in a readable order.
- Verify: test size, sign, units, domain, accuracy and contextual meaning.

WORKED EXAMPLE 1

Round 6.7849 to 3 decimal places.

WORKED REASONING

1. The fourth decimal digit is 9, so round the third up.

Conclusion: 6.785

WORKED EXAMPLE 2

A mass is 760 g to the nearest 10 g. Is 754 g possible?

WORKED REASONING

1. The interval is 755 <= m < 765, so 754 is outside it.

Conclusion: No

SELF-EXPLANATION PROMPT

Which line contains the main mathematical decision? Which line checks interpretation, reasonableness or accuracy? Explain how the method would change if one condition changed.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 12: Connect and reason

Limits of accuracy: applications and reasoning

Why the method works

The method works because each stage preserves the defining relationship in the problem. A calculation is not merely a sequence of button presses: it is a chain in which every symbol, operation and representation has a stated meaning. An independent check uses a different feature - such as an inverse operation, an alternative representation, a bound, a unit or a limiting case - so it can reveal an error rather than repeat it.

COMMON MISCONCEPTION

A common error is to use a familiar rule before checking its conditions. For 1.6, this can produce a plausible-looking answer with the wrong structure, scale, sign, unit or interpretation. State the condition first, then apply the rule.

GUIDED REASONING TASK

Could a mass of 764.9 g round to 760 g to the nearest 10 g? Before calculating, write: (a) what is known, (b) what is required, (c) the controlling relationship, and (d) one check. Then complete the solution.

COMMUNICATION STANDARD

Use one mathematical statement per line. Define symbols, label units and diagrams, retain exact values until approximation is requested, and close with a sentence that answers the actual question.

EXTENSION OR REPAIR

Change one value or condition in the guided task. Predict which steps remain valid and which must change. This is the difference between memorising a routine and understanding limits of accuracy: applications and reasoning.

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COMPREHENSIVE LESSON NOTEBOOK

Independent practice

1.6 • Limits of accuracy: applications and reasoning

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official WJEC marks.

1. **Round 6.7849 to 3 decimal places.** [4]

2. **A mass is 760 g to the nearest 10 g. Is 754 g possible?** [4]

3. **Could a mass of 764.9 g round to 760 g to the nearest 10 g?** [4]

4. **Explain why the upper endpoint is excluded from a rounding interval.** [4]

REFLECTION

Record the question number of your least secure answer. Name the error type and write the first corrected line that would repair it.

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COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

1.6 • Limits of accuracy: applications and reasoning

1. WORKED ANSWER

Method: The fourth decimal digit is 9, so round the third up. Answer: 6.785 Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: The interval is 755 <= m < 765, so 754 is outside it. Answer: No Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: 764.9 is below the excluded upper bound of 765. Answer: Yes; 755 <= m < 765 Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: For example, 8.45 to nearest 0.1 rounds to 8.5, not 8.4. Answer: It would round to the next stated value. Check: confirm the result against the original conditions, units and expected scale.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 13: Information and mathematical communication: core concepts and methods

Extract, interpret, organise and present numerical information.

SPECIFICATION ALIGNMENT

Independent teaching summary for current WJEC content heading 1.7. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Extract, interpret, organise and present numerical information. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this core concepts lesson, first identify the quantities, structures or events involved; then connect the words to notation, a diagram, a table or a graph. A reliable solution preserves that meaning at every step and ends with an answer that fits the original context.

KEY VOCABULARY

source; scale; unit; key; assumption; inference; representation

Three controlling ideas

- Read titles, labels, units, keys and scales before using data.
- Select only the information needed and record assumptions.
- Present calculations in an order another reader can audit.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “A table gives 18, 24 and 30 sales on three days. Find the total and mean.”, and predict the form or approximate size of the answer? Repair any weakness before continuing.

CHECKPOINT

Explain one method condition in a complete sentence. Give a simple valid example and one non-example that breaks the condition.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 13: Build the method

Information and mathematical communication: core concepts and methods

Reliable routine

- Interpret: name the target, given information, conditions and units.
- Represent: write an equation, diagram, table, graph or exact numerical structure.
- Execute: show valid transformations or calculations in a readable order.
- Verify: test size, sign, units, domain, accuracy and contextual meaning.

WORKED EXAMPLE 1

A table gives 18, 24 and 30 sales on three days. Find the total and mean.

WORKED REASONING

1. Add to get 72; divide by 3.

Conclusion: Total 72; mean 24

WORKED EXAMPLE 2

A chart scale rises by 20 over four equal gaps. What is one gap worth?

WORKED REASONING

1. 20/4=5.

Conclusion: 5

SELF-EXPLANATION PROMPT

Which line contains the main mathematical decision? Which line checks interpretation, reasonableness or accuracy? Explain how the method would change if one condition changed.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 13: Connect and reason

Information and mathematical communication: core concepts and methods

Why the method works

The method works because each stage preserves the defining relationship in the problem. A calculation is not merely a sequence of button presses: it is a chain in which every symbol, operation and representation has a stated meaning. An independent check uses a different feature - such as an inverse operation, an alternative representation, a bound, a unit or a limiting case - so it can reveal an error rather than repeat it.

COMMON MISCONCEPTION

A common error is to use a familiar rule before checking its conditions. For 1.7, this can produce a plausible-looking answer with the wrong structure, scale, sign, unit or interpretation. State the condition first, then apply the rule.

GUIDED REASONING TASK

A recipe for 4 uses 300 g flour. How much is needed for 10? Before calculating, write: (a) what is known, (b) what is required, (c) the controlling relationship, and (d) one check. Then complete the solution.

COMMUNICATION STANDARD

Use one mathematical statement per line. Define symbols, label units and diagrams, retain exact values until approximation is requested, and close with a sentence that answers the actual question.

EXTENSION OR REPAIR

Change one value or condition in the guided task. Predict which steps remain valid and which must change. This is the difference between memorising a routine and understanding information and mathematical communication: core concepts and methods.

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COMPREHENSIVE LESSON NOTEBOOK

Independent practice

1.7 • Information and mathematical communication: core concepts and methods

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official WJEC marks.

1. **A table gives 18, 24 and 30 sales on three days. Find the total and mean.** **[4]**

2. **A chart scale rises by 20 over four equal gaps. What is one gap worth?** **[4]**

3. **A recipe for 4 uses 300 g flour. How much is needed for 10?** **[4]**

4. **A journey table shows 42 km in 0.75 h. Find average speed.** **[4]**

REFLECTION

Record the question number of your least secure answer. Name the error type and write the first corrected line that would repair it.

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COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

1.7 • Information and mathematical communication: core concepts and methods

1. WORKED ANSWER

Method: Add to get 72; divide by 3. Answer: Total 72; mean 24 Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: 20/4=5. Answer: 5 Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: 75 g per person; 75x10. Answer: 750 g Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: Speed=42/0.75. Answer: 56 km/h Check: confirm the result against the original conditions, units and expected scale.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 14: Information and mathematical communication: applications and reasoning

Extract, interpret, organise and present numerical information.

SPECIFICATION ALIGNMENT

Independent teaching summary for current WJEC content heading 1.7. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Extract, interpret, organise and present numerical information. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this applications and reasoning lesson, first identify the quantities, structures or events involved; then connect the words to notation, a diagram, a table or a graph. A reliable solution preserves that meaning at every step and ends with an answer that fits the original context.

KEY VOCABULARY

source; scale; unit; key; assumption; inference; representation

Three controlling ideas

- Read titles, labels, units, keys and scales before using data.
- Select only the information needed and record assumptions.
- Present calculations in an order another reader can audit.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “Two sources report 1.8 million and 1 760 000. Which is larger and by how much?”, and predict the form or approximate size of the answer? Repair any weakness before continuing.

CHECKPOINT

Explain one method condition in a complete sentence. Give a simple valid example and one non-example that breaks the condition.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 14: Build the method

Information and mathematical communication: applications and reasoning

Reliable routine

- Interpret: name the target, given information, conditions and units.
- Represent: write an equation, diagram, table, graph or exact numerical structure.
- Execute: show valid transformations or calculations in a readable order.
- Verify: test size, sign, units, domain, accuracy and contextual meaning.

WORKED EXAMPLE 1

Two sources report 1.8 million and 1 760 000. Which is larger and by how much?

WORKED REASONING

1. 1.8 million=1 800 000.

Conclusion: 1.8 million by 40 000

WORKED EXAMPLE 2

A label says 250 ml makes 5 servings. State ml per serving.

WORKED REASONING

1. 250/5=50.

Conclusion: 50 ml

SELF-EXPLANATION PROMPT

Which line contains the main mathematical decision? Which line checks interpretation, reasonableness or accuracy? Explain how the method would change if one condition changed.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 14: Connect and reason

Information and mathematical communication: applications and reasoning

Why the method works

The method works because each stage preserves the defining relationship in the problem. A calculation is not merely a sequence of button presses: it is a chain in which every symbol, operation and representation has a stated meaning. An independent check uses a different feature - such as an inverse operation, an alternative representation, a bound, a unit or a limiting case - so it can reveal an error rather than repeat it.

COMMON MISCONCEPTION

A common error is to use a familiar rule before checking its conditions. For 1.7, this can produce a plausible-looking answer with the wrong structure, scale, sign, unit or interpretation. State the condition first, then apply the rule.

GUIDED REASONING TASK

Why must a graph axis include units? Before calculating, write: (a) what is known, (b) what is required, (c) the controlling relationship, and (d) one check. Then complete the solution.

COMMUNICATION STANDARD

Use one mathematical statement per line. Define symbols, label units and diagrams, retain exact values until approximation is requested, and close with a sentence that answers the actual question.

EXTENSION OR REPAIR

Change one value or condition in the guided task. Predict which steps remain valid and which must change. This is the difference between memorising a routine and understanding information and mathematical communication: applications and reasoning.

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COMPREHENSIVE LESSON NOTEBOOK

Independent practice

1.7 • Information and mathematical communication: applications and reasoning

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official WJEC marks.

1. **Two sources report 1.8 million and 1 760 000. Which is larger and by how much?** **[4]**

2. **A label says 250 ml makes 5 servings. State ml per serving.** **[4]**

3. **Why must a graph axis include units?** **[4]**

4. **A map key says 1 cm represents 4 km. What does 6.5 cm represent?** **[4]**

REFLECTION

Record the question number of your least secure answer. Name the error type and write the first corrected line that would repair it.

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COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

1.7 • Information and mathematical communication: applications and reasoning

1. WORKED ANSWER

Method: 1.8 million=1 800 000. Answer: 1.8 million by 40 000 Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: 250/5=50. Answer: 50 ml Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: Without units the scale cannot be interpreted reliably. Answer: Units give numerical values their meaning. Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: 6.5x4=26. Answer: 26 km Check: confirm the result against the original conditions, units and expected scale.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 15: Personal, household finance and enterprise: core concepts and methods

Make reasoned financial decisions using rates, percentages and budgets.

SPECIFICATION ALIGNMENT

Independent teaching summary for current WJEC content heading 1.8. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Make reasoned financial decisions using rates, percentages and budgets. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this core concepts lesson, first identify the quantities, structures or events involved; then connect the words to notation, a diagram, a table or a graph. A reliable solution preserves that meaning at every step and ends with an answer that fits the original context.

KEY VOCABULARY

income; expenditure; budget; interest; tax; tariff; inflation; depreciation

Three controlling ideas

- Income minus spending gives surplus or deficit.
- A percentage increase uses multiplier 1+p/100; a decrease uses 1-p/100.
- Compare deals using the same quantity, time period and unit.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “Monthly take-home pay is GBP 1,860 and spending is GBP 1,725. Find the surplus.”, and predict the form or approximate size of the answer? Repair any weakness before continuing.

CHECKPOINT

Explain one method condition in a complete sentence. Give a simple valid example and one non-example that breaks the condition.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 15: Build the method

Personal, household finance and enterprise: core concepts and methods

Reliable routine

- Interpret: name the target, given information, conditions and units.
- Represent: write an equation, diagram, table, graph or exact numerical structure.
- Execute: show valid transformations or calculations in a readable order.
- Verify: test size, sign, units, domain, accuracy and contextual meaning.

WORKED EXAMPLE 1

Monthly take-home pay is GBP 1,860 and spending is GBP 1,725. Find the surplus.

WORKED REASONING

1. 1860-1725=135.

Conclusion: GBP 135

WORKED EXAMPLE 2

A GBP 640 laptop is reduced by 15%. Find the sale price.

WORKED REASONING

1. Use multiplier 0.85.

Conclusion: GBP 544

SELF-EXPLANATION PROMPT

Which line contains the main mathematical decision? Which line checks interpretation, reasonableness or accuracy? Explain how the method would change if one condition changed.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 15: Connect and reason

Personal, household finance and enterprise: core concepts and methods

Why the method works

The method works because each stage preserves the defining relationship in the problem. A calculation is not merely a sequence of button presses: it is a chain in which every symbol, operation and representation has a stated meaning. An independent check uses a different feature - such as an inverse operation, an alternative representation, a bound, a unit or a limiting case - so it can reveal an error rather than repeat it.

COMMON MISCONCEPTION

A common error is to use a familiar rule before checking its conditions. For 1.8, this can produce a plausible-looking answer with the wrong structure, scale, sign, unit or interpretation. State the condition first, then apply the rule.

GUIDED REASONING TASK

Simple interest is 4% per year on GBP 1,500 for 3 years. Find total interest. Before calculating, write: (a) what is known, (b) what is required, (c) the controlling relationship, and (d) one check. Then complete the solution.

COMMUNICATION STANDARD

Use one mathematical statement per line. Define symbols, label units and diagrams, retain exact values until approximation is requested, and close with a sentence that answers the actual question.

EXTENSION OR REPAIR

Change one value or condition in the guided task. Predict which steps remain valid and which must change. This is the difference between memorising a routine and understanding personal, household finance and enterprise: core concepts and methods.

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COMPREHENSIVE LESSON NOTEBOOK

Independent practice

1.8 • Personal, household finance and enterprise: core concepts and methods

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official WJEC marks.

1. **Monthly take-home pay is GBP 1,860 and spending is GBP 1,725. Find the surplus.** **[4]**

2. **A GBP 640 laptop is reduced by 15%. Find the sale price.** **[4]**

3. **Simple interest is 4% per year on GBP 1,500 for 3 years. Find total interest.** **[4]**

4. **A tariff charges GBP 18 plus GBP 0.12 per minute for 75 minutes. Find the bill.** **[4]**

REFLECTION

Record the question number of your least secure answer. Name the error type and write the first corrected line that would repair it.

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COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

1.8 • Personal, household finance and enterprise: core concepts and methods

1. WORKED ANSWER

Method: 1860-1725=135. Answer: GBP 135 Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: Use multiplier 0.85. Answer: GBP 544 Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: 0.04x1500x3=180. Answer: GBP 180 Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: 18+0.12x75=27. Answer: GBP 27 Check: confirm the result against the original conditions, units and expected scale.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 16: Personal, household finance and enterprise: applications and reasoning

Make reasoned financial decisions using rates, percentages and budgets.

SPECIFICATION ALIGNMENT

Independent teaching summary for current WJEC content heading 1.8. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Make reasoned financial decisions using rates, percentages and budgets. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this applications and reasoning lesson, first identify the quantities, structures or events involved; then connect the words to notation, a diagram, a table or a graph. A reliable solution preserves that meaning at every step and ends with an answer that fits the original context.

KEY VOCABULARY

income; expenditure; budget; interest; tax; tariff; inflation; depreciation

Three controlling ideas

- Income minus spending gives surplus or deficit.
- A percentage increase uses multiplier 1+p/100; a decrease uses 1-p/100.
- Compare deals using the same quantity, time period and unit.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “Six 500 g packs cost GBP 16.20. Find the price per kg.”, and predict the form or approximate size of the answer? Repair any weakness before continuing.

CHECKPOINT

Explain one method condition in a complete sentence. Give a simple valid example and one non-example that breaks the condition.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 16: Build the method

Personal, household finance and enterprise: applications and reasoning

Reliable routine

- Interpret: name the target, given information, conditions and units.
- Represent: write an equation, diagram, table, graph or exact numerical structure.
- Execute: show valid transformations or calculations in a readable order.
- Verify: test size, sign, units, domain, accuracy and contextual meaning.

WORKED EXAMPLE 1

Six 500 g packs cost GBP 16.20. Find the price per kg.

WORKED REASONING

1. Total mass 3 kg; 16.20/3.

Conclusion: GBP 5.40 per kg

WORKED EXAMPLE 2

A household budget has a GBP 48 deficit. Give one mathematically valid way to balance it.

WORKED REASONING

1. The change must remove the whole deficit.

Conclusion: Reduce spending or increase income by GBP 48 in total.

SELF-EXPLANATION PROMPT

Which line contains the main mathematical decision? Which line checks interpretation, reasonableness or accuracy? Explain how the method would change if one condition changed.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 16: Connect and reason

Personal, household finance and enterprise: applications and reasoning

Why the method works

The method works because each stage preserves the defining relationship in the problem. A calculation is not merely a sequence of button presses: it is a chain in which every symbol, operation and representation has a stated meaning. An independent check uses a different feature - such as an inverse operation, an alternative representation, a bound, a unit or a limiting case - so it can reveal an error rather than repeat it.

COMMON MISCONCEPTION

A common error is to use a familiar rule before checking its conditions. For 1.8, this can produce a plausible-looking answer with the wrong structure, scale, sign, unit or interpretation. State the condition first, then apply the rule.

GUIDED REASONING TASK

VAT of 20% is added to GBP 35. Find the total. Before calculating, write: (a) what is known, (b) what is required, (c) the controlling relationship, and (d) one check. Then complete the solution.

COMMUNICATION STANDARD

Use one mathematical statement per line. Define symbols, label units and diagrams, retain exact values until approximation is requested, and close with a sentence that answers the actual question.

EXTENSION OR REPAIR

Change one value or condition in the guided task. Predict which steps remain valid and which must change. This is the difference between memorising a routine and understanding personal, household finance and enterprise: applications and reasoning.

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COMPREHENSIVE LESSON NOTEBOOK

Independent practice

1.8 • Personal, household finance and enterprise: applications and reasoning

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official WJEC marks.

1. **Six 500 g packs cost GBP 16.20. Find the price per kg.** **[4]**

2. **A household budget has a GBP 48 deficit. Give one mathematically valid way to balance it.** **[4]**

3. **VAT of 20% is added to GBP 35. Find the total.** **[4]**

4. **Plan a GBP 90 weekly food budget if 35% is for fresh food.** **[4]**

REFLECTION

Record the question number of your least secure answer. Name the error type and write the first corrected line that would repair it.

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COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

1.8 • Personal, household finance and enterprise: applications and reasoning

1. WORKED ANSWER

Method: Total mass 3 kg; 16.20/3. Answer: GBP 5.40 per kg Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: The change must remove the whole deficit. Answer: Reduce spending or increase income by GBP 48 in total. Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: 35x1.20=42. Answer: GBP 42 Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: 0.35x90=31.50; the remainder is GBP 58.50. Answer: GBP 31.50 for fresh food Check: confirm the result against the original conditions, units and expected scale.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 17: Rational and irrational numbers: core concepts and methods

Classify number types and work with recurring decimals and surds.

SPECIFICATION ALIGNMENT

Independent teaching summary for current WJEC content heading 1.9. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Classify number types and work with recurring decimals and surds. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this core concepts lesson, first identify the quantities, structures or events involved; then connect the words to notation, a diagram, a table or a graph. A reliable solution preserves that meaning at every step and ends with an answer that fits the original context.

KEY VOCABULARY

integer; rational; irrational; recurring decimal; surd; exact value

Three controlling ideas

- A rational number can be written as a fraction of integers.
- Terminating and recurring decimals are rational.
- A non-terminating, non-recurring decimal is irrational.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “Classify 7/12 as rational or irrational.”, and predict the form or approximate size of the answer? Repair any weakness before continuing.

CHECKPOINT

Explain one method condition in a complete sentence. Give a simple valid example and one non-example that breaks the condition.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 17: Build the method

Rational and irrational numbers: core concepts and methods

Reliable routine

- Interpret: name the target, given information, conditions and units.
- Represent: write an equation, diagram, table, graph or exact numerical structure.
- Execute: show valid transformations or calculations in a readable order.
- Verify: test size, sign, units, domain, accuracy and contextual meaning.

WORKED EXAMPLE 1

Classify 7/12 as rational or irrational.

WORKED REASONING

1. It is already a ratio of integers.

Conclusion: Rational

WORKED EXAMPLE 2

Classify sqrt(49) and sqrt(50).

WORKED REASONING

1. sqrt(49)=7; 50 is not a perfect square.

Conclusion: sqrt(49) rational; sqrt(50) irrational

SELF-EXPLANATION PROMPT

Which line contains the main mathematical decision? Which line checks interpretation, reasonableness or accuracy? Explain how the method would change if one condition changed.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 17: Connect and reason

Rational and irrational numbers: core concepts and methods

Why the method works

The method works because each stage preserves the defining relationship in the problem. A calculation is not merely a sequence of button presses: it is a chain in which every symbol, operation and representation has a stated meaning. An independent check uses a different feature - such as an inverse operation, an alternative representation, a bound, a unit or a limiting case - so it can reveal an error rather than repeat it.

COMMON MISCONCEPTION

A common error is to use a familiar rule before checking its conditions. For 1.9, this can produce a plausible-looking answer with the wrong structure, scale, sign, unit or interpretation. State the condition first, then apply the rule.

GUIDED REASONING TASK

Write 0.272727... as a recurring-decimal description. Before calculating, write: (a) what is known, (b) what is required, (c) the controlling relationship, and (d) one check. Then complete the solution.

COMMUNICATION STANDARD

Use one mathematical statement per line. Define symbols, label units and diagrams, retain exact values until approximation is requested, and close with a sentence that answers the actual question.

EXTENSION OR REPAIR

Change one value or condition in the guided task. Predict which steps remain valid and which must change. This is the difference between memorising a routine and understanding rational and irrational numbers: core concepts and methods.

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COMPREHENSIVE LESSON NOTEBOOK

Independent practice

1.9 • Rational and irrational numbers: core concepts and methods

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official WJEC marks.

1. **Classify 7/12 as rational or irrational.** **[4]**

2. **Classify sqrt(49) and sqrt(50).** **[4]**

3. **Write 0.272727... as a recurring-decimal description.** **[4]**

4. **Explain why every terminating decimal is rational.** **[4]**

REFLECTION

Record the question number of your least secure answer. Name the error type and write the first corrected line that would repair it.

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COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

1.9 • Rational and irrational numbers: core concepts and methods

1. WORKED ANSWER

Method: It is already a ratio of integers. Answer: Rational Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: sqrt(49)=7; 50 is not a perfect square. Answer: sqrt(49) rational; sqrt(50) irrational Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: The digits 27 repeat without end. Answer: The block 27 recurs. Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: For example 0.37=37/100. Answer: It can be written over a power of 10. Check: confirm the result against the original conditions, units and expected scale.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 18: Rational and irrational numbers: applications and reasoning

Classify number types and work with recurring decimals and surds.

SPECIFICATION ALIGNMENT

Independent teaching summary for current WJEC content heading 1.9. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Classify number types and work with recurring decimals and surds. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this applications and reasoning lesson, first identify the quantities, structures or events involved; then connect the words to notation, a diagram, a table or a graph. A reliable solution preserves that meaning at every step and ends with an answer that fits the original context.

KEY VOCABULARY

integer; rational; irrational; recurring decimal; surd; exact value

Three controlling ideas

- A rational number can be written as a fraction of integers.
- Terminating and recurring decimals are rational.
- A non-terminating, non-recurring decimal is irrational.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “Between which consecutive integers does sqrt(70) lie?”, and predict the form or approximate size of the answer? Repair any weakness before continuing.

CHECKPOINT

Explain one method condition in a complete sentence. Give a simple valid example and one non-example that breaks the condition.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 18: Build the method

Rational and irrational numbers: applications and reasoning

Reliable routine

- Interpret: name the target, given information, conditions and units.
- Represent: write an equation, diagram, table, graph or exact numerical structure.
- Execute: show valid transformations or calculations in a readable order.
- Verify: test size, sign, units, domain, accuracy and contextual meaning.

WORKED EXAMPLE 1

Between which consecutive integers does sqrt(70) lie?

WORKED REASONING

1. 8^2=64 and 9^2=81.

Conclusion: 8 and 9

WORKED EXAMPLE 2

Give an irrational number between 3 and 4.

WORKED REASONING

1. 9<10<16, so 3<sqrt(10)<4.

Conclusion: For example sqrt(10)

SELF-EXPLANATION PROMPT

Which line contains the main mathematical decision? Which line checks interpretation, reasonableness or accuracy? Explain how the method would change if one condition changed.

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 18: Connect and reason

Rational and irrational numbers: applications and reasoning

Why the method works

The method works because each stage preserves the defining relationship in the problem. A calculation is not merely a sequence of button presses: it is a chain in which every symbol, operation and representation has a stated meaning. An independent check uses a different feature - such as an inverse operation, an alternative representation, a bound, a unit or a limiting case - so it can reveal an error rather than repeat it.

COMMON MISCONCEPTION

A common error is to use a familiar rule before checking its conditions. For 1.9, this can produce a plausible-looking answer with the wrong structure, scale, sign, unit or interpretation. State the condition first, then apply the rule.

GUIDED REASONING TASK

Is pi exactly 3.14? Before calculating, write: (a) what is known, (b) what is required, (c) the controlling relationship, and (d) one check. Then complete the solution.

COMMUNICATION STANDARD

Use one mathematical statement per line. Define symbols, label units and diagrams, retain exact values until approximation is requested, and close with a sentence that answers the actual question.

EXTENSION OR REPAIR

Change one value or condition in the guided task. Predict which steps remain valid and which must change. This is the difference between memorising a routine and understanding rational and irrational numbers: applications and reasoning.

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COMPREHENSIVE LESSON NOTEBOOK

Independent practice

1.9 • Rational and irrational numbers: applications and reasoning

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official WJEC marks.

1. **Between which consecutive integers does sqrt(70) lie?** **[4]**

2. **Give an irrational number between 3 and 4.** **[4]**

3. **Is pi exactly 3.14?** **[4]**

4. **State whether 0.1010010001... is terminating, recurring or neither.** **[4]**

REFLECTION

Record the question number of your least secure answer. Name the error type and write the first corrected line that would repair it.

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COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

1.9 • Rational and irrational numbers: applications and reasoning

1. WORKED ANSWER

Method: 8^2=64 and 9^2=81. Answer: 8 and 9 Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: 9<10<16, so 3<sqrt(10)<4. Answer: For example sqrt(10) Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: 3.14 is a rational approximation; pi is irrational. Answer: No Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: The pattern changes and never settles into a fixed repeating block. Answer: Neither terminating nor recurring Check: confirm the result against the original conditions, units and expected scale.

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COMPREHENSIVE LESSON NOTEBOOK

Number mastery review

Explain, demonstrate, connect and revisit.

I can...

- 1.1 Number and rounding: core concepts and methods: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- 1.1 Number and rounding: applications and reasoning: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- 1.2 Number properties and prime composition: core concepts and methods: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- 1.2 Number properties and prime composition: applications and reasoning: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- 1.3 Indices and standard form: core concepts and methods: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- 1.3 Indices and standard form: applications and reasoning: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- 1.4 Fractions, decimals, percentages and ratio: core concepts and methods: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- 1.4 Fractions, decimals, percentages and ratio: applications and reasoning: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- 1.5 Proficiency in calculations: core concepts and methods: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- 1.5 Proficiency in calculations: applications and reasoning: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- 1.6 Limits of accuracy: core concepts and methods: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- 1.6 Limits of accuracy: applications and reasoning: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- 1.7 Information and mathematical communication: core concepts and methods: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- 1.7 Information and mathematical communication: applications and reasoning: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- 1.8 Personal, household finance and enterprise: core concepts and methods: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- 1.8 Personal, household finance and enterprise: applications and reasoning: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- 1.9 Rational and irrational numbers: core concepts and methods: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- 1.9 Rational and irrational numbers: applications and reasoning: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.

INDEPENDENT PUBLICATION NOTICE

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