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MATHEMATICS

NATIONAL 5

NATIONAL 5

COMPREHENSIVE LESSON NOTEBOOK

UNIT 4: STATISTICS

Mapped independently to Qualifications Scotland National 5 Mathematics C847 75 • 10 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.

COMPREHENSIVE LESSON NOTEBOOK

Statistics unit map

10 chapters mapped independently to the current course specification.

CH 01 **N5-S1** Median and quartiles

CH 02 **N5-S2** Interquartile range

CH 03 **N5-S3** Comparing distributions with quartiles

CH 04 **N5-S4** Standard deviation as spread

CH 05 **N5-S5** Calculating standard deviation

CH 06 **N5-S6** Comparing mean and standard deviation

CH 07 **N5-S7** Scattergraphs and correlation

CH 08 **N5-S8** Drawing a best-fitting line

CH 09 **N5-S9** Equation of a linear model

CH 10 **N5-S10** Interpolation, extrapolation and integrated comparison

COMPREHENSIVE LESSON NOTEBOOK

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COMPREHENSIVE LESSON NOTEBOOK

Chapter 1: Median and quartiles

Order data and determine median, lower quartile and upper quartile consistently.

SPECIFICATION ALIGNMENT

Independent teaching summary for Qualifications Scotland National 5 Mathematics: N5-S1. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Order data and determine median, lower quartile and upper quartile consistently. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this national 5 statistical skills 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

data; distribution; centre; spread; model; correlation; interpolation; uncertainty

Three controlling ideas

- Identify the quantity, representation, conditions and units before calculating.
- Show a transparent chain from definition or model to the required result.
- Check interpretation, scale, sign, accuracy and contextual meaning independently.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “Find the median of 3, 8, 9, 12, 15.”, 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.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 1: Build the method

Median and quartiles

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 the median of 3, 8, 9, 12, 15.

WORKED REASONING

1. The data are ordered; choose the middle value.

Conclusion: 9.

WORKED EXAMPLE 2

Find Q1, median and Q3 for 2,4,5,7,8,10,12,13.

WORKED REASONING

1. Average the central pair for the median.
2. Take medians of the lower and upper halves.

Conclusion: Q1=4.5, median=7.5, Q3=11.

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.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 1: Connect and reason

Median and quartiles

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 N5-S1, 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 raw data be ordered before quartiles are found? 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 median and quartiles.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

N5-S1 • Median and quartiles

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official Qualifications Scotland / former SQA marks.

1. Find the median of 3, 8, 9, 12, 15.**[4]**

2. Find Q1, median and Q3 for 2,4,5,7,8,10,12,13.**[4]**

3. Why must raw data be ordered before quartiles are found?**[4]**

4. A data set has median 18. Explain what this tells you.**[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.

COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

N5-S1 • Median and quartiles

1. WORKED ANSWER

Method: The data are ordered; choose the middle value. Answer: 9. Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: Average the central pair for the median. Take medians of the lower and upper halves. Answer: $Q1=4.5$, median=7.5, $Q3=11$. Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: Unordered positions do not represent cumulative proportions. Answer: Quartiles depend on position in the ordered distribution. Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: The median describes central position, not the mean. Answer: At least half the observations are no greater than 18 and at least half are no less than 18. Check: confirm the result against the original conditions, units and expected scale.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 2: Interquartile range

Calculate and interpret the spread of the middle 50 percent of data.

SPECIFICATION ALIGNMENT

Independent teaching summary for Qualifications Scotland National 5 Mathematics: N5-S2. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Calculate and interpret the spread of the middle 50 percent of data. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this national 5 statistical skills 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

data; distribution; centre; spread; model; correlation; interpolation; uncertainty

Three controlling ideas

- Identify the quantity, representation, conditions and units before calculating.
- Show a transparent chain from definition or model to the required result.
- Check interpretation, scale, sign, accuracy and contextual meaning independently.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “Given $Q1=14$ and $Q3=27$, find the IQR.”, 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.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 2: Build the method

Interquartile range

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

Given $Q1=14$ and $Q3=27$, find the IQR.

WORKED REASONING

1. $IQR=Q3-Q1$.

Conclusion: 13.

WORKED EXAMPLE 2

A set has $Q1=8.5$ and $IQR=12$. Find $Q3$.

WORKED REASONING

1. $Q3=Q1+IQR$.

Conclusion: 20.5.

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.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 2: Connect and reason

Interquartile range

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 N5-S2, 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

Compare IQRs 6 and 15. Which set is more consistent? 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 interquartile range.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

N5-S2 • Interquartile range

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official Qualifications Scotland / former SQA marks.

1. Given $Q1=14$ and $Q3=27$, find the IQR.

[4]

2. A set has $Q1=8.5$ and $IQR=12$. Find $Q3$.

[4]

3. Compare IQRs 6 and 15. Which set is more consistent?

[4]

4. Explain one advantage of IQR over range.

[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.

COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

N5-S2 • Interquartile range

1. WORKED ANSWER

Method: $IQR = Q3 - Q1$. Answer: 13. Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: $Q3 = Q1 + IQR$. Answer: 20.5. Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: A smaller IQR means the middle half is less spread out. Answer: The set with IQR 6. Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: It uses the central 50 percent rather than only the minimum and maximum. Answer: IQR is less affected by extreme values. Check: confirm the result against the original conditions, units and expected scale.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 3: Comparing distributions with quartiles

Use median and IQR together to make contextual comparisons.

SPECIFICATION ALIGNMENT

Independent teaching summary for Qualifications Scotland National 5 Mathematics: N5-S3. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Use median and IQR together to make contextual comparisons. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this national 5 statistical skills 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

data; distribution; centre; spread; model; correlation; interpolation; uncertainty

Three controlling ideas

- Identify the quantity, representation, conditions and units before calculating.
- Show a transparent chain from definition or model to the required result.
- Check interpretation, scale, sign, accuracy and contextual meaning independently.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “Class A has median 64 and IQR 8; Class B has median 60 and IQR 5. Compare.”, 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.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 3: Build the method

Comparing distributions with quartiles

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

Class A has median 64 and IQR 8; Class B has median 60 and IQR 5. Compare.

WORKED REASONING

1. Compare medians for location and IQRs for spread.

Conclusion: Class A typically scores higher; Class B is more consistent.

WORKED EXAMPLE 2

Team X time median is 42 s, IQR 6 s; Team Y median 45 s, IQR 3 s. Which is faster and which is more consistent?

WORKED REASONING

1. For time, a lower median is faster.
2. Smaller IQR means more consistent.

Conclusion: X is typically faster; Y is more consistent.

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.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 3: Connect and reason

Comparing distributions with quartiles

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 N5-S3, 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 is comparing medians alone incomplete? 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 comparing distributions with quartiles.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

N5-S3 • Comparing distributions with quartiles

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official Qualifications Scotland / former SQA marks.

1. Class A has median 64 and IQR 8; Class B has median 60 and IQR 5. Compare.

[4]

2. Team X time median is 42 s, IQR 6 s; Team Y median 45 s, IQR 3 s. Which is faster and which is more consistent?

[4]

3. Why is comparing medians alone incomplete?

[4]

4. Write a valid comparison when two sets have equal IQR but medians 12 and 19.

[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.

COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

N5-S3 • Comparing distributions with quartiles

1. WORKED ANSWER

Method: Compare medians for location and IQRs for spread. Answer: Class A typically scores higher; Class B is more consistent. Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: For time, a lower median is faster. Smaller IQR means more consistent. Answer: X is typically faster; Y is more consistent. Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: Two data sets can share a median but have very different spreads. Answer: It ignores variation or consistency. Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: State both location and spread. Answer: They have the same middle-half spread, but the second set has a higher typical value. Check: confirm the result against the original conditions, units and expected scale.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 4: Standard deviation as spread

Understand standard deviation as typical distance from the mean.

SPECIFICATION ALIGNMENT

Independent teaching summary for Qualifications Scotland National 5 Mathematics: N5-S4. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Understand standard deviation as typical distance from the mean. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this national 5 statistical skills 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

data; distribution; centre; spread; model; correlation; interpolation; uncertainty

Three controlling ideas

- Identify the quantity, representation, conditions and units before calculating.
- Show a transparent chain from definition or model to the required result.
- Check interpretation, scale, sign, accuracy and contextual meaning independently.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “Which has the smaller standard deviation: 5,5,5,5 or 2,4,6,8?”, 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.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 4: Build the method

Standard deviation as spread

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

Which has the smaller standard deviation: 5,5,5,5 or 2,4,6,8?

WORKED REASONING

1. Every value equals the mean, so its standard deviation is 0.

Conclusion: 5,5,5,5.

WORKED EXAMPLE 2

What does a standard deviation of 0 mean?

WORKED REASONING

1. Every deviation from the mean is zero.

Conclusion: All observations are equal.

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.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 4: Connect and reason

Standard deviation as spread

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 N5-S4, 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

Two sets have the same mean. One has SD 1.2 and the other 4.9. Compare consistency. 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 standard deviation as spread.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

N5-S4 • Standard deviation as spread

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official Qualifications Scotland / former SQA marks.

1. Which has the smaller standard deviation: 5,5,5,5 or 2,4,6,8?

[4]

2. What does a standard deviation of 0 mean?

[4]

3. Two sets have the same mean. One has SD 1.2 and the other 4.9. Compare consistency.

[4]

4. Explain why standard deviation cannot be negative.

[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.

COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

N5-S4 • Standard deviation as spread

1. WORKED ANSWER

Method: Every value equals the mean, so its standard deviation is 0. Answer: 5,5,5,5. Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: Every deviation from the mean is zero. Answer: All observations are equal. Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: Its values cluster more closely around the mean. Answer: The set with SD 1.2 is more consistent. Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: Both stages produce non-negative values. Answer: It is derived from squared deviations and a square root. Check: confirm the result against the original conditions, units and expected scale.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 5: Calculating standard deviation

Use a calculator or supplied formula accurately and retain suitable precision.

SPECIFICATION ALIGNMENT

Independent teaching summary for Qualifications Scotland National 5 Mathematics: N5-S5. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Use a calculator or supplied formula accurately and retain suitable precision. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this national 5 statistical skills 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

data; distribution; centre; spread; model; correlation; interpolation; uncertainty

Three controlling ideas

- Identify the quantity, representation, conditions and units before calculating.
- Show a transparent chain from definition or model to the required result.
- Check interpretation, scale, sign, accuracy and contextual meaning independently.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “Find the population SD of 2,4,6.”, 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.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 5: Build the method

Calculating standard deviation

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 the population SD of 2,4,6.

WORKED REASONING

1. Mean=4; squared deviations are 4,0,4.
2. Divide by 3 and take the square root.

Conclusion: $\sqrt{8/3}$, approximately 1.63.

WORKED EXAMPLE 2

Find the population SD of 7,7,9,9.

WORKED REASONING

1. Mean=8; squared deviations total 4.
2. Divide by 4 and take square root.

Conclusion: 1.

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.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 5: Connect and reason

Calculating standard deviation

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 N5-S5, 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

For x values 1,2,3 with frequencies 2,3,1, find the mean. 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 calculating standard deviation.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

N5-S5 • Calculating standard deviation

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official Qualifications Scotland / former SQA marks.

1. Find the population SD of 2,4,6.

[4]

2. Find the population SD of 7,7,9,9.

[4]

3. For x values 1,2,3 with frequencies 2,3,1, find the mean.

[4]

4. Why should standard deviation usually be reported with its mean?

[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.

COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

N5-S5 • Calculating standard deviation

1. WORKED ANSWER

Method: Mean=4; squared deviations are 4,0,4. Divide by 3 and take the square root. Answer: $\sqrt{8/3}$, approximately 1.63. Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: Mean=8; squared deviations total 4. Divide by 4 and take square root. Answer: 1. Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: Total frequency 6; total $\sum x = 11$. Answer: $11/6$, approximately 1.83. Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: The same SD may have different practical meaning around different means. Answer: Spread needs the location and scale of the data for interpretation. Check: confirm the result against the original conditions, units and expected scale.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 6: Comparing mean and standard deviation

Make balanced comparisons using centre, spread and context.

SPECIFICATION ALIGNMENT

Independent teaching summary for Qualifications Scotland National 5 Mathematics: N5-S6. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Make balanced comparisons using centre, spread and context. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this national 5 statistical skills 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

data; distribution; centre; spread; model; correlation; interpolation; uncertainty

Three controlling ideas

- Identify the quantity, representation, conditions and units before calculating.
- Show a transparent chain from definition or model to the required result.
- Check interpretation, scale, sign, accuracy and contextual meaning independently.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “Machine A output has mean 50.2 and SD 0.4; B has mean 50.0 and SD 1.8. Compare.”, 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.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 6: Build the method

Comparing mean and standard deviation

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

Machine A output has mean 50.2 and SD 0.4; B has mean 50.0 and SD 1.8. Compare.

WORKED REASONING

1. Compare both means and SDs.

Conclusion: A has slightly higher average output and is much more consistent.

WORKED EXAMPLE 2

Runner P mean time is 12.4 s, SD 0.2; Q mean 12.1 s, SD 0.8. Compare.

WORKED REASONING

1. Lower mean time is better, lower SD is more consistent.

Conclusion: Q is faster on average; P is more consistent.

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.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 6: Connect and reason

Comparing mean and standard deviation

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 N5-S6, 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 might a smaller SD not always mean better performance? 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 comparing mean and standard deviation.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

N5-S6 • Comparing mean and standard deviation

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official Qualifications Scotland / former SQA marks.

1. Machine A output has mean 50.2 and SD 0.4; B has mean 50.0 and SD 1.8. Compare.

[4]

2. Runner P mean time is 12.4 s, SD 0.2; Q mean 12.1 s, SD 0.8. Compare.

[4]

3. Why might a smaller SD not always mean better performance?

[4]

4. Two batteries have equal mean life. Brand A has smaller SD. Give a commercial interpretation.

[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.

COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

N5-S6 • Comparing mean and standard deviation

1. WORKED ANSWER

Method: Compare both means and SDs. Answer: A has slightly higher average output and is much more consistent. Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: Lower mean time is better, lower SD is more consistent. Answer: Q is faster on average; P is more consistent. Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: Centre and context must also be considered. Answer: Consistency may be around an undesirable mean. Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: Customers face less variation around the same average. Answer: A gives more predictable battery life. Check: confirm the result against the original conditions, units and expected scale.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 7: Scattergraphs and correlation

Interpret direction, strength, unusual points and limits of association.

SPECIFICATION ALIGNMENT

Independent teaching summary for Qualifications Scotland National 5 Mathematics: N5-S7. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Interpret direction, strength, unusual points and limits of association. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this national 5 statistical skills 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

data; distribution; centre; spread; model; correlation; interpolation; uncertainty

Three controlling ideas

- Identify the quantity, representation, conditions and units before calculating.
- Show a transparent chain from definition or model to the required result.
- Check interpretation, scale, sign, accuracy and contextual meaning independently.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “Describe a scattergraph that rises closely from left to right.”, 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.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 7: Build the method

Scattergraphs and correlation

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

Describe a scattergraph that rises closely from left to right.

WORKED REASONING

1. Both variables tend to increase together and points lie near a rising line.

Conclusion: Strong positive correlation.

WORKED EXAMPLE 2

Does correlation prove causation?

WORKED REASONING

1. A lurking variable, coincidence or reverse causation may explain the association.

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.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 7: Connect and reason

Scattergraphs and correlation

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 N5-S7, 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

What is an outlier on a scattergraph? 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 scattergraphs and correlation.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

N5-S7 • Scattergraphs and correlation

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official Qualifications Scotland / former SQA marks.

1. Describe a scattergraph that rises closely from left to right.

[4]

2. Does correlation prove causation?

[4]

3. What is an outlier on a scattergraph?

[4]

4. A graph of temperature against heating cost slopes downward. Interpret.

[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.

COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

N5-S7 • Scattergraphs and correlation

1. WORKED ANSWER

Method: Both variables tend to increase together and points lie near a rising line. Answer: Strong positive correlation. Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: A lurking variable, coincidence or reverse causation may explain the association. Answer: No. Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: It may merit checking or contextual explanation. Answer: A point that lies unusually far from the overall pattern. Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: This is negative correlation, not automatic proof of cause. Answer: Higher temperatures tend to be associated with lower heating costs. Check: confirm the result against the original conditions, units and expected scale.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 8: Drawing a best-fitting line

Place a balanced straight-line model through a scattergraph.

SPECIFICATION ALIGNMENT

Independent teaching summary for Qualifications Scotland National 5 Mathematics: N5-S8. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Place a balanced straight-line model through a scattergraph. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this national 5 statistical skills 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

data; distribution; centre; spread; model; correlation; interpolation; uncertainty

Three controlling ideas

- Identify the quantity, representation, conditions and units before calculating.
- Show a transparent chain from definition or model to the required result.
- Check interpretation, scale, sign, accuracy and contextual meaning independently.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “State two features of a sensible best-fitting line.”, 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.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 8: Build the method

Drawing a best-fitting line

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

State two features of a sensible best-fitting line.

WORKED REASONING

1. It need not pass through every point or the origin.

Conclusion: It follows the trend and has a roughly balanced number of points above and below.

WORKED EXAMPLE 2

Why should a best-fitting line not be forced through the origin?

WORKED REASONING

1. The line should reflect the observed trend.

Conclusion: The context may not support $y=0$ when $x=0$.

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.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 8: Connect and reason

Drawing a best-fitting line

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 N5-S8, 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 line passes through (2,7) and (8,19). Find its gradient. 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 drawing a best-fitting line.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

N5-S8 • Drawing a best-fitting line

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official Qualifications Scotland / former SQA marks.

1. State two features of a sensible best-fitting line.

[4]

2. Why should a best-fitting line not be forced through the origin?

[4]

3. A line passes through (2,7) and (8,19). Find its gradient.

[4]

4. Using the same line, find its equation.

[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.

COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

N5-S8 • Drawing a best-fitting line

1. WORKED ANSWER

Method: It need not pass through every point or the origin. Answer: It follows the trend and has a roughly balanced number of points above and below. Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: The line should reflect the observed trend. Answer: The context may not support $y=0$ when $x=0$. Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: Use $(19-7)/(8-2)$. Answer: 2. Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: Substitute either point into $y=mx+c$. Answer: $y=2x+3$. Check: confirm the result against the original conditions, units and expected scale.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 9: Equation of a linear model

Determine and use the equation of a best-fitting straight line.

SPECIFICATION ALIGNMENT

Independent teaching summary for Qualifications Scotland National 5 Mathematics: N5-S9. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Determine and use the equation of a best-fitting straight line. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this national 5 statistical skills 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

data; distribution; centre; spread; model; correlation; interpolation; uncertainty

Three controlling ideas

- Identify the quantity, representation, conditions and units before calculating.
- Show a transparent chain from definition or model to the required result.
- Check interpretation, scale, sign, accuracy and contextual meaning independently.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “A best-fitting line passes through (10,32) and (30,68). Find its equation.”, 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.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 9: Build the method

Equation of a linear model

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 best-fitting line passes through (10,32) and (30,68). Find its equation.

WORKED REASONING

1. Gradient = $36/20 = 1.8$.
2. Use a point to find intercept 14.

Conclusion: $y = 1.8x + 14$.

WORKED EXAMPLE 2

Use $y = 1.8x + 14$ to estimate y when $x = 25$.

WORKED REASONING

1. Substitute $x = 25$.

Conclusion: 59.

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.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 9: Connect and reason

Equation of a linear model

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 N5-S9, 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

Interpret the gradient 1.8 in context. 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 equation of a linear model.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

N5-S9 • Equation of a linear model

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official Qualifications Scotland / former SQA marks.

1. A best-fitting line passes through (10,32) and (30,68). Find its equation.

[4]

2. Use $y=1.8x+14$ to estimate y when $x=25$.

[4]

3. Interpret the gradient 1.8 in context.

[4]

4. A model $y=4.2x-7$ gives $y=-7$ at $x=0$. Why may this be unsuitable?

[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.

COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

N5-S9 • Equation of a linear model

1. WORKED ANSWER

Method: Gradient = $36/20 = 1.8$. Use a point to find intercept 14. Answer: $y = 1.8x + 14$. Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: Substitute $x = 25$. Answer: 59. Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: Attach the actual units when known. Answer: The model predicts y increases by about 1.8 units for each one-unit increase in x . Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: Check meaning and data range. Answer: A negative intercept may be impossible in context or outside the observed domain. Check: confirm the result against the original conditions, units and expected scale.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 10: Interpolation, extrapolation and integrated comparison

Use models cautiously and communicate uncertainty.

SPECIFICATION ALIGNMENT

Independent teaching summary for Qualifications Scotland National 5 Mathematics: N5-S10. This lesson develops conceptual understanding, communication using symbols, fluency, logical reasoning and strategic competence.

Understand the mathematical object

Use models cautiously and communicate uncertainty. The central idea is that a representation is useful only when its meaning and conditions are explicit. In this national 5 statistical skills 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

data; distribution; centre; spread; model; correlation; interpolation; uncertainty

Three controlling ideas

- Identify the quantity, representation, conditions and units before calculating.
- Show a transparent chain from definition or model to the required result.
- Check interpretation, scale, sign, accuracy and contextual meaning independently.

PRIOR-KNOWLEDGE CHECK

Can you state the meaning of the key terms, identify the operation or relationship in “What is interpolation?”, 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.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 10: Build the method

Interpolation, extrapolation and integrated comparison

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

What is interpolation?

WORKED REASONING

1. It is generally safer than extrapolation if the trend is stable.

Conclusion: Estimating within the range of observed x-values.

WORKED EXAMPLE 2

Why is extrapolation risky?

WORKED REASONING

1. A straight-line pattern need not continue indefinitely.

Conclusion: The relationship may change beyond the observed range.

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.

COMPREHENSIVE LESSON NOTEBOOK

Chapter 10: Connect and reason

Interpolation, extrapolation and integrated comparison

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 N5-S10, 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

Data cover x from 5 to 40. Classify an estimate at $x=27$ and one at $x=60$. 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 interpolation, extrapolation and integrated comparison.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

N5-S10 • Interpolation, extrapolation and integrated comparison

Complete without notes. Show the setup, decisive working and final conclusion. Marks are independent teaching allocations, not official Qualifications Scotland / former SQA marks.

1. What is interpolation?

[4]

2. Why is extrapolation risky?

[4]

3. Data cover x from 5 to 40. Classify an estimate at $x=27$ and one at $x=60$.

[4]

4. Set A has median 52, IQR 7; Set B median 55, IQR 15. Give a balanced comparison.

[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.

COMPREHENSIVE LESSON NOTEBOOK

Worked answers and repair notes

N5-S10 • Interpolation, extrapolation and integrated comparison

1. WORKED ANSWER

Method: It is generally safer than extrapolation if the trend is stable. Answer: Estimating within the range of observed x-values. Check: confirm the result against the original conditions, units and expected scale.

2. WORKED ANSWER

Method: A straight-line pattern need not continue indefinitely. Answer: The relationship may change beyond the observed range. Check: confirm the result against the original conditions, units and expected scale.

3. WORKED ANSWER

Method: Compare each value with the observed range. Answer: 27 is interpolation; 60 is extrapolation. Check: confirm the result against the original conditions, units and expected scale.

4. WORKED ANSWER

Method: Use median for centre and IQR for spread. Answer: B has the higher typical value, while A is more consistent. Check: confirm the result against the original conditions, units and expected scale.

COMPREHENSIVE LESSON NOTEBOOK

Statistics mastery review

Explain, demonstrate, connect and revisit.

I can...

- N5-S1 Median and quartiles: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- N5-S2 Interquartile range: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- N5-S3 Comparing distributions with quartiles: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- N5-S4 Standard deviation as spread: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- N5-S5 Calculating standard deviation: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- N5-S6 Comparing mean and standard deviation: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- N5-S7 Scattergraphs and correlation: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- N5-S8 Drawing a best-fitting line: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- N5-S9 Equation of a linear model: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.
- N5-S10 Interpolation, extrapolation and integrated comparison: explain the idea, reproduce a valid method, solve an unfamiliar problem and check the result.

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