GCSE MATHEMATICS

FOUNDATION TIER
COMPREHENSIVE LESSON NOTEBOOK

UNIT 9 | STATISTICS

TEACH-FROM-SCRATCH • PUBLICATION EDITION

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

COMPREHENSIVE LESSON NOTEBOOK

How to learn from this notebook

Meaning first. Method second. Practice third.

FIVE-PASS ROUTINE

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

What a complete mathematics answer contains

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

Error loop

REPAIR, DO NOT MERELY CORRECT

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

Foundation does not mean superficial

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

COMPREHENSIVE LESSON NOTEBOOK

Unit 9 coverage map

OCR J560 Statistics content organised into a teachable sequence.

CH 01	OCR 12.01a	Populations, samples and bias
CH 02	OCR 12.02a	Data types and frequency tables
CH 03	OCR 12.02a	Bar charts, pie charts and pictograms
CH 04	OCR 12.02a	Time series and comparative charts
CH 05	OCR 12.03a	Mean, median, mode and range
CH 06	OCR 12.03a	Grouped data and estimated averages
CH 07	OCR 12.03a	Comparing distributions
CH 08	OCR 12.03b	Misleading graphs and claims
CH 09	OCR 12.03c	Scatter graphs and lines of best fit
CH 10	OCR 12.03c-12.03d	Outliers and mixed statistical reasoning

IMPORTANT TIER NOTE

This notebook covers OCR J560 section 12 at Foundation Tier: sampling, data representation, summary statistics, misleading data, scatter graphs and outliers. Specification references are identifiers, not copied specification wording.

COMPREHENSIVE LESSON NOTEBOOK

Fast-reference method bank

Understand each relationship before memorising it.

Mean	Σx/n or Σfx/Σf
Range	maximum-minimum
Estimated mean	Σ(midpoint×frequency)/Σfrequency
Pie angle	frequency/total×360°
Frequency density	frequency/class width
Cumulative frequency	running total
Interquartile range	Q3-Q1
Scatter prediction	use best-fit line cautiously
Interpolation	inside observed range
Extrapolation	outside observed range

CURRENT ASSESSMENT NOTE

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

COMPREHENSIVE LESSON NOTEBOOK

Populations, samples and bias

Distinguish population from sample and evaluate whether a sample can support an inference.

SPECIFICATION FOCUS

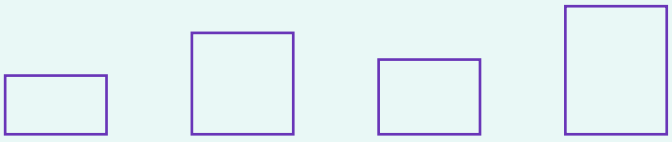
OCR reference OCR 12.01a. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

A sample is evidence about a wider population only when its selection process supports that inference. Randomness reduces systematic selection, while sample size mainly reduces random fluctuation.

KEY VOCABULARY

population • sample • random • bias • inference



Why the method works

- The method preserves the link between observations and conclusions.
- A suitable representation makes the relevant pattern visible without distortion.
- Matched summaries and explicit assumptions make comparisons auditable.

CHECK BEFORE MOVING ON

Answer mentally: A school wants opinions of all 1200 pupils and asks 80 selected pupils. State the population and sample. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Populations, samples and bias — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Name the target population.
- Describe how the sample was selected.
- Identify under-coverage, self-selection or leading wording.

WORKED EXAMPLE 1

A school wants opinions of all 1200 pupils and asks 80 selected pupils. State the population and sample.

SOLUTION

1. Population is the full target group.

ANSWER: Population: all 1200 pupils; sample: the 80 selected pupils

WORKED EXAMPLE 2

Why may asking only football-club members about school sport be biased?

SOLUTION

1. The sampling frame under-represents non-members.

ANSWER: They are likely to be more interested in sport than the whole school

SELF-CHECK QUESTION

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

COMPREHENSIVE LESSON NOTEBOOK

Populations, samples and bias — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Polling, product research and school surveys depend on representative samples.

Common misconceptions

- Choosing a display before identifying the data type.
- Generalising beyond the sample design.
- Reporting a statistic without context, spread or limitations.

GUIDED TRY

Describe a simple random sample of 50 names from a numbered list of 900. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Explain why a larger biased sample may be worse than a smaller random sample. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

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

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Populations, samples and bias

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

1. **A school wants opinions of all 1200 pupils and asks 80 selected pupils. State the population and sample.** **[2]**

2. **Why may asking only football-club members about school sport be biased?** **[2]**

3. **Describe a simple random sample of 50 names from a numbered list of 900.** **[3]**

4. **A website poll receives 640 voluntary replies. State one limitation.** **[2]**

5. **Which is less biased: every 20th name from a complete list after a random start, or the first 50 arrivals?** **[2]**

6. **Rewrite “Don’t you agree homework is useful?” to reduce bias.** **[2]**

7. **A sample of 30 from a town of 80,000 supports a precise claim. Give two concerns.** **[3]**

8. **Explain why a larger biased sample may be worse than a smaller random sample.** **[3]**

REFLECTION

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

COMPREHENSIVE LESSON NOTEBOOK

Data types and frequency tables

Classify data and organise raw observations in auditable tables.

SPECIFICATION FOCUS

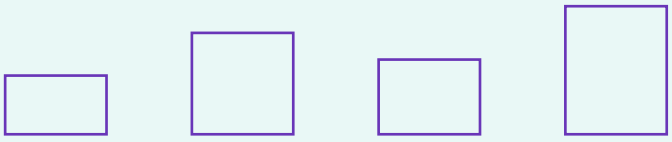
OCR reference OCR 12.02a. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Data type determines which tables, scales and calculations are meaningful. A well-designed frequency table preserves every observation once.

KEY VOCABULARY

categorical • discrete • continuous • tally • frequency



Why the method works

- The method preserves the link between observations and conclusions.
- A suitable representation makes the relevant pattern visible without distortion.
- Matched summaries and explicit assumptions make comparisons auditable.

CHECK BEFORE MOVING ON

Answer mentally: Classify shoe size as categorical, discrete numerical or continuous numerical. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Data types and frequency tables — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Decide categorical or numerical.
- For numerical data, decide discrete or continuous.
- Check frequencies total the sample size.

WORKED EXAMPLE 1

Classify shoe size as categorical, discrete numerical or continuous numerical.

SOLUTION

1. It takes separated allowed values.

ANSWER: Discrete numerical

WORKED EXAMPLE 2

Classify journey time.

SOLUTION

1. It can take any value in an interval.

ANSWER: Continuous numerical

SELF-CHECK QUESTION

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

COMPREHENSIVE LESSON NOTEBOOK

Data types and frequency tables — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Databases and surveys begin with consistent classification.

Common misconceptions

- Choosing a display before identifying the data type.
- Generalising beyond the sample design.
- Reporting a statistic without context, spread or limitations.

GUIDED TRY

Values 2,3,2,5,4,3,2. Complete frequencies for 2,3,4,5. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

State two checks for a data table. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

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

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Data types and frequency tables

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

1. **Classify shoe size as categorical, discrete numerical or continuous numerical.** [1]

2. **Classify journey time.** [1]

3. **Values 2,3,2,5,4,3,2. Complete frequencies for 2,3,4,5.** [2]

4. **A frequency table totals 48 but the survey had 52 responses. What does this show?** [2]

5. **Give one suitable response category set for travel-to-school method.** [2]

6. **Why is height not best recorded in categories “short” and “tall” without boundaries?** [2]

7. **A table has frequencies 6,9,x,4 and total 31. Find x.** [2]

8. **State two checks for a data table.** [2]

REFLECTION

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

COMPREHENSIVE LESSON NOTEBOOK

Bar charts, pie charts and pictograms

Choose and construct displays appropriate to categorical or discrete data.

SPECIFICATION FOCUS

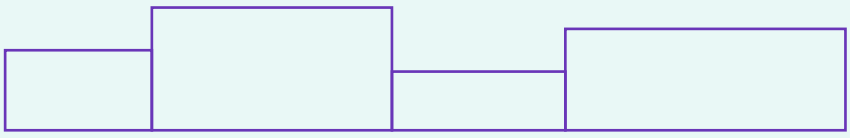
OCR reference OCR 12.02a. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Displays encode counts or proportions through length, angle or symbols. The visual scale must correspond exactly to the numerical scale.

KEY VOCABULARY

bar chart • pie chart • pictogram • frequency • proportion



bar area represents frequency

Why the method works

- The method preserves the link between observations and conclusions.
- A suitable representation makes the relevant pattern visible without distortion.
- Matched summaries and explicit assumptions make comparisons auditable.

CHECK BEFORE MOVING ON

Answer mentally: Frequencies A=12,B=18,C=30. Find the pie-chart angle for B. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Bar charts, pie charts and pictograms — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Use separated bars for categories.
- Pie-chart angle=frequency/total×360°.
- State the key and allow partial symbols in pictograms.

WORKED EXAMPLE 1

Frequencies A=12,B=18,C=30. Find the pie-chart angle for B.

SOLUTION

1. 18/60×360=108.

ANSWER: 108°

WORKED EXAMPLE 2

A 72° pie sector represents 16 people. Find the total.

SOLUTION

1. 72/360=1/5, so total=16×5.

ANSWER: 80

SELF-CHECK QUESTION

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

COMPREHENSIVE LESSON NOTEBOOK

Bar charts, pie charts and pictograms — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Public reports use charts to communicate category composition.

Common misconceptions

- Choosing a display before identifying the data type.
- Generalising beyond the sample design.
- Reporting a statistic without context, spread or limitations.

GUIDED TRY

A pictogram key is one symbol=8 pupils. What does 2.5 symbols represent? First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Give one advantage and one limitation of a pie chart. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

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

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Bar charts, pie charts and pictograms

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

1. **Frequencies A=12,B=18,C=30. Find the pie-chart angle for B.** **[2]**

2. **A 72° pie sector represents 16 people. Find the total.** **[3]**

3. **A pictogram key is one symbol=8 pupils. What does 2.5 symbols represent?** **[2]**

4. **Why should bars for categories have gaps?** **[1]**

5. **A bar height is 14 on an axis marked every 5 units. State one construction precaution.** **[2]**

6. **In a pie chart, 45 of 120 prefer option P. Find the angle.** **[2]**

7. **A pie sector is 126° from 200 responses. Find frequency.** **[3]**

8. **Give one advantage and one limitation of a pie chart.** **[2]**

REFLECTION

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

COMPREHENSIVE LESSON NOTEBOOK

Time series and comparative charts

Interpret trends and compare multiple or composite displays responsibly.

SPECIFICATION FOCUS

OCR reference OCR 12.02a. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Time order reveals trends and repeating patterns. Comparative charts require common definitions and scales.

KEY VOCABULARY

time series • trend • seasonality • composite • comparison

Why the method works

- The method preserves the link between observations and conclusions.
- A suitable representation makes the relevant pattern visible without distortion.
- Matched summaries and explicit assumptions make comparisons auditable.

CHECK BEFORE MOVING ON

Answer mentally: Monthly sales rise from 240 to 330 over 6 months. Find the overall increase. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Time series and comparative charts — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Read axes and units before values.
- Describe overall trend and seasonal/repeated variation separately.
- Compare like with like.

WORKED EXAMPLE 1

Monthly sales rise from 240 to 330 over 6 months. Find the overall increase.

SOLUTION

1. 330-240=90.

ANSWER: 90

WORKED EXAMPLE 2

A time series peaks every December. Name this pattern.

SOLUTION

1. It repeats at the same time of year.

ANSWER: Seasonal variation

SELF-CHECK QUESTION

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

COMPREHENSIVE LESSON NOTEBOOK

Time series and comparative charts — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Sales, weather and attendance are monitored over time.

Common misconceptions

- Choosing a display before identifying the data type.
- Generalising beyond the sample design.
- Reporting a statistic without context, spread or limitations.

GUIDED TRY

Why should time points be joined in chronological order? First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

State two comparison checks for multiple bar charts. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

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

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Time series and comparative charts

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

1. **Monthly sales rise from 240 to 330 over 6 months. Find the overall increase.** **[1]**

2. **A time series peaks every December. Name this pattern.** **[1]**

3. **Why should time points be joined in chronological order?** **[2]**

4. **A composite bar shows 18 boys and 22 girls cycling. Find total cyclists.** **[1]**

5. **Two years have totals 500 and 800. Why can equal-height percentage bars hide the difference?** **[2]**

6. **Values rise 12,15,14,18,21. Describe trend.** **[2]**

7. **A graph uses quarterly data. Can it justify a claim about daily variation?** **[2]**

8. **State two comparison checks for multiple bar charts.** **[2]**

REFLECTION

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

COMPREHENSIVE LESSON NOTEBOOK

Mean, median, mode and range

Calculate summary statistics and select a measure appropriate to the context.

SPECIFICATION FOCUS

OCR reference OCR 12.03a. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Averages describe centre in different ways; spread describes variation. The context and distribution decide which summary is most informative.

KEY VOCABULARY

mean • median • mode • range • outlier

Why the method works

- The method preserves the link between observations and conclusions.
- A suitable representation makes the relevant pattern visible without distortion.
- Matched summaries and explicit assumptions make comparisons auditable.

CHECK BEFORE MOVING ON

Answer mentally: Find mean of 4,7,8,11,15. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Mean, median, mode and range — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Order data before median.
- Mean=sum/frequency.
- Range=maximum-minimum.

WORKED EXAMPLE 1

Find mean of 4,7,8,11,15.

SOLUTION

1. Sum=45; divide by 5.

ANSWER: 9

WORKED EXAMPLE 2

Find median and range of 9,3,12,5,7,7.

SOLUTION

1. Order:3,5,7,7,9,12.

ANSWER: Median 7; range 9

SELF-CHECK QUESTION

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

COMPREHENSIVE LESSON NOTEBOOK

Mean, median, mode and range — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Performance and service times require defensible summaries.

Common misconceptions

- Choosing a display before identifying the data type.
- Generalising beyond the sample design.
- Reporting a statistic without context, spread or limitations.

GUIDED TRY

Find mode of 2,4,4,5,7,7,7,9. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

State a limitation of range. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

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

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Mean, median, mode and range

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

1. **Find mean of 4,7,8,11,15.** **[2]**

2. **Find median and range of 9,3,12,5,7,7.** **[3]**

3. **Find mode of 2,4,4,5,7,7,7,9.** **[1]**

4. **The mean of 8 values is 13. Find their total.** **[2]**

5. **Six values have mean 9. A seventh value 16 is added. Find new mean.** **[3]**

6. **Why may median be preferable for house prices?** **[2]**

7. **Values 5,6,x,10 have mean 8. Find x.** **[3]**

8. **State a limitation of range.** **[2]**

REFLECTION

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

COMPREHENSIVE LESSON NOTEBOOK

Grouped data and estimated averages

Estimate statistics from grouped frequency tables and explain why estimates are not exact.

SPECIFICATION FOCUS

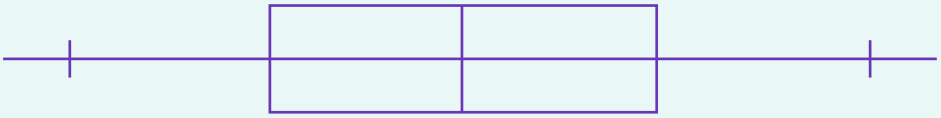
OCR reference OCR 12.03a. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Grouping compresses data and loses exact values. Midpoints and within-class assumptions create estimates rather than exact statistics.

KEY VOCABULARY

group • midpoint • modal class • estimate • interpolation



minimum • quartiles • median • maximum

Why the method works

- The method preserves the link between observations and conclusions.
- A suitable representation makes the relevant pattern visible without distortion.
- Matched summaries and explicit assumptions make comparisons auditable.

CHECK BEFORE MOVING ON

Answer mentally: Classes 0–10,10–20,20–30 have frequencies 3,5,2. State modal class. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Grouped data and estimated averages — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Use class midpoints to estimate the mean.
- Modal class has greatest frequency.
- Estimate median from cumulative frequency and class position.

WORKED EXAMPLE 1

Classes 0–10,10–20,20–30 have frequencies 3,5,2. State modal class.

SOLUTION

1. It has frequency 5.

ANSWER: 10–20

WORKED EXAMPLE 2

For the same table, estimate mean.

SOLUTION

1. Midpoints 5,15,25.
2. Weighted total=15+75+50=140.
3. Divide by 10.

ANSWER: 14

SELF-CHECK QUESTION

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

COMPREHENSIVE LESSON NOTEBOOK

Grouped data and estimated averages — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Large data sets are often published in class intervals.

Common misconceptions

- Choosing a display before identifying the data type.
- Generalising beyond the sample design.
- Reporting a statistic without context, spread or limitations.

GUIDED TRY

Why is the grouped mean an estimate? First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Give one way narrower classes improve an estimated mean. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

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

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Grouped data and estimated averages

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

1. **Classes 0–10,10–20,20–30 have frequencies 3,5,2. State modal class.** **[1]**

2. **For the same table, estimate mean.** **[4]**

3. **Why is the grouped mean an estimate?** **[2]**

4. **A grouped table has total 40. Which positions locate the median?** **[2]**

5. **Classes 0–5,5–10,10–15 have frequencies 4,9,7. Identify median class.** **[2]**

6. **Estimate range for classes 20–30 through 60–70.** **[2]**

7. **Midpoints 5,15,25 have frequencies 6,8,6. Estimate mean.** **[3]**

8. **Give one way narrower classes improve an estimated mean.** **[2]**

REFLECTION

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

COMPREHENSIVE LESSON NOTEBOOK

Comparing distributions

Compare data sets using matched measures of centre and spread.

SPECIFICATION FOCUS

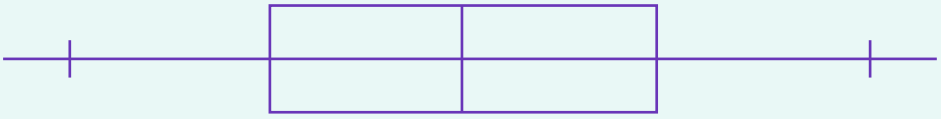
OCR reference OCR 12.03a. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

A comparison needs matched measures of both typical value and variability. Numbers must be interpreted in the original context.

KEY VOCABULARY

distribution • centre • spread • consistency • context



minimum • quartiles • median • maximum

Why the method works

- The method preserves the link between observations and conclusions.
- A suitable representation makes the relevant pattern visible without distortion.
- Matched summaries and explicit assumptions make comparisons auditable.

CHECK BEFORE MOVING ON

Answer mentally: A has mean 18, range 7; B has mean 21, range 12. Compare. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Comparing distributions — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Compare median with median or mean with mean.
- Compare spread using the same measure.
- Write conclusions in context.

WORKED EXAMPLE 1

A has mean 18, range 7; B has mean 21, range 12. Compare.

SOLUTION

1. Use both centre and spread.

ANSWER: B is higher on average; A is more consistent by range

WORKED EXAMPLE 2

Team X median 14, Team Y median 11. Interpret.

SOLUTION

1. State context if supplied.

ANSWER: A typical ordered result is higher for Team X by 3

SELF-CHECK QUESTION

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

COMPREHENSIVE LESSON NOTEBOOK

Comparing distributions — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Schools, teams and processes are compared through distributions.

Common misconceptions

- Choosing a display before identifying the data type.
- Generalising beyond the sample design.
- Reporting a statistic without context, spread or limitations.

GUIDED TRY

Two sets have equal means. Must their distributions be identical? First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

State two features needed for a useful comparison. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

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

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Comparing distributions

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

1. **A has mean 18, range 7; B has mean 21, range 12. Compare.** **[3]**

2. **Team X median 14, Team Y median 11. Interpret.** **[2]**

3. **Two sets have equal means. Must their distributions be identical?** **[2]**

4. **A set has median 40 and range 5. Another has median 38 and range 2. Which is more consistent?** **[1]**

5. **Why is comparing A mean with B median weak?** **[2]**

6. **Class P mean score 62 from 10 pupils; Q mean 68 from 30 pupils. Find combined mean.** **[4]**

7. **Give a contextual comparison from medians 7.2 and 8.1 minutes.** **[2]**

8. **State two features needed for a useful comparison.** **[2]**

REFLECTION

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

COMPREHENSIVE LESSON NOTEBOOK

Misleading graphs and claims

Recognise distorted scales, areas and selective summaries.

SPECIFICATION FOCUS

OCR reference OCR 12.03b. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

A technically drawn graph can still mislead through truncated scales, unequal intervals, area symbols or selective data.

KEY VOCABULARY

scale • baseline • area • distortion • claim

Why the method works

- The method preserves the link between observations and conclusions.
- A suitable representation makes the relevant pattern visible without distortion.
- Matched summaries and explicit assumptions make comparisons auditable.

CHECK BEFORE MOVING ON

Answer mentally: A bar chart axis starts at 95 and bars are 98 and 100. Why may it mislead? Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Misleading graphs and claims — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Check whether axes start at zero and use equal intervals.
- Distinguish bar height from area or volume.
- Test whether the statistic supports the wording.

WORKED EXAMPLE 1

A bar chart axis starts at 95 and bars are 98 and 100. Why may it mislead?

SOLUTION

1. The actual difference is 2.

ANSWER: The truncated axis exaggerates the small difference

WORKED EXAMPLE 2

A pictogram doubles both height and width of a symbol. By what factor does its area grow?

SOLUTION

1. Area scales in two dimensions.

ANSWER: 4

SELF-CHECK QUESTION

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

COMPREHENSIVE LESSON NOTEBOOK

Misleading graphs and claims — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

News and advertising require critical graph reading.

Common misconceptions

- Choosing a display before identifying the data type.
- Generalising beyond the sample design.
- Reporting a statistic without context, spread or limitations.

GUIDED TRY

A graph has unequal numerical intervals drawn at equal spacing. What is wrong? First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Give three checks for a statistical claim. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

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

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Misleading graphs and claims

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

1. A bar chart axis starts at 95 and bars are 98 and 100. Why may it mislead? **[2]**

2. A pictogram doubles both height and width of a symbol. By what factor does its area grow? **[2]**

3. A graph has unequal numerical intervals drawn at equal spacing. What is wrong? **[2]**

4. A headline says “average doubled” using mean 2 to 4. What extra information is needed? **[2]**

5. Why can omitting a category mislead? **[1]**

6. A 3D cylinder icon doubles in every dimension. By what factor does volume grow? **[2]**

7. A company selects only its best month. Name the problem. **[1]**

8. Give three checks for a statistical claim. **[3]**

REFLECTION

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

COMPREHENSIVE LESSON NOTEBOOK

Scatter graphs and lines of best fit

Describe association, draw a balanced trend line and make cautious predictions.

SPECIFICATION FOCUS

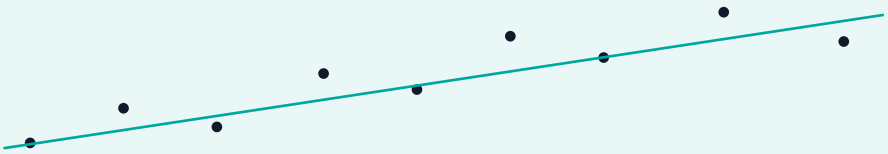
OCR reference OCR 12.03c. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Scatter graphs show association between paired variables. A trend supports prediction within evidence but does not by itself establish cause.

KEY VOCABULARY

scatter • correlation • best fit • interpolation • causation



Why the method works

- The method preserves the link between observations and conclusions.
- A suitable representation makes the relevant pattern visible without distortion.
- Matched summaries and explicit assumptions make comparisons auditable.

CHECK BEFORE MOVING ON

Answer mentally: As temperature rises, ice-cream sales generally rise. State correlation. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Scatter graphs and lines of best fit — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Describe direction and strength.
- A line of best fit follows the centre of the cloud.
- Correlation does not prove causation.

WORKED EXAMPLE 1

As temperature rises, ice-cream sales generally rise. State correlation.

SOLUTION

1. Both variables tend to increase together.

ANSWER: Positive correlation

WORKED EXAMPLE 2

Points lie close to a downward line. Describe.

SOLUTION

1. Downward direction; close clustering.

ANSWER: Strong negative correlation

SELF-CHECK QUESTION

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

COMPREHENSIVE LESSON NOTEBOOK

Scatter graphs and lines of best fit — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Science and economics examine relationships between variables.

Common misconceptions

- Choosing a display before identifying the data type.
- Generalising beyond the sample design.
- Reporting a statistic without context, spread or limitations.

GUIDED TRY

Does strong correlation prove one variable causes the other? First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

An outlier lies far from the pattern. Give one sensible action. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

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

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Scatter graphs and lines of best fit

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

1. **As temperature rises, ice-cream sales generally rise. State correlation.** [1]

2. **Points lie close to a downward line. Describe.** [2]

3. **Does strong correlation prove one variable causes the other?** [1]

4. **Why should a best-fit line have points on both sides?** [2]

5. **A line predicts y=32 at x=8. State the estimate.** [1]

6. **Data x-values run 2–10. Is prediction at x=9 interpolation or extrapolation?** [1]

7. **Why is prediction at x=25 less reliable?** [2]

8. **An outlier lies far from the pattern. Give one sensible action.** [2]

REFLECTION

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

COMPREHENSIVE LESSON NOTEBOOK

Outliers and mixed statistical reasoning

Identify unusual values and combine sampling, display and summary evidence.

SPECIFICATION FOCUS

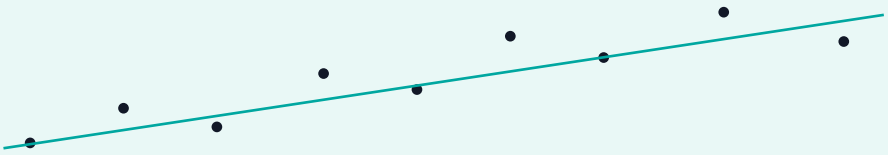
OCR reference OCR 12.03c-12.03d. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

An outlier is a prompt to investigate, not an automatic deletion. Conclusions should be checked for sensitivity to unusual values.

KEY VOCABULARY

outlier • error • genuine variation • sensitivity • conclusion



Why the method works

- The method preserves the link between observations and conclusions.
- A suitable representation makes the relevant pattern visible without distortion.
- Matched summaries and explicit assumptions make comparisons auditable.

CHECK BEFORE MOVING ON

Answer mentally: Data are 4,5,5,6,6,7,28. Identify likely outlier. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Outliers and mixed statistical reasoning — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Check an outlier against the context and recording process.
- Compare conclusions with and without an unusual value.
- Do not generalise beyond the sample design.

WORKED EXAMPLE 1

Data are 4,5,5,6,6,7,28. Identify likely outlier.

SOLUTION

1. It is far from the cluster 4–7.

ANSWER: 28

WORKED EXAMPLE 2

Find mean of those data.

SOLUTION

1. Total=61; divide by 7.

ANSWER: 61/7 or about 8.71

SELF-CHECK QUESTION

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

COMPREHENSIVE LESSON NOTEBOOK

Outliers and mixed statistical reasoning — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Quality assurance distinguishes error from meaningful exceptions.

Common misconceptions

- Choosing a display before identifying the data type.
- Generalising beyond the sample design.
- Reporting a statistic without context, spread or limitations.

GUIDED TRY

Find median of those data. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Design a final check before reporting a survey conclusion. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

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

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Outliers and mixed statistical reasoning

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

1. **Data are 4,5,5,6,6,7,28. Identify likely outlier.** **[1]**

2. **Find mean of those data.** **[3]**

3. **Find median of those data.** **[1]**

4. **Which centre better represents the typical value?** **[2]**

5. **A measurement is 280 cm where others are 150–180 cm. Give two possibilities.** **[2]**

6. **A random sample gives 54% support. Can we say exactly 54% of population supports?** **[2]**

7. **A scatter outlier is removed and correlation strengthens. Is removal automatically justified?** **[2]**

8. **Design a final check before reporting a survey conclusion.** **[3]**

REFLECTION

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

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Populations, samples and bias

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

1. A school wants opinions of all 1200 pupils and asks 80 selected pupils. State the popula...

ANSWER: Population: all 1200 pupils; sample: the 80 selected pupils

Method cue: Population is the full target group. Check sign, size, accuracy and units.

2. Why may asking only football-club members about school sport be biased?

ANSWER: They are likely to be more interested in sport than the whole school

Method cue: The sampling frame under-represents non-members. Check sign, size, accuracy and units.

3. Describe a simple random sample of 50 names from a numbered list of 900.

ANSWER: Use a random-number generator to select 50 different numbers from 1 to 900

Method cue: Give every name an equal chance. Check sign, size, accuracy and units.

4. A website poll receives 640 voluntary replies. State one limitation.

ANSWER: Self-selection bias

Method cue: People choosing to reply may differ from non-respondents. Check sign, size, accuracy and units.

5. Which is less biased: every 20th name from a complete list after a random start, or the ...

ANSWER: Every 20th name after a random start

Method cue: The first arrivals may share characteristics. Check sign, size, accuracy and units.

6. Rewrite “Don’t you agree homework is useful?” to reduce bias.

ANSWER: For example: “How useful do you find homework?” with balanced response options

Method cue: Remove leading language. Check sign, size, accuracy and units.

7. A sample of 30 from a town of 80,000 supports a precise claim. Give two concerns.

ANSWER: Small sample and possible unrepresentative selection

Method cue: Precision depends on selection and sample size. Check sign, size, accuracy and units.

8. Explain why a larger biased sample may be worse than a smaller random sample.

ANSWER: Increasing size does not remove systematic selection bias

Method cue: A random sample better represents the population. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Data types and frequency tables

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

1. Classify shoe size as categorical, discrete numerical or continuous numerical.

ANSWER: Discrete numerical

Method cue: It takes separated allowed values. Check sign, size, accuracy and units.

2. Classify journey time.

ANSWER: Continuous numerical

Method cue: It can take any value in an interval. Check sign, size, accuracy and units.

3. Values 2,3,2,5,4,3,2. Complete frequencies for 2,3,4,5.

ANSWER: 3,2,1,1

Method cue: Tally each value. Check sign, size, accuracy and units.

4. A frequency table totals 48 but the survey had 52 responses. What does this show?

ANSWER: Four responses are missing or misclassified

Method cue: Frequencies should total 52. Check sign, size, accuracy and units.

5. Give one suitable response category set for travel-to-school method.

ANSWER: Walk, cycle, bus, car, train, other

Method cue: Categories should be exhaustive and non-overlapping. Check sign, size, accuracy and units.

6. Why is height not best recorded in categories “short” and “tall” without boundaries?

ANSWER: The categories are subjective and not reproducible

Method cue: Numerical boundaries are needed. Check sign, size, accuracy and units.

7. A table has frequencies 6,9,x,4 and total 31. Find x.

ANSWER: 12

Method cue: x=31-6-9-4. Check sign, size, accuracy and units.

8. State two checks for a data table.

ANSWER: Clear heading/units and exhaustive non-overlapping categories

Method cue: Also check total frequency. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Bar charts, pie charts and pictograms

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

1. Frequencies A=12,B=18,C=30. Find the pie-chart angle for B.

ANSWER: 108°

Method cue: 18/60×360=108. Check sign, size, accuracy and units.

2. A 72° pie sector represents 16 people. Find the total.

ANSWER: 80

Method cue: 72/360=1/5, so total=16×5. Check sign, size, accuracy and units.

3. A pictogram key is one symbol=8 pupils. What does 2.5 symbols represent?

ANSWER: 20 pupils

Method cue: 2.5×8=20. Check sign, size, accuracy and units.

4. Why should bars for categories have gaps?

ANSWER: The categories are separate, not continuous intervals

Method cue: Gaps distinguish category bars. Check sign, size, accuracy and units.

5. A bar height is 14 on an axis marked every 5 units. State one construction precaution.

ANSWER: Use a consistent linear scale and plot 14 accurately between 10 and 15

Method cue: Label axes and units. Check sign, size, accuracy and units.

6. In a pie chart, 45 of 120 prefer option P. Find the angle.

ANSWER: 135°

Method cue: 45/120×360=135. Check sign, size, accuracy and units.

7. A pie sector is 126° from 200 responses. Find frequency.

ANSWER: 70

Method cue: 126/360×200=70. Check sign, size, accuracy and units.

8. Give one advantage and one limitation of a pie chart.

ANSWER: It shows proportions clearly; exact comparisons or many categories are difficult

Method cue: Use a bar chart when precise comparison matters. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Time series and comparative charts

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

1. Monthly sales rise from 240 to 330 over 6 months. Find the overall increase.

ANSWER: 90

Method cue: 330-240=90. Check sign, size, accuracy and units.

2. A time series peaks every December. Name this pattern.

ANSWER: Seasonal variation

Method cue: It repeats at the same time of year. Check sign, size, accuracy and units.

3. Why should time points be joined in chronological order?

ANSWER: The line represents change through time

Method cue: A different order would misrepresent the sequence. Check sign, size, accuracy and units.

4. A composite bar shows 18 boys and 22 girls cycling. Find total cyclists.

ANSWER: 40

Method cue: 18+22. Check sign, size, accuracy and units.

5. Two years have totals 500 and 800. Why can equal-height percentage bars hide the differe...

ANSWER: They show composition, not absolute totals

Method cue: State both percentages and totals. Check sign, size, accuracy and units.

6. Values rise 12,15,14,18,21. Describe trend.

ANSWER: Overall upward trend with a small fall from 15 to 14

Method cue: Mention both features. Check sign, size, accuracy and units.

7. A graph uses quarterly data. Can it justify a claim about daily variation?

ANSWER: No

Method cue: Quarterly aggregation hides daily variation. Check sign, size, accuracy and units.

8. State two comparison checks for multiple bar charts.

ANSWER: Same scale and same category definitions/time period

Method cue: Also compare totals where relevant. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Mean, median, mode and range

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

1. Find mean of 4,7,8,11,15.

ANSWER: 9

Method cue: Sum=45; divide by 5. Check sign, size, accuracy and units.

2. Find median and range of 9,3,12,5,7,7.

ANSWER: Median 7; range 9

Method cue: Order:3,5,7,7,9,12. Check sign, size, accuracy and units.

3. Find mode of 2,4,4,5,7,7,7,9.

ANSWER: 7

Method cue: It occurs most often. Check sign, size, accuracy and units.

4. The mean of 8 values is 13. Find their total.

ANSWER: 104

Method cue: 13×8=104. Check sign, size, accuracy and units.

5. Six values have mean 9. A seventh value 16 is added. Find new mean.

ANSWER: 10

Method cue: Old total=54; new total=70; 70/7. Check sign, size, accuracy and units.

6. Why may median be preferable for house prices?

ANSWER: It is less affected by a few very high prices

Method cue: Prices may be skewed. Check sign, size, accuracy and units.

7. Values 5,6,x,10 have mean 8. Find x.

ANSWER: 11

Method cue: Total must be 32; known total 21. Check sign, size, accuracy and units.

8. State a limitation of range.

ANSWER: It uses only the two extreme values and is sensitive to outliers

Method cue: It ignores the rest of the distribution. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Grouped data and estimated averages

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

1. Classes 0–10,10–20,20–30 have frequencies 3,5,2. State modal class.

ANSWER: 10–20

Method cue: It has frequency 5. Check sign, size, accuracy and units.

2. For the same table, estimate mean.

ANSWER: 14

Method cue: Midpoints 5,15,25. Check sign, size, accuracy and units.

3. Why is the grouped mean an estimate?

ANSWER: Actual values inside each class are unknown

Method cue: Midpoints stand in for all values. Check sign, size, accuracy and units.

4. A grouped table has total 40. Which positions locate the median?

ANSWER: 20th and 21st values

Method cue: For an even total use the two central positions. Check sign, size, accuracy and units.

5. Classes 0–5,5–10,10–15 have frequencies 4,9,7. Identify median class.

ANSWER: 5–10

Method cue: The 10th and 11th values lie in cumulative frequency 13. Check sign, size, accuracy and units.

6. Estimate range for classes 20–30 through 60–70.

ANSWER: 50

Method cue: Use upper end 70 minus lower end 20. Check sign, size, accuracy and units.

7. Midpoints 5,15,25 have frequencies 6,8,6. Estimate mean.

ANSWER: 15

Method cue: Weighted total=30+120+150=300; divide by 20. Check sign, size, accuracy and units.

8. Give one way narrower classes improve an estimated mean.

ANSWER: Midpoints are closer to the unknown observations

Method cue: Less information is lost within each class. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Comparing distributions

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

1. A has mean 18, range 7; B has mean 21, range 12. Compare.

ANSWER: B is higher on average; A is more consistent by range

Method cue: Use both centre and spread. Check sign, size, accuracy and units.

2. Team X median 14, Team Y median 11. Interpret.

ANSWER: A typical ordered result is higher for Team X by 3

Method cue: State context if supplied. Check sign, size, accuracy and units.

3. Two sets have equal means. Must their distributions be identical?

ANSWER: No

Method cue: They may have different spreads and shapes. Check sign, size, accuracy and units.

4. A set has median 40 and range 5. Another has median 38 and range 2. Which is more consis...

ANSWER: The second set

Method cue: Smaller range. Check sign, size, accuracy and units.

5. Why is comparing A mean with B median weak?

ANSWER: The measures respond differently to skew and outliers

Method cue: Use like-for-like measures. Check sign, size, accuracy and units.

6. Class P mean score 62 from 10 pupils; Q mean 68 from 30 pupils. Find combined mean.

ANSWER: 66.5

Method cue: Totals=620 and 2040. Check sign, size, accuracy and units.

7. Give a contextual comparison from medians 7.2 and 8.1 minutes.

ANSWER: The second group typically takes 0.9 minutes longer

Method cue: Name the groups in a full response. Check sign, size, accuracy and units.

8. State two features needed for a useful comparison.

ANSWER: One measure of centre and one measure of spread

Method cue: Use matched measures and context. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Misleading graphs and claims

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

1. A bar chart axis starts at 95 and bars are 98 and 100. Why may it mislead?

ANSWER: The truncated axis exaggerates the small difference

Method cue: The actual difference is 2. Check sign, size, accuracy and units.

2. A pictogram doubles both height and width of a symbol. By what factor does its area grow...

ANSWER: 4

Method cue: Area scales in two dimensions. Check sign, size, accuracy and units.

3. A graph has unequal numerical intervals drawn at equal spacing. What is wrong?

ANSWER: The scale is non-linear but appears linear

Method cue: Distances do not represent equal changes. Check sign, size, accuracy and units.

4. A headline says “average doubled” using mean 2 to 4. What extra information is needed?

ANSWER: Sample sizes, spread, context and how samples were selected

Method cue: A mean alone is incomplete. Check sign, size, accuracy and units.

5. Why can omitting a category mislead?

ANSWER: The displayed proportions no longer represent the whole data set

Method cue: Check exhaustiveness. Check sign, size, accuracy and units.

6. A 3D cylinder icon doubles in every dimension. By what factor does volume grow?

ANSWER: 8

Method cue: Volume scale factor=2^3. Check sign, size, accuracy and units.

7. A company selects only its best month. Name the problem.

ANSWER: Cherry-picking

Method cue: The time period is unrepresentative. Check sign, size, accuracy and units.

8. Give three checks for a statistical claim.

ANSWER: Source/sample, scale/graph construction, and appropriate summary/context

Method cue: Also inspect missing data and uncertainty. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Scatter graphs and lines of best fit

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

1. As temperature rises, ice-cream sales generally rise. State correlation.

ANSWER: Positive correlation

Method cue: Both variables tend to increase together. Check sign, size, accuracy and units.

2. Points lie close to a downward line. Describe.

ANSWER: Strong negative correlation

Method cue: Downward direction; close clustering. Check sign, size, accuracy and units.

3. Does strong correlation prove one variable causes the other?

ANSWER: No

Method cue: A third factor or coincidence may explain it. Check sign, size, accuracy and units.

4. Why should a best-fit line have points on both sides?

ANSWER: It should represent the centre of the trend rather than extremes

Method cue: Balance the residuals visually. Check sign, size, accuracy and units.

5. A line predicts y=32 at x=8. State the estimate.

ANSWER: 32

Method cue: Read the line at x=8. Check sign, size, accuracy and units.

6. Data x-values run 2–10. Is prediction at x=9 interpolation or extrapolation?

ANSWER: Interpolation

Method cue: It lies within the observed range. Check sign, size, accuracy and units.

7. Why is prediction at x=25 less reliable?

ANSWER: It is extrapolation far beyond observed data

Method cue: The trend may change. Check sign, size, accuracy and units.

8. An outlier lies far from the pattern. Give one sensible action.

ANSWER: Check for recording error and investigate; do not delete automatically

Method cue: It may be genuine. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Outliers and mixed statistical reasoning

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

1. Data are 4,5,5,6,6,7,28. Identify likely outlier.

ANSWER: 28

Method cue: It is far from the cluster 4–7. Check sign, size, accuracy and units.

2. Find mean of those data.

ANSWER: 61/7 or about 8.71

Method cue: Total=61; divide by 7. Check sign, size, accuracy and units.

3. Find median of those data.

ANSWER: 6

Method cue: The fourth ordered value. Check sign, size, accuracy and units.

4. Which centre better represents the typical value?

ANSWER: Median 6

Method cue: The outlier pulls the mean upward. Check sign, size, accuracy and units.

5. A measurement is 280 cm where others are 150–180 cm. Give two possibilities.

ANSWER: Recording/unit error or a genuine unusual case

Method cue: Investigate source data. Check sign, size, accuracy and units.

6. A random sample gives 54% support. Can we say exactly 54% of population supports?

ANSWER: No

Method cue: It is an estimate subject to sampling variation. Check sign, size, accuracy and units.

7. A scatter outlier is removed and correlation strengthens. Is removal automatically justi...

ANSWER: No

Method cue: Removal needs a valid reason such as error; genuine data must be retained. Check sign, size, accuracy and units.

8. Design a final check before reporting a survey conclusion.

ANSWER: Verify sampling, totals, scales, suitable summaries and limitations

Method cue: The conclusion must match the evidence. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Independent authorship and release check

OCR Foundation Mathematics • Unit 9 Statistics

ORIGINAL-CONTENT STATEMENT

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

Release checklist

- 10 publisher-organised chapters mapped to OCR J560 section 12.
- Every chapter begins on a new page and contains conceptual explanation.
- Original vector diagrams and two worked examples appear in every chapter.
- Applications, misconceptions, guided reasoning and independent practice are included.
- Answers are collected at the end with method cues.
- Copyright, trademark and non-endorsement wording included.

USE OF OFFICIAL MATERIALS

The current OCR specification and public assessment materials informed curriculum scope and general assessment characteristics only. This independent publication is not an official OCR paper, mark scheme or endorsed resource. Consult OCR for the current specification, assessment materials and formula-sheet arrangements.