



COMPREHENSIVE LESSON NOTEBOOK

GCSE MATHEMATICS

FOUNDATION TIER

UNIT 6 | STATISTICS

PURPOSE

Learn how to collect trustworthy data, select and construct suitable displays, calculate and compare summary measures, and communicate conclusions with appropriate caution.

Aligned to the AQA GCSE Mathematics (8300) specification.
Independent educational resource - not produced, approved, endorsed or affiliated with AQA.

Specification map and Foundation boundary

Lesson	AQA	Coverage
1	S4	Types of data and statistical language
2	S1, S5	Populations, samples, censuses and bias
3	S2	Tally charts, frequency tables and grouped data
4	S2	Bar charts, vertical line charts and pictograms
5	S2	Pie charts and proportional angles
6	S2	Time-series tables and line graphs
7	S4	Mean, median, mode and modal class
8	S4, S5	Range, outliers and comparing distributions
9	S6	Scatter graphs, correlation and lines of best fit
10	S2, S4, S5, S6	Choosing, interpreting and criticising statistics

FOUNDATION BOUNDARY

Included: S1, S2, S4, S5 and S6 Foundation content. Excluded: S3 histograms and cumulative frequency; Higher-only box plots, quartiles and interquartile range.

Formula and method bank

Skill	Method
Mean	sum of values $\div$ number of values
Mean from frequency table	$\Sigma(\text{value} \times \text{frequency}) \div \Sigma \text{frequency}$
Range	maximum – minimum
Pie-chart angle	$\text{frequency} \div \text{total} \times 360^\circ$
Frequency from sector	$\text{angle} \div 360^\circ \times \text{total}$
Comparison	typical value + spread + contextual conclusion
Scatter estimate	draw/read a sensible best-fit line; label as an estimate

LESSON 01 • S4

Types of data and statistical language

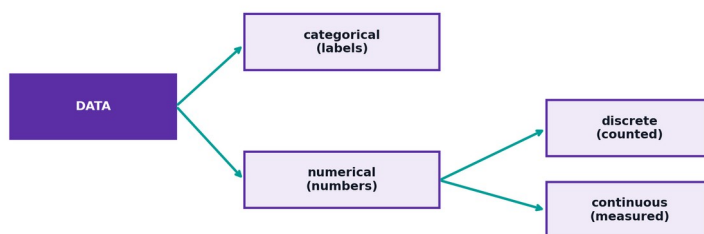
Question • representation • calculation • interpretation

SPECIFICATION ALIGNMENT

AQA reference S4. This lesson teaches the meaning, method, appropriate representation and interpretation expected at Foundation tier.

KEY VOCABULARY

primary data • secondary data • categorical • numerical • discrete • continuous



Understand the idea

Statistics begins with a question. The data must match that question: names or groups are categorical, while values that can be calculated with are numerical.

Discrete data is counted and normally takes separate values, such as number of pets. Continuous data is measured and can take any value in an interval, such as time, mass or temperature.

Primary data is collected first-hand for the investigation. Secondary data already exists, for example a government table. Either can be useful, but the source, date and method affect reliability.

DECISION CHECK

Before calculating, identify the population, variable type and whether the chosen summary or diagram actually answers the question.

COMMON MISCONCEPTION

A correct calculation does not rescue biased data or an unsuitable graph. Always interpret the result and state a limitation when evidence is incomplete.

Worked examples

Worked example 1

QUESTION

Classify eye colour.

1 Identify: Name the data structure and the statistic or display required.

2 Apply: Use the definition or method carefully: categorical

3 Interpret: State what the result means in the context.

ANSWER

categorical

Worked example 2

QUESTION

Classify the number of goals in a match.

1 Read: Check totals, scale, units and any ordering.

2 Reason: The required conclusion is discrete numerical

3 Check: Ask whether the conclusion is supported by the data.

ANSWER

discrete numerical

Guided practice

GUIDED QUESTION 1

Classify a runner's time.

HINT

Write the relevant definition or formula first, then use values and units from the context.

GUIDED QUESTION 2

A student uses council recycling figures. Primary or secondary?

HINT

Write the relevant definition or formula first, then use values and units from the context.

Independent practice

Questions 1–3

1. Classify eye colour.
2. Classify the number of goals in a match.
3. Classify a runner's time.

Questions 4–6

4. A student uses council recycling figures. Primary or secondary?
5. Give one advantage of primary data.
6. Why record units with measurements?

AO2–AO3 REASONING

Explain why the chosen method is appropriate, identify one possible weakness in the evidence, and write a cautious conclusion supported by a quoted value.

LESSON 02 • S1, S5

Populations, samples, censuses and bias

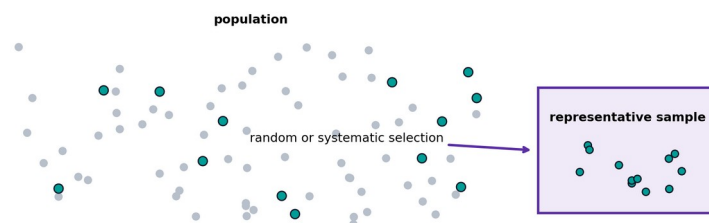
Question • representation • calculation • interpretation

SPECIFICATION ALIGNMENT

AQA reference S1, S5. This lesson teaches the meaning, method, appropriate representation and interpretation expected at Foundation tier.

KEY VOCABULARY

population • sample • census • representative • random • systematic • bias



Understand the idea

The population is the entire group the conclusion is about. A sample is the smaller group actually observed. A census collects data from every member of the population.

A good sample represents important features of the population. Random selection gives each member a fair chance; systematic selection uses a regular interval after a suitable random start. Convenience samples are quick but often biased.

A large biased sample is still biased. Sample size mainly reduces random variation; it cannot repair a method that excludes part of the population. Conclusions must be limited to the population and conditions actually sampled.

DECISION CHECK

Before calculating, identify the population, variable type and whether the chosen summary or diagram actually answers the question.

COMMON MISCONCEPTION

A correct calculation does not rescue biased data or an unsuitable graph. Always interpret the result and state a limitation when evidence is incomplete.

Worked examples

Worked example 1

QUESTION

A school asks 80 of its 900 pupils about lunch. State the population.

- 1 Identify:** Name the data structure and the statistic or display required.
- 2 Apply:** Use the definition or method carefully: all 900 pupils
- 3 Interpret:** State what the result means in the context.

ANSWER

all 900 pupils

Worked example 2

QUESTION

State the sample.

- 1 Read:** Check totals, scale, units and any ordering.
- 2 Reason:** The required conclusion is the 80 pupils asked
- 3 Check:** Ask whether the conclusion is supported by the data.

ANSWER

the 80 pupils asked

Guided practice

GUIDED QUESTION 1

Give one advantage of sampling over a census.

HINT

Write the relevant definition or formula first, then use values and units from the context.

GUIDED QUESTION 2

Why is surveying only the football team biased?

HINT

Write the relevant definition or formula first, then use values and units from the context.

Independent practice

Questions 1–3	Questions 4–6
1. A school asks 80 of its 900 pupils about lunch. State the population.	4. Why is surveying only the football team biased?
2. State the sample.	5. Choose 30 names fairly from a register.
3. Give one advantage of sampling over a census.	6. Can a sample prove a claim about every person? Explain.

AO2–AO3 REASONING

Explain why the chosen method is appropriate, identify one possible weakness in the evidence, and write a cautious conclusion supported by a quoted value.

LESSON 03 • S2

Tally charts, frequency tables and grouped data

Question • representation • calculation • interpretation

SPECIFICATION ALIGNMENT

AQA reference S2. This lesson teaches the meaning, method, appropriate representation and interpretation expected at Foundation tier.

KEY VOCABULARY

tally • frequency • total • class interval • non-overlapping • exhaustive

Books read	Tally	Frequency
0		4
1	/	7
2	/	9
3	/	6
4		4

Check: frequencies total 30

Understand the idea

A tally records observations as they arrive; the fifth mark crosses the previous four, making groups of five easy to count. The frequency is the final numerical count.

Categories and class intervals must be mutually exclusive, so one value cannot enter two rows, and exhaustive, so every possible value has a place. Intervals such as $0 < t \leq 10$ and $10 < t \leq 20$ avoid overlap.

Always check that frequencies add to the stated sample size. For grouped continuous data, exact original values are no longer known, so later calculations may be estimates.

DECISION CHECK

Before calculating, identify the population, variable type and whether the chosen summary or diagram actually answers the question.

COMMON MISCONCEPTION

A correct calculation does not rescue biased data or an unsuitable graph. Always interpret the result and state a limitation when evidence is incomplete.

Worked examples

Worked example 1

QUESTION

Frequencies 4,7,9,6,4: find the total.

1 Identify: Name the data structure and the statistic or display required.

2 Apply: Use the definition or method carefully: 30

3 Interpret: State what the result means in the context.

ANSWER

30

Worked example 2**QUESTION**Write a class after $0 < t \leq 10$.**1 Read:** Check totals, scale, units and any ordering.**2 Reason:** The required conclusion is $10 < t \leq 20$ **3 Check:** Ask whether the conclusion is supported by the data.**ANSWER** $10 < t \leq 20$ **Guided practice****GUIDED QUESTION 1**

Why is 10–20 after 0–10 ambiguous?

HINT

Write the relevant definition or formula first, then use values and units from the context.

GUIDED QUESTION 2

A tally has three full groups of five and two marks. Frequency?

HINT

Write the relevant definition or formula first, then use values and units from the context.

Independent practice**Questions 1–3**

1. Frequencies 4,7,9,6,4: find the total.

2. Write a class after $0 < t \leq 10$.**Questions 4–6**

4. A tally has three full groups of five and two marks. Frequency?

5. A table totals 48 but the survey had 50 replies. What

does this show?

3. Why is 10–20 after 0–10 ambiguous?

6. Why can grouped data lose information?

AO2–AO3 REASONING

Explain why the chosen method is appropriate, identify one possible weakness in the evidence, and write a cautious conclusion supported by a quoted value.

LESSON 04 • S2

Bar charts, vertical line charts and pictograms

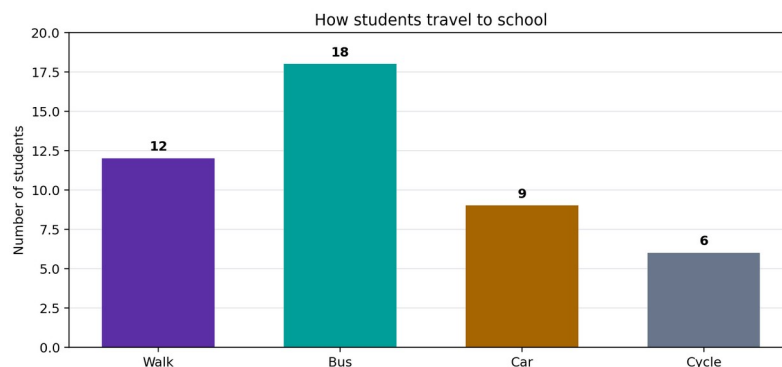
Question • representation • calculation • interpretation

SPECIFICATION ALIGNMENT

AQA reference S2. This lesson teaches the meaning, method, appropriate representation and interpretation expected at Foundation tier.

KEY VOCABULARY

category • frequency axis • equal scale • bar chart • vertical line chart • key



Understand the idea

A bar chart compares categories. Bars have equal width and gaps because categories are separate. The frequency scale must begin and increase consistently; labels and units must be clear.

A vertical line chart is suitable for ungrouped discrete numerical values. The horizontal positions have numerical meaning, but separate lines show that values between them may be impossible.

A pictogram uses symbols and requires a key. Part-symbols must represent the correct fraction. Before reading any chart, inspect its scale: a truncated or uneven axis can exaggerate differences.

DECISION CHECK

Before calculating, identify the population, variable type and whether the chosen summary or diagram actually answers the question.

COMMON MISCONCEPTION

A correct calculation does not rescue biased data or an unsuitable graph. Always interpret the result and state a limitation when evidence is incomplete.

Worked examples

Worked example 1

QUESTION

From the chart, how many travel by bus?

- 1 Identify:** Name the data structure and the statistic or display required.
- 2 Apply:** Use the definition or method carefully: 18
- 3 Interpret:** State what the result means in the context.

ANSWER

18

Worked example 2

QUESTION

How many more use bus than cycle?

- 1 Read:** Check totals, scale, units and any ordering.
- 2 Reason:** The required conclusion is 12
- 3 Check:** Ask whether the conclusion is supported by the data.

ANSWER

12

Guided practice

GUIDED QUESTION 1

Which chart suits shoe sizes 3,4,5,6?

HINT

Write the relevant definition or formula first, then use values and units from the context.

GUIDED QUESTION 2

A pictogram key is one icon = 8. What is half an icon?

HINT

Write the relevant definition or formula first, then use values and units from the context.

Independent practice

Questions 1–3	Questions 4–6
1. From the chart, how many travel by bus?	4. A pictogram key is one icon = 8. What is half an icon?
2. How many more use bus than cycle?	5. Why are gaps used in a bar chart?
3. Which chart suits shoe sizes 3,4,5,6?	6. What is wrong with axis labels 0,5,10,30 at equal spacing?

AO2–AO3 REASONING

Explain why the chosen method is appropriate, identify one possible weakness in the evidence, and write a cautious conclusion supported by a quoted value.

LESSON 05 • S2

Pie charts and proportional angles

Question • representation • calculation • interpretation

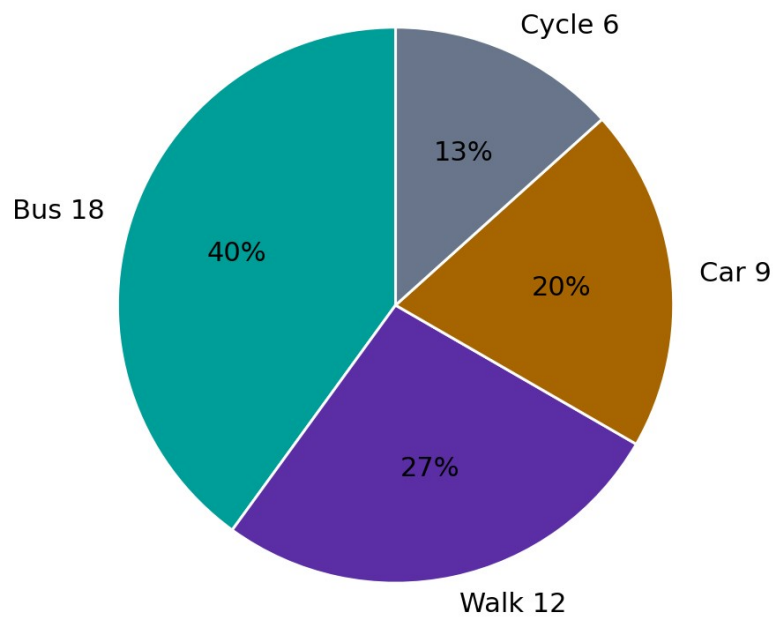
SPECIFICATION ALIGNMENT

AQA reference S2. This lesson teaches the meaning, method, appropriate representation and interpretation expected at Foundation tier.

KEY VOCABULARY

sector • proportion • central angle • total frequency • legend • compare

Travel survey: 45 students



Understand the idea

A pie chart represents a whole circle, so all sector angles total 360° . A category's share is frequency divided by total frequency.

To construct a sector, calculate $\text{angle} = \text{frequency} \div \text{total} \times 360^\circ$. To recover a frequency, use $\text{frequency} = \text{angle} \div 360^\circ \times \text{total}$. Include a key or direct labels.

Pie charts show composition clearly but make close comparisons difficult. Two pie charts can mislead if their circles look alike but represent very different totals, so state sample sizes.

DECISION CHECK

Before calculating, identify the population, variable type and whether the chosen summary or diagram actually answers the question.

COMMON MISCONCEPTION

A correct calculation does not rescue biased data or an unsuitable graph. Always interpret the result and state a limitation when evidence is incomplete.

Worked examples

Worked example 1

QUESTION

18 of 45 students travel by bus. Find the sector angle.

- 1 Identify:** Name the data structure and the statistic or display required.
- 2 Apply:** Use the definition or method carefully: 144°
- 3 Interpret:** State what the result means in the context.

ANSWER 144°

Worked example 2

QUESTION

A 72° sector represents what fraction?

- 1 Read:** Check totals, scale, units and any ordering.
- 2 Reason:** The required conclusion is $\frac{1}{5}$
- 3 Check:** Ask whether the conclusion is supported by the data.

ANSWER $\frac{1}{5}$

Guided practice

GUIDED QUESTION 1

A 90° sector in a survey of 80: find frequency.

HINT

Write the relevant definition or formula first, then use values and units from the context.

GUIDED QUESTION 2

Angles are $120^\circ, 80^\circ, 70^\circ$ and x . Find x .

HINT

Write the relevant definition or formula first, then use values and units from the context.

Independent practice

Questions 1–3

Questions 4–6

- 18 of 45 students travel by bus. Find the sector angle.
- A 72° sector represents what fraction?
- A 90° sector in a survey of 80: find frequency.
- Angles are $120^\circ, 80^\circ, 70^\circ$ and x . Find x .
- Why must sector angles total 360° ?
- Why compare frequencies as well as pie-chart sectors?

AO2-AO3 REASONING

Explain why the chosen method is appropriate, identify one possible weakness in the evidence, and write a cautious conclusion supported by a quoted value.

LESSON 06 • S2**Time-series tables and line graphs**

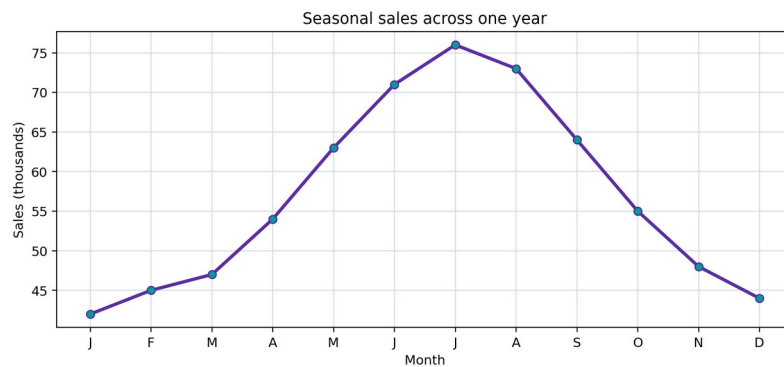
Question • representation • calculation • interpretation

SPECIFICATION ALIGNMENT

AQA reference S2. This lesson teaches the meaning, method, appropriate representation and interpretation expected at Foundation tier.

KEY VOCABULARY

time series • chronological • trend • seasonal pattern • anomaly • interpolation

**Understand the idea**

Time-series data is recorded in time order. Plot time on the horizontal axis and the measured quantity on the vertical axis, then join consecutive points to reveal change.

A trend is the broad direction over time. A seasonal pattern repeats at regular intervals. An anomaly is an unusual value that does not fit the surrounding pattern and should be investigated, not automatically deleted.

A line between recorded points can help estimate an intermediate value, but it does not prove the quantity changed smoothly. Predictions beyond the observed period become less reliable.

DECISION CHECK

Before calculating, identify the population, variable type and whether the chosen summary or

diagram actually answers the question.

COMMON MISCONCEPTION

A correct calculation does not rescue biased data or an unsuitable graph. Always interpret the result and state a limitation when evidence is incomplete.

Worked examples

Worked example 1

QUESTION

Which month has the highest sales?

- 1 Identify:** Name the data structure and the statistic or display required.
- 2 Apply:** Use the definition or method carefully: July
- 3 Interpret:** State what the result means in the context.

ANSWER

July

Worked example 2

QUESTION

Describe the pattern from January to July.

- 1 Read:** Check totals, scale, units and any ordering.
- 2 Reason:** The required conclusion is They rise overall from 42 to 76 thousand.
- 3 Check:** Ask whether the conclusion is supported by the data.

ANSWER

They rise overall from 42 to 76 thousand.

Guided practice

GUIDED QUESTION 1

Estimate sales halfway between April 54 and May 63, assuming linear change.

HINT

Write the relevant definition or formula first, then use values and units from the context.

GUIDED QUESTION 2

Give one possible reason for an anomaly.

HINT

Write the relevant definition or formula first, then use values and units from the context.

Independent practice

Questions 1–3

1. Which month has the highest sales?

2. Describe the pattern from January to July.

3. Estimate sales halfway between April 54 and May 63, assuming linear change.

Questions 4–6

4. Give one possible reason for an anomaly.

5. Why must points be plotted in time order?

6. Is a prediction for next month certain?

AO2–AO3 REASONING

Explain why the chosen method is appropriate, identify one possible weakness in the evidence, and write a cautious conclusion supported by a quoted value.

LESSON 07 • S4

Mean, median, mode and modal class

Question • representation • calculation • interpretation

SPECIFICATION ALIGNMENT

AQA reference S4. This lesson teaches the meaning, method, appropriate representation and interpretation expected at Foundation tier.

KEY VOCABULARY

mean • median • mode • modal class • total • ordered data • frequency



Understand the idea

The mean redistributes the total equally: $\text{mean} = \text{sum of values} \div \text{number of values}$. With a frequency table, use $\text{sum of (value} \times \text{frequency)} \div \text{sum of frequencies}$.

The median is the middle value after ordering. For an even number of values, average the two middle values. The mode is the most frequent exact value; grouped data may only reveal a modal class.

Choose an average for the context. The mean uses every value but is pulled by extremes. The median is resistant to extremes. The mode is useful for the most common category or size.

DECISION CHECK

Before calculating, identify the population, variable type and whether the chosen summary or diagram actually answers the question.

COMMON MISCONCEPTION

A correct calculation does not rescue biased data or an unsuitable graph. Always interpret the result and state a limitation when evidence is incomplete.

Worked examples

Worked example 1

QUESTION

Find the mean of 2,4,4,5,10.

1 Identify: Name the data structure and the statistic or display required.

2 Apply: Use the definition or method carefully: 5

3 Interpret: State what the result means in the context.

ANSWER

5

Worked example 2

QUESTION

Find the median.

1 Read: Check totals, scale, units and any ordering.

2 Reason: The required conclusion is 4

3 Check: Ask whether the conclusion is supported by the data.

ANSWER

4

Guided practice

GUIDED QUESTION 1

Find the mode.

HINT

Write the relevant definition or formula first, then use values and units from the context.

GUIDED QUESTION 2

Values 1,2,3 have frequencies 2,3,5. Find the mean.

HINT

Write the relevant definition or formula first, then use values and units from the context.

Independent practice

Questions 1–3

1. Find the mean of 2,4,4,5,10.

2. Find the median.

3. Find the mode.

Questions 4–6

4. Values 1,2,3 have frequencies 2,3,5. Find the mean.

5. Why might median suit house prices?

6. Can a data set have no mode?

AO2–AO3 REASONING

Explain why the chosen method is appropriate, identify one possible weakness in the evidence,

and write a cautious conclusion supported by a quoted value.

LESSON 08 • S4, S5

Range, outliers and comparing distributions

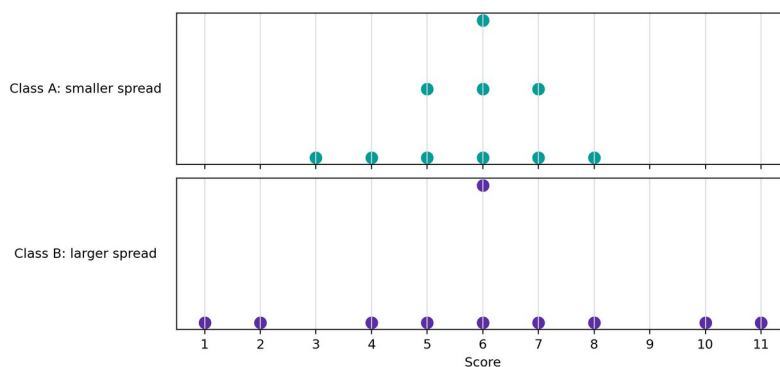
Question • representation • calculation • interpretation

SPECIFICATION ALIGNMENT

AQA reference S4, S5. This lesson teaches the meaning, method, appropriate representation and interpretation expected at Foundation tier.

KEY VOCABULARY

range • spread • consistency • outlier • distribution • compare • context



Understand the idea

The range measures spread: maximum – minimum. A smaller range usually indicates greater consistency, but it uses only two values and can be changed greatly by one outlier.

To compare distributions, make two linked statements: compare a suitable average for typical performance and compare range for consistency. Quote values and return to the context.

An outlier is unusually far from the rest. It may be an error or a genuine important result. Investigate its cause before deciding whether exclusion is justified, and state any decision.

DECISION CHECK

Before calculating, identify the population, variable type and whether the chosen summary or diagram actually answers the question.

COMMON MISCONCEPTION

A correct calculation does not rescue biased data or an unsuitable graph. Always interpret the result and state a limitation when evidence is incomplete.

Worked examples

Worked example 1

QUESTION

Find the range of 3,4,5,5,6,8.

1 Identify: Name the data structure and the statistic or display required.

2 Apply: Use the definition or method carefully: 5

3 Interpret: State what the result means in the context.

ANSWER

5

Worked example 2

QUESTION

Sets A and B have means 6 and 7. Which has higher typical value?

1 Read: Check totals, scale, units and any ordering.

2 Reason: The required conclusion is B

3 Check: Ask whether the conclusion is supported by the data.

ANSWER

B

Guided practice

GUIDED QUESTION 1

Ranges are 4 and 10. Which is more consistent?

HINT

Write the relevant definition or formula first, then use values and units from the context.

GUIDED QUESTION 2

Why can range be unreliable?

HINT

Write the relevant definition or formula first, then use values and units from the context.

Independent practice

Questions 1–3

- Find the range of 3,4,5,5,6,8.
- Sets A and B have means 6 and 7. Which has higher typical value?
- Ranges are 4 and 10. Which is more consistent?

Questions 4–6

- Why can range be unreliable?
- Write a complete comparison using mean 68 vs 72 and range 12 vs 20.
- Should every outlier be removed?

AO2–AO3 REASONING

Explain why the chosen method is appropriate, identify one possible weakness in the evidence, and write a cautious conclusion supported by a quoted value.

LESSON 09 • S6

Scatter graphs, correlation and lines of best fit

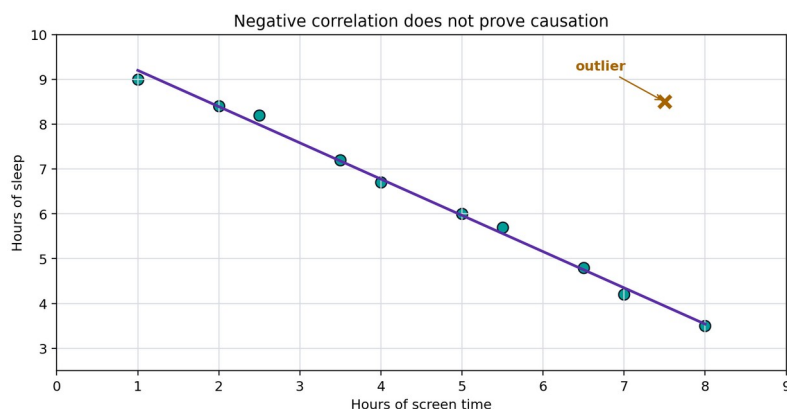
Question • representation • calculation • interpretation

SPECIFICATION ALIGNMENT

AQA reference S6. This lesson teaches the meaning, method, appropriate representation and interpretation expected at Foundation tier.

KEY VOCABULARY

bivariate • correlation • positive • negative • outlier • line of best fit • estimate



Understand the idea

A scatter graph pairs two measurements from each individual. Positive correlation rises left to right; negative correlation falls; no correlation has no clear linear pattern. Strength describes how tightly points follow a trend.

Correlation does not prove causation. A third factor may influence both variables, the direction may be reversed, or the pattern may be coincidental.

A line of best fit follows the centre of the pattern with roughly balanced points above and below. Use it for interpolation within the data range. Extrapolation beyond the range is risky because the relationship may change.

DECISION CHECK

Before calculating, identify the population, variable type and whether the chosen summary or diagram actually answers the question.

COMMON MISCONCEPTION

A correct calculation does not rescue biased data or an unsuitable graph. Always interpret the result and state a limitation when evidence is incomplete.

Worked examples

Worked example 1

QUESTION

Describe the correlation shown.

- 1 Identify:** Name the data structure and the statistic or display required.
- 2 Apply:** Use the definition or method carefully: negative correlation
- 3 Interpret:** State what the result means in the context.

ANSWER

negative correlation

Worked example 2

QUESTION

Identify the unusual point.

- 1 Read:** Check totals, scale, units and any ordering.
- 2 Reason:** The required conclusion is approximately (7.5, 8.5)

3 Check: Ask whether the conclusion is supported by the data.

ANSWER

approximately (7.5, 8.5)

Guided practice

GUIDED QUESTION 1

Estimate sleep when screen time is 4.5 hours.

HINT

Write the relevant definition or formula first, then use values and units from the context.

GUIDED QUESTION 2

Why does correlation not prove screen time causes sleep loss?

HINT

Write the relevant definition or formula first, then use values and units from the context.

Independent practice

Questions 1–3

1. Describe the correlation shown.
2. Identify the unusual point.
3. Estimate sleep when screen time is 4.5 hours.

Questions 4–6

4. Why does correlation not prove screen time causes sleep loss?
5. Which is safer: interpolation or extrapolation?
6. Should a line of best fit join every point?

AO2–AO3 REASONING

Explain why the chosen method is appropriate, identify one possible weakness in the evidence, and write a cautious conclusion supported by a quoted value.

LESSON 10 • S2, S4, S5, S6

Choosing, interpreting and criticising statistics

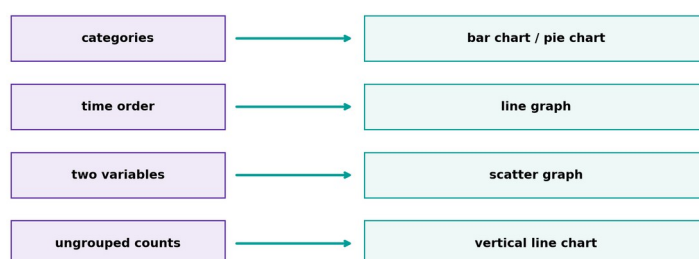
Question • representation • calculation • interpretation

SPECIFICATION ALIGNMENT

AQA reference S2, S4, S5, S6. This lesson teaches the meaning, method, appropriate representation and interpretation expected at Foundation tier.

KEY VOCABULARY

appropriate display • misleading scale • sample size • source • conclusion • limitation



Understand the idea

Choose a display from the structure of the data: bar or pie chart for categories, line graph for time series, vertical line chart for discrete numerical frequencies, and scatter graph for paired variables.

A statistical claim is only as strong as its evidence. Check who was measured, how they were selected, sample size, missing responses, units, time period and whether the graph's scale or area exaggerates differences.

A strong conclusion quotes evidence, answers the original question and states a limitation. Avoid absolute language such as proves or always when a sample, estimate or association is involved.

DECISION CHECK

Before calculating, identify the population, variable type and whether the chosen summary or diagram actually answers the question.

COMMON MISCONCEPTION

A correct calculation does not rescue biased data or an unsuitable graph. Always interpret the result and state a limitation when evidence is incomplete.

Worked examples

Worked example 1

QUESTION

Choose a chart for monthly rainfall across a year.

- 1 Identify:** Name the data structure and the statistic or display required.
- 2 Apply:** Use the definition or method carefully: a time-series line graph
- 3 Interpret:** State what the result means in the context.

ANSWER

a time-series line graph

Worked example 2

QUESTION

Choose a chart for height and arm span.

- 1 Read:** Check totals, scale, units and any ordering.
- 2 Reason:** The required conclusion is a scatter graph
- 3 Check:** Ask whether the conclusion is supported by the data.

ANSWER

a scatter graph

Guided practice

GUIDED QUESTION 1

Why is a bar axis beginning at 98 misleading for values 99 and 100?

HINT

Write the relevant definition or formula first, then use values and units from the context.

GUIDED QUESTION 2

What information should accompany a percentage?

HINT

Write the relevant definition or formula first, then use values and units from the context.

Independent practice

Questions 1–3

1. Choose a chart for monthly rainfall across a year.
2. Choose a chart for height and arm span.
3. Why is a bar axis beginning at 98 misleading for values 99 and 100?

Questions 4–6

4. What information should accompany a percentage?
5. Improve “This proves all teenagers prefer X.”
6. Give one check before accepting online secondary data.

AO2–AO3 REASONING

Explain why the chosen method is appropriate, identify one possible weakness in the evidence, and write a cautious conclusion supported by a quoted value.

Answer and reasoning guide

Lesson 1: Types of data and statistical language

1. categorical

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

2. discrete numerical

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

3. continuous numerical

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

4. secondary

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

5. It can be collected specifically for the investigation.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

6. Without units, the size and meaning of a measurement are ambiguous.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

Lesson 2: Populations, samples, censuses and bias

1. all 900 pupils

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

2. the 80 pupils asked

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

3. It is usually quicker and cheaper.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

4. Football-team members may have different interests from the whole school.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

5. Use a random-number generator, or systematic sampling with a random start.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

6. No. A sample supports an estimate and has sampling uncertainty.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

Lesson 3: Tally charts, frequency tables and grouped data

1. 30

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

2. $10 < t \leq 20$

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

3. The value 10 could be placed in either class.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

4. 17

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

5. Two observations are missing or misrecorded.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

6. Values within each interval are not retained individually.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

Lesson 4: Bar charts, vertical line charts and pictograms

1. 18

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

2. 12

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

3. a vertical line chart

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

4. 4

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

5. The categories are separate, not a continuous scale.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

6. The scale intervals are unequal and misleading.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

Lesson 5: Pie charts and proportional angles

1. 144°

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

2. 1/5

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

3. 20

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

4. 90°

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

5. The sectors represent the complete data set.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

6. Equal percentages may come from very different sample sizes.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

Lesson 6: Time-series tables and line graphs

1. July

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

2. They rise overall from 42 to 76 thousand.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

3. 58.5 thousand

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

4. A recording error, one-off event or genuine unusual condition.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

5. The graph represents change through time.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

6. No; it is an estimate based on a pattern that may change.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

Lesson 7: Mean, median, mode and modal class

1. 5

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

2. 4

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

3. 4

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

4. 2.3

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

5. A few extremely expensive houses can distort the mean.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

6. Yes, if no value occurs more often than the others.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

Lesson 8: Range, outliers and comparing distributions

1. 5

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

2. B

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

3. the set with range 4

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

4. It depends only on the minimum and maximum and is sensitive to outliers.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

5. The second group is typically higher (mean 72 vs 68), but the first is more consistent (range 12 vs 20).

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

6. No. Check whether it is an error or a valid unusual observation.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

Lesson 9: Scatter graphs, correlation and lines of best fit

1. negative correlation

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

2. approximately (7.5, 8.5)

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

3. about 6.3 hours; answers depend on the drawn line

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

4. Other variables may affect both, so the graph alone cannot establish cause.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

5. interpolation

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

6. No. It should represent the overall trend with balanced residuals.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

Lesson 10: Choosing, interpreting and criticising statistics

1. a time-series line graph

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

2. a scatter graph

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

3. It visually magnifies a difference of only 1 unit.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

4. the sample size and how the sample was selected

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

5. The sample suggests a preference for X among those surveyed, but may not represent all teenagers.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

6. Check the source, date, collection method and definitions.

Method check: identify the data structure, apply the relevant definition or calculation, quote units or values where needed, and keep the conclusion within the evidence.

Unit 6 mastery record

AQA	I can demonstrate...	Secure?
S4	Types of data and statistical language	☐
S1, S5	Populations, samples, censuses and bias	☐
S2	Tally charts, frequency tables and grouped data	☐
S2	Bar charts, vertical line charts and pictograms	☐
S2	Pie charts and proportional angles	☐
S2	Time-series tables and line graphs	☐
S4	Mean, median, mode and modal class	☐
S4, S5	Range, outliers and comparing distributions	☐
S6	Scatter graphs, correlation and lines of best fit	☐
S2, S4, S5, S6	Choosing, interpreting and criticising statistics	☐

Official specification source

AQA GCSE Mathematics (8300), Subject Content 3.6 Statistics:

<https://www.aqa.org.uk/subjects/mathematics/gcse/mathematics-8300/specification/subject-content/3.6-statistics>

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