AQA
Realising potential

GCSE
STATISTICS
(8382)

Specification
For teaching from September 2017 onwards
For exams in 2019 onwards

Version 1.1 26 February 2018

Contents

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1 Introduction

1.1 Why choose AQA for GCSE Statistics

Statistics is about making decisions when there is uncertainty. Perhaps one of the most versatile areas of maths, it gives students the skills to collect, analyse, interpret and present data.

It complements subjects such as GCSE Biology, Psychology, Geography, Business and Economics, and opens the door to a variety of careers – from weather forecasting to the biological sciences.

A specification designed for you and your students

This new qualification retains much of the content that we know you and your students enjoy. Our new qualification is fully co-teachable alongside our GCSE Maths, helping you teach GCSE Statistics students in the same class. Topics are clearly and logically structured and include:

- understanding the importance of careful planning, a clear strategy for collecting, recording and processing data in order to address an identified question or hypothesis
- generating data visualisation and understanding the maths involved.

Clear, well-structured exams, accessible for all

To enable your students to show their breadth of knowledge and understanding, we've created a simple and straightforward structure and layout to our papers, using a mixture of question styles. There will be no coursework.

You can find out about all our Statistics qualifications at aqa.org.uk/mathematics

1.2 Support and resources to help you teach

We've worked with experienced teachers to provide you with a range of resources that will help you confidently plan, teach and prepare for exams.

1.2.1 Teaching resources

Visit aqa.org.uk/8382 to see all our teaching resources. They include:

- sample schemes of work and route maps to help you plan your course with confidence
- Teaching guidance which provides a summary of changes to content and a summary of key features
- training courses to help you deliver AQA Statistics qualifications
- subject expertise courses for all teachers, from newly qualified teachers who are just getting started to experienced teachers looking for fresh inspiration.

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- Exampro: a searchable bank of past AQA exam questions
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2 Specification at a glance

This qualification is linear. Linear means that students will sit all their exams at the end of the course.

2.1 Subject content

2.2 Assessments

GCSE Statistics has a Foundation tier (grades 1 – 5) and a Higher tier (grades 4 – 9). Students must take two question papers at the same tier. All question papers must be taken in the same series.

A student taking Foundation tier assessments will be awarded a grade within the range of 1 to 5. Students who fail to reach the minimum standard for grade 1 will be recorded as U (unclassified) and will not receive a qualification certificate.

A student taking Higher tier assessments will be awarded a grade within the range of 4 to 9. A student sitting the Higher tier who **just** fails to achieve grade 4 will be awarded an allowed grade 3. Students who fail to reach the minimum standard for the allowed grade 3 will be recorded as U (unclassified) and will not receive a qualification certificate.

The information in the table below is the same for both Foundation and Higher tiers.

The Subject content section shows the content that is assessed in each tier.

Paper 1
What's assessed All specification content.
How it's assessed • Written exam: 1 hour 45 minutes • Tiered Higher and Foundation • 80 marks • 50% of GCSE
Questions • Multiple choice, short answer and a Statistical Enquiry Cycle (SEC) question.

Paper 2
What's assessed All specification content.
How it's assessed • Written exam: 1 hour 45 minutes • Tiered Higher and Foundation • 80 marks • 50% of GCSE
Questions • Multiple choice, short answer and a Statistical Enquiry Cycle (SEC) question.

3 Subject content

The subject content of this specification matches that set out in the Department for Education's *Statistics GCSE subject content and assessment objectives* document. This content is common to all exam boards.

The subject content, aims and learning outcomes, and assessment objectives sections of this specification set out the knowledge, skills and understanding common to all GCSE Statistics exams.

Within this specification, the assessment will reflect the key concepts of the subject as articulated in the *Statistics GCSE subject content and assessment objectives* document.

In line with the requirements set by the Department for Education, the expectation is that:

- all students will develop confidence and competence with the content identified in the 'basic foundation content' column
- all students will be assessed on the content identified by the 'basic foundation content' and 'additional foundation content' columns; more highly attaining students will develop confidence and competence with all of this content
- only the more highly attaining students will be assessed on the content identified in the 'higher content' column. The highest attaining students will develop confidence and competence with this content.

Students can be said to have confidence and competence with mathematical content when they can apply it flexibly to solve problems.

The content in the 'basic foundation content' column and 'additional foundation content' column can be assessed on Foundation tier question papers.

All content can be assessed on Higher tier question papers.

Notes are added to exemplify some of the specification references.

In addition to this subject content, students should be able to recall, select and apply mathematical formulae. See Appendix 1 (page 37) for a list of the DfE prescribed formulae.

3.1 Section A

Understand the importance of the careful planning of a clear strategy for collecting, recording and processing data in order to address an identified question or hypothesis.

3.1.1 A1

Basic foundation content	Additional foundation content	Higher content only
Know that a hypothesis can only be tested through the appropriate collection and analysis of data.		

Notes: formal use of null hypothesis will not be required.

3.1.2 A2

Basic foundation content	Additional foundation content	Higher content only
Know the constraints that may be faced in designing an investigation to test a hypothesis: these may include factors such as time, costs, ethical issues, confidentiality and convenience etc.		

3.1.3 A3

Basic foundation content	Additional foundation content	Higher content only
Determine proactive strategies to mitigate issues that might arise during the statistical enquiry process. For example, dealing with difficulties in identifying the population, non-response issues or unexpected outcomes.		

Notes: students will be expected to be familiar with issues that arise in the collection of real data and how these issues could be prevented or have their effect minimised.

3.2 Section B

Recognise the opportunities, constraints and implications for subsequent mathematical analysis involved in obtaining appropriate data through careful design of primary data collection techniques or through the use of reference sources for secondary data to ensure unbiased research.

3.2.1 B1a

Basic foundation content	Additional foundation content	Higher content only
Know and apply terms used to describe different types of data that can be collected for statistical analysis: • raw data • categorical • ordinal • discrete • continuous • ungrouped • grouped.	In addition to the terms in the basic foundation content, know and apply the following terms used to describe different types of data that can be collected for statistical analysis: • quantitative • qualitative • bivariate.	In addition to the terms in the foundation content, know and apply the following term used to describe different types of data that can be collected for statistical analysis: multivariate.

3.2.2 B1b

Basic foundation content	Additional foundation content	Higher content only
Know the advantages and implications of merging data into more general categories, and of grouping numerical data into class intervals.		

Notes: students may be required to make decisions about appropriate class intervals given a data set.

3.2.3 B1c

Basic foundation content	Additional foundation content	Higher content only
	Know and apply the terms explanatory or independent variables and response or dependent variables.	

3.2.4 B2a

Basic foundation content	Additional foundation content	Higher content only
Know the difference between primary and secondary data.		

Notes: students should be aware of limitations or implications of using secondary data.

3.2.5 B2b

Basic foundation content	Additional foundation content	Higher content only
Know that data can be collected from different sources: • experimental (laboratory, field and natural) • simulation • questionnaires • observation • reference • census • population • sampling. In addition,sources of secondary data should be acknowledged.		

Notes: students should know the specific or relative benefits and limitations of each of the collection methods and be able to discuss these in context.

3.2.6 B2c

Basic foundation content	Additional foundation content	Higher content only
	Know the importance of reliability and validity with regards to collected data.	

Notes: students should know that reliability is the extent to which something gives results that are consistent. Students should know that validity is the extent to which something measures what it is supposed to measure.

3.2.7 B2d

Basic foundation content	Additional foundation content	Higher content only
	Determine factors that may lead to bias, including issues of sensitivity of the content matter, and know how to minimise data distortion.	In addition to the foundation content, students should know how to minimise data distortion including level of control.

3.2.8 B3a

Basic foundation content	Additional foundation content	Higher content only
Know the difference between population, sample frame and sample.		

Notes: students should know that the population might not all be available for sampling.

3.2.9 B3b

Basic foundation content	Additional foundation content	Higher content only
Know that 'population' can have different meanings within a stated context.		

3.2.10 B3c

Basic foundation content	Additional foundation content	Higher content only
Know reasons for employing judgement or opportunity (convenience) sampling, and the associated risks of bias when these techniques are used.		

3.2.11 B3d

Basic foundation content	Additional foundation content	Higher content only
Use appropriate sampling techniques in the context of the problem to avoid bias: • random • systematic.	Use appropriate sampling techniques in the context of the problem to avoid bias: quota.	

3.2.12 B3e

Basic foundation content	Additional foundation content	Higher content only
Know the key features of a simple random sample.	Demonstrate understanding of how different techniques, both physical and electronic, are used to select random members from a population including, but not limited to: • dice • cards • random number lists • calculator functions.	

Notes: students will not be expected to derive samples using these techniques in the exam.

3.2.13 B3f

Basic foundation content	Additional foundation content	Higher content only
	Use stratification and know when this is appropriate before sampling takes place.	

Notes: students should know that stratification is not a method of sampling but a method which may be used before sampling takes place.

3.2.14 B4

Basic foundation content	Additional foundation content	Higher content only
Know the key features to be considered when planning data collection: • leading questions • avoiding biased sources • time factors • open/closed questions • different types of interview technique.		

Notes: both in theory and in specific contexts.

3.2.15 B5a

Basic foundation content	Additional foundation content	Higher content only
Know and demonstrate understanding of techniques used to deal with problems that may arise with collected data for example: • missing data • incorrect formats • non-responses • incomplete responses etc.		

Notes: both in theory and in context.

3.2.16 B5b

Basic foundation content	Additional foundation content	Higher content only
Know why data may need to be 'cleaned' before further processing, including issues that arise on spreadsheets and apply techniques to clean data in context.		

Notes: students may be asked to use techniques to identify issues in raw or summarised data. For example, identifying a wrongly recorded value by considering row or column totals or considering whether values are consistent with other values within the data. Awareness of the need to remove extraneous notation or symbols may be required.

3.2.17 B5c

Basic foundation content	Additional foundation content	Higher content only
	Know the importance of identifying and controlling extraneous variables.	The use of control groups.

3.3 Section C

Generate data visualisation and understand the mathematics required to derive these visualisations.

3.3.1 C1a

Basic foundation content	Additional foundation content	Higher content only
Represent data sets pictorially using calculated key values as necessary, and interpret and compare data sets displayed pictorially as: • tabulation • tally • pictogram.	Represent data sets pictorially using calculated key values as necessary, and interpret and compare data sets displayed pictorially as: • pie chart • stem and leaf diagram • Venn diagram.	

Notes: includes back-to-back stem and leaf diagrams.

3.3.2 C1b

Basic foundation content	Additional foundation content	Higher content only
Interpret and compare data sets displayed pictorially.	Interpret and compare data sets displayed in the following formats: • population pyramid • choropleth map.	Interpret and compare data sets displayed in the following formats: • comparative pie chart • comparative 2D representations • comparative 3D representations.

Notes: students will not be expected to draw 3D representations.

3.3.3 C2

Basic foundation content	Additional foundation content	Higher content only
Represent data sets graphically using calculated key values as necessary, and interpret and compare data sets displayed graphically as: • bar charts • line charts • time series • scatter charts.	Interpret and compare data sets displayed graphically as: • bar line charts • frequency polygons • cumulative frequency (discrete and grouped) charts • histograms (equal width) • box plots.	Calculate and use frequency density to draw histograms (unequal width), and interpret and compare data sets displayed in histograms (unequal width).

Notes: includes dual, multiple, composite and percentage bar charts. Includes cumulative frequency step polygons for discrete data.

3.3.4 C3a

Basic foundation content	Additional foundation content	Higher content only
Justify the appropriate format and produce accurate visualisation of data.		

Notes: justifications include, but are not limited to, the type of data.

3.3.5 C3b

Basic foundation content	Additional foundation content	Higher content only
Recognise where errors in construction lead to graphical misrepresentation including but not limited to incorrect scales, truncated axis, distorted sizing.		Recognise where the misuse of formula when calculating the frequency densities of histograms can lead to graphical misrepresentation.

Notes: students will be expected to critique graphical misrepresentation from secondary sources.

3.3.6 C4a

Basic foundation content	Additional foundation content	Higher content only
Extract and calculate corresponding values in order to compare data sets that have been presented in different formats and be able to present the same information in multiple formats.		

Notes: students should be able to, for example, compare medians and interquartile ranges or means and standard deviations. These may be given or may have to be calculated.

3.3.7 C4b

Basic foundation content	Additional foundation content	Higher content only
Select appropriate form of representation.	Select and justify appropriate form of representation with regard to the nature of data.	

3.4 Section D

Calculate statistical measures to compare data.

3.4.1 D1a

Basic foundation content	Additional foundation content	Higher content only
Calculate averages for discrete and grouped data: • mode • median • arithmetic mean.		Calculate averages for discrete and grouped data: • weighted mean • geometric mean • mean seasonal variation.

Notes: use of the term 'mean' should be assumed to be arithmetic mean in exams, unless the word geometric is used.

3.4.2 D1b

Basic foundation content	Additional foundation content	Higher content only
	Justify the rationale for selecting appropriate types of average in context.	

Notes: students should understand when the geometric mean may be more useful than the arithmetic mean.

3.4.3 D2

Basic foundation content	Additional foundation content	Higher content only
Determine skewness from data by inspection.		Determine skewness from data by calculation.

Notes: formulae for skewness will be given when required.

3.4.4 D3a

Basic foundation content	Additional foundation content	Higher content only
Calculate different measures of spread: • range • quartiles.	In addition those in the basic foundation content, calculate the following measures of spread: • interquartile range • percentiles.	In addition those in the foundation content, calculate the following measures of spread: • interpercentile range • interdecile range • standard deviation.

Notes: when calculating quartiles data sets will have n values where n is one less than a multiple of 4.

3.4.5 D3b

Basic foundation content	Additional foundation content	Higher content only
Identify outliers by inspection.		Identify outliers by using appropriate calculations.

Notes: using, as appropriate, either:

- more than 1.5 interquartile ranges from the relevant quartile
- more than 3 standard deviations from the mean.

3.4.6 D4

Basic foundation content	Additional foundation content	Higher content only
Identify trends in data through inspection.	Identify trends in data by calculation of 4 point moving averages.	Identify trends in data by calculation of moving averages which have been determined to be appropriate.

3.4.7 D5

Basic foundation content	Additional foundation content	Higher content only
Determine line of best fit by eye.	Determine line of best fit by drawing through a calculated double mean point $(\overline{x}, \overline{y})$.	Determine line of best fit by using the equation of the regression line.

Notes: double mean points, when used, should be plotted.

3.4.8 D6

Basic foundation content	Additional foundation content	Higher content only
		Apply formula to determine Spearman's rank correlation coefficient. Values found using calculator functions will be permissible.

Notes: the formula will be given in the question.

3.4.9 D7

Basic foundation content	Additional foundation content	Higher content only
Use collected data to calculate estimates of probabilities.		

3.5 Section E

Use visualisation and calculation to interpret results with reference to the context of the problem, and to evaluate the validity and reliability of statistical findings.

3.5.1 E1a

Basic foundation content	Additional foundation content	Higher content only
Compare the probability of different possible outcomes using the 0–1 or 0–100% scale.		

Notes: using fractions, decimal and percentages.

3.5.2 E1b

Basic foundation content	Additional foundation content	Higher content only
Use probability values to calculate expected frequency of a specified characteristic within a sample or population.		

3.5.3 E1c

Basic foundation content	Additional foundation content	Higher content only
	Use collected data and calculated probabilities to determine and interpret relative risks and absolute risks, and express in terms of expected frequencies in groups.	

3.5.4 E2a

Basic foundation content	Additional foundation content	Higher content only
Compare experimental data with theoretical predictions to identify possible bias within the experimental design.		

3.5.5 E2b

Basic foundation content	Additional foundation content	Higher content only
Recognise that experimental probability will tend towards theoretical probability as the number of trials increases when all variables are random.		

Notes: includes making estimates of theoretical probability from a relative frequency table or diagram.

3.5.6 E2c

Basic foundation content	Additional foundation content	Higher content only
	Use two-way tables, sample space diagrams, tree diagrams and Venn diagrams to represent all the different outcomes possible for at most three events.	

Notes: includes the calculation and use of appropriate probabilities from the use of these diagrams.

3.5.7 E3a

Basic foundation content	Additional foundation content	Higher content only
Compare different data sets using appropriate calculated or given measure of central tendency: mode, modal group, median and mean.		

3.5.8 E3b

Basic foundation content	Additional foundation content	Higher content only
Compare different data sets using appropriate calculated or given measure of spread: range.	Compare different data sets using appropriate calculated or given measure of spread: • interquartile range • percentiles.	Compare different data sets using appropriate calculated or given measure of spread: standard deviation.

Notes: comparisons should be context based interpretations, not just observations of difference. Use of calculator functions is encouraged.

3.5.9 E3c

Basic foundation content	Additional foundation content	Higher content only
	Use calculated or given median and interquartile range to compare data samples and to compare sample data with population data.	Use calculated or given interpercentile range or interdecile range or mean and standard deviation to compare data samples and to compare sample data with population data..

Notes: comparisons should be context-based interpretations, not just observations of difference. Use of calculator functions is encouraged.

3.5.10 E3d

Basic foundation content	Additional foundation content	Higher content only
Interpret data presented in a variety of tabular forms.		

Notes: including published secondary data.

3.5.11 E4a

Basic foundation content	Additional foundation content	Higher content only
	Know and apply the formal notation for independent events.	

3.5.12 E4b

Basic foundation content	Additional foundation content	Higher content only
	Know and apply the formal notation for conditional probability.	

Notes: includes the use of Venn, sample space, tree diagrams and two-way tables.

3.5.13 E5a

Basic foundation content	Additional foundation content	Higher content only
Interpret a distribution of data in terms of skewness identified from inspection.		Interpret a distribution of data in terms of skewness identified from calculation.

Notes: the formula will be given in the question. Students should be able to identify positive and negative skew. Decisions on the strength of the skew are not expected.

3.5.14 E5b

Basic foundation content	Additional foundation content	Higher content only
	Comment on outliers with reference to the original data.	

3.5.15 E6

Basic foundation content	Additional foundation content	Higher content only
	Interpret seasonal and cyclic trends in context.	Use such trends to make predictions.

3.5.16 E7a

Basic foundation content	Additional foundation content	Higher content only
Interpret data related to rates of change over time (including, but not limited to, births, deaths, house prices and unemployment) when given in graphical form.	Calculate and interpret rates of change over time from tables using context specific formula.	

Notes: rates of change formulae will be given in the question. This includes birth and death rates.

3.5.17 E7b

Basic foundation content	Additional foundation content	Higher content only
	Calculate and interpret rates of change over time from tables using context specific formula.	

Notes: rates of change formulae will be given in the question. This includes birth and death rates.

3.5.18 E7c

Basic foundation content	Additional foundation content	Higher content only
	Use different types of index numbers in context, including but not limited to retail price index, consumer price index and gross domestic product.	Use weighted index numbers in context.

3.5.19 E8a

Basic foundation content	Additional foundation content	Higher content only
Know and apply vocabulary of correlation: • positive • negative • zero • causation • association • interpolation • extrapolation.		

3.5.20 E8b

Basic foundation content	Additional foundation content	Higher content only
Make comparisons of correlation by inspection: strong or weak.		

Notes: use of the word 'moderate' for correlation will not be required.

Values of 0.6 or above or −0.6 or below will be considered strong. 0.2 up to but not including 0.6 or −0.2 down to but not including −0.6 will be considered weak.

Values between, but not including −0.2 and 0.2 will be considered as 'no correlation'.

3.5.21 E8c

Basic foundation content	Additional foundation content	Higher content only
	Know that correlation does not necessarily imply causation.	Know that there are multiple factors that may interact.

3.5.22 E9a

Basic foundation content	Additional foundation content	Higher content only
	Interpret given Spearman's rank correlation coefficient in the context of the problem.	Interpret calculated Spearman's rank correlation coefficient in the context of the problem.

Notes: formula will be given in the question.

3.5.23 E9b

Basic foundation content	Additional foundation content	Higher content only
		Interpret given Pearson's product moment correlation coefficient in the context of the problem.

3.5.24 E9c

Basic foundation content	Additional foundation content	Higher content only
		Understand the distinction between Spearman's rank correlation and Pearson's product moment correlation coefficients.

Notes: students should know that Spearman's measures the correlation of the rank orders whereas Pearson's measures the linear relationship.

3.5.25 E10a

Basic foundation content	Additional foundation content	Higher content only
		Comment on the differences between experimental and theoretical values in terms of possible bias.

Notes: formal tests of significance will not be required.

3.5.26 E10b

Basic foundation content	Additional foundation content	Higher content only
		Know and interpret the characteristics of a binomial distribution.

Notes: Including the notion of a fixed number of trials and a constant probability of 'success'. Students should know and use the characteristic of symmetry of probabilities where appropriate. The word 'binomial' will be used in assessments. Notation X ~ B (n , p) will not be used. The value of n will be no greater than 5.

3.5.27 E11a

Basic foundation content	Additional foundation content	Higher content only
		Know and interpret the characteristics of a Normal distribution.

Notes: including the symmetric bell-shape nature of the distribution.

3.5.28 E11b

Basic foundation content	Additional foundation content	Higher content only
		Know that, for a Normal distribution, values more than three standard deviations from the mean are very unusual; know that approximately 95% of the data lie within two standard deviations of the mean and that 68% (just over two thirds) lie within one standard deviation of the mean.

Notes: other than the results in E11b, no calculations for values or normal probabilities are expected.

3.5.29 E11c

Basic foundation content	Additional foundation content	Higher content only
		Use action and warning lines in quality assurance sampling applications.

3.5.30 E11d

Basic foundation content	Additional foundation content	Higher content only
		Use calculated or given means and standard deviation to standardise and interpret data collected in two comparable samples.

Notes: formulae will be given in the question.

3.5.31 E12a

Basic foundation content	Additional foundation content	Higher content only
	Use calculated or given summary statistical data to make estimates of population characteristics.	

3.5.32 E12b

Basic foundation content	Additional foundation content	Higher content only
	Use samples to estimate population mean.	

3.5.33 E12c

Basic foundation content	Additional foundation content	Higher content only
	Use sample data to predict population proportions.	

3.5.34 E12d

Basic foundation content	Additional foundation content	Higher content only
		Apply Petersen capture/recapture formula to calculate an estimate of the size of a population.

Notes: includes understanding possible assumptions that may affect the validity or reliability of the process.

3.5.35 E13a

Basic foundation content	Additional foundation content	Higher content only
Know that sample size has an impact on reliability and replication.		

3.5.36 E13b

Basic foundation content	Additional foundation content	Higher content only
		Know that a set of sample means is more closely distributed than individual values from the same population.

Notes: no formal use of the distribution of $\overline{X}$ is expected.

3.6 Statistical Enquiry Cycle (SEC)

The Statistical Enquiry Cycle (SEC) underpins the study of Statistics. Students need to be able to apply the knowledge and techniques outlined in this section within the framework of the SEC. The cycle covers five stages:

- initial planning
- data collection
- data processing and presentation
- interpretation of results
- evaluation and review.

The detail of the SEC that is common to all exam boards is provided in Appendix 3: statistical enquiry cycle (page 43). During their learning students should develop their understanding of the SEC through a variety of authentic contexts. Practical experience of the cycle is integral to their understanding of the principles of the SEC.

3.6.1 Initial planning

Students must understand the importance of initial planning when designing a line of enquiry or investigation including:

- defining a question or hypothesis (or hypotheses) to investigate
- deciding what data to collect, and how to collect and record it, giving reasons
- developing a strategy for how to process and represent the data giving reasons.

3.6.2 Data collection

Students must recognise the constraints involved in sourcing data including:

- when designing collection methods for primary data
- when researching sources of secondary data, including from reference publications, the internet and the media
- through appreciating the importance of acknowledging sources
- by recognising where issues of sensitivity may influence data availability.

3.6.3 Data processing and presentation

Students must understand the ways that data can be processed and presented including:

- organising and processing data, including an understanding of how technology can be used
- generating diagrams and visualisations to represent the data, including an understanding of outputs generated by appropriate technology
- generating statistical measures to compare data, understanding the advantages of using technology to automate processing.

3.6.4 Interpretation of results

Students must understand that results must be interpreted with reference to the context of the problem including:

- analysing/interpreting the diagrams and calculations/measures
- reaching conclusions that relate to the questions and hypotheses addressed

- making inferences and/or predictions
- discussing the reliability of findings.

Students must show an understanding of the importance of the clear and concise communication of findings and key ideas, and awareness of target audience.

3.6.5 Evaluation and review

Students must understand the importance of evaluating statistical work including:

- identifying weaknesses in approach or representation
- suggesting improvements to processes or the presentation
- refining the process to elicit further clarification of the initial hypothesis.

4 Scheme of assessment

Find past papers and mark schemes, and specimen papers for new courses, on our website at aqa.org.uk/pastpapers

This specification is designed to be taken over two years.

This is a linear qualification. In order to achieve the award, students must complete all assessments at the end of the course and in the same series.

GCSE exams and certification for this specification are available for the first time in May/June 2019 and then every May/June for the life of the specification.

All materials are available in English only.

Our GCSE exams in Statistics include questions that allow students to demonstrate their ability to:

- recall information
- draw together information from different areas of the specification
- apply their knowledge and understanding in practical and theoretical contexts.

4.1 Aims and learning outcomes

Courses based on this specification must encourage students to:

- use statistical techniques in a variety of authentic investigations, use real world data in contexts such as, but not limited to, populations, climate, sales etc.
- identify trends through carrying out appropriate calculations and data visualisation techniques
- apply statistical techniques across the curriculum, in subjects such as the sciences, social sciences, computing, geography, business and economics, and outside of the classroom in the world in general
- critically evaluate data, calculations and evaluations that would be commonly encountered in their studies and in everyday life
- understand how technology has enabled the collection, visualisation and analysis of large quantities of data to inform decision-making processes in public, commercial and academic sectors
- apply appropriate mathematical and statistical formulae, as set out in Appendix 1, and building upon prior knowledge, as listed in Appendix 2.

4.2 Assessment objectives

Assessment objectives (AOs) are set by Ofqual and are the same across all GCSE Statistics specifications and all exam boards.

The exams will measure how students have achieved the following assessment objectives.

- AO1: Demonstrate knowledge and understanding, using appropriate terminology and notation, of standard statistical techniques used to:
  - collect and represent data
  - calculate summary statistics and probabilities.
- AO2: Interpret statistical information and results in context and reason statistically to draw conclusions.
- AO3: Assess the appropriateness of statistical methodologies and the conclusions drawn through the application of the statistical enquiry cycle.

4.2.1 Assessment objective weightings for GCSE Statistics

4.2.1.1 Foundation tier

Assessment objectives (AOs)	Component weightings (approx %) +/-3%		Overall weighting (approx %) +/-3%
	Paper 1	Paper 2	
AO1	55	55	55
AO2	25	25	25
AO3	20	20	20
Overall weighting of components	50	50	100

4.2.1.2 Higher tier

Assessment objectives (AOs)	Component weightings (approx %) +/-3%		Overall weighting (approx %) +/-3%
	Paper 1	Paper 2	
AO1	55	55	55
AO2	25	25	25
AO3	20	20	20
Overall weighting of components	50	50	100

4.3 Assessment weightings

The marks awarded on the papers will be scaled to meet the weighting of the components. Students' final marks will be calculated by adding together the scaled marks for each component. Grade boundaries will be set using this total scaled mark. The scaling and total scaled marks are shown in the table below.

Component	Maximum raw mark	Scaling factor	Maximum scaled mark
Paper 1	80	x1	80
Paper 2	80	x1	80
		Total scaled mark:	160

5 General administration

You can find information about all aspects of administration, as well as all the forms you need, at aqa.org.uk/examsadmin

5.1 Entries and codes

You only need to make one entry for each qualification – this will cover all the question papers and certification.

Students can only be entered for foundation or higher tier not both.

Every specification is given a national discount (classification) code by the Department for Education (DfE), which indicates its subject area.

If a student takes two specifications with the same discount code:

- further and higher education providers are likely to take the view that they have only achieved one of the two qualifications
- only one of them will be counted for the purpose of the *School and College Performance tables* – the DfE's rules on 'early entry' will determine which one.

Please check this before your students start their course.

Qualification title	AQA entry code	DfE discount code
AQA GCSE in Statistics	8382	TBC

This specification complies with:

- Ofqual *General conditions of recognition* that apply to all regulated qualifications
- Ofqual GCSE qualification level conditions that apply to all GCSEs
- Ofqual GCSE subject level conditions that apply to all GCSEs in this subject
- all other relevant regulatory documents.

The Ofqual qualification accreditation number (QAN) is 603/1177/0.

5.2 Overlaps with other qualifications

There are no overlaps with any other AQA qualifications at this level.

5.3 Awarding grades and reporting results

The qualification will be graded on a nine-point scale: 1 to 9 – where 9 is the best grade.

A student taking Foundation Tier assessments will be awarded a grade within the range of 1 to 5. Students who fail to reach the minimum standard for grade 1 will be recorded as U (unclassified) and will not receive a qualification certificate.

A student taking Higher Tier assessments will be awarded a grade within the range of 4 to 9. A student sitting the Higher tier who just fails to achieve grade 4 will be awarded an allowed grade 3. Students who fail to reach the minimum standard for the allowed grade 3 will be recorded as U (unclassified) and will not receive a qualification certificate.

5.4 Resits and shelf life

Students can resit the qualification as many times as they wish, within the shelf life of the qualification.

5.5 Previous learning and prerequisites

Familiarity with KS3 programme of study and prior knowledge highlighted in Appendix 2 (page 41).

5.6 Access to assessment: diversity and inclusion

General qualifications are designed to prepare students for a wide range of occupations and further study. Therefore our qualifications must assess a wide range of competences.

The subject criteria have been assessed to see if any of the skills or knowledge required present any possible difficulty to any students, whatever their ethnic background, religion, sex, age, disability or sexuality. Tests of specific competences were only included if they were important to the subject.

As members of the Joint Council for Qualifications (JCQ) we participate in the production of the JCQ document *Access Arrangements and Reasonable Adjustments: General and Vocational qualifications*. We follow these guidelines when assessing the needs of individual students who may require an access arrangement or reasonable adjustment. This document is published at jcq.org.uk

Students with disabilities and special needs

We're required by the Equality Act 2010 to make reasonable adjustments to remove or lessen any disadvantage that affects a disabled student.

We can make arrangements for disabled students and students with special needs to help them access the assessments, as long as the competences being tested aren't changed. Access arrangements must be agreed **before** the assessment. For example, a Braille paper would be a reasonable adjustment for a Braille reader.

To arrange access arrangements or reasonable adjustments, you can apply using the online service at aqa.org.uk/eaqa

Special consideration

We can give special consideration to students who have been disadvantaged at the time of the assessment through no fault of their own – for example a temporary illness, injury or serious problem such as family bereavement. We can only do this **after** the assessment.

Your exams officer should apply online for special consideration at aqa.org.uk/eaqa

For more information and advice visit aqa.org.uk/access or email accessarrangementsqueries@aqa.org.uk

5.7 Working with AQA for the first time

If your school or college hasn't previously offered our specifications, you need to register as an AQA centre. Find out how at aqa.org.uk/becomeacentre

5.8 Private candidates

This specification is available to private candidates.

A private candidate is someone who enters for exams through an AQA approved school or college but is not enrolled as a student there.

A private candidate may be self-taught, home schooled or have private tuition, either with a tutor or through a distance learning organisation. They must be based in the UK.

If you have any queries as a private candidate, you can:

- speak to the exams officer at the school or college where you intend to take your exams
- visit our website at aqa.org.uk/privatecandidates
- email privatecandidates@aqa.org.uk

5.9 Use of calculators

Students may use a calculator in the exam. They must ensure that their calculator meets the requirements as set out in the *JCQ Instructions for conducting examinations*. These instructions make it clear what the requirements are for calculators (what they must be) and what they are not (what they must not be). The instructions are regularly updated and can be found at jcq.org.uk

Statistics requirements

For GCSE Statistics exams calculators should have the following as a minimum requirement:

- four rules
- square
- square root
- reciprocal function
- power function
- brackets
- a memory facility.

Students may use the statistical functions on their calculator, where appropriate, if they wish but this is not a requirement of the specification.

Appendix 1

Foundation tier

Formulae included in the GCSE Mathematics subject content. Students are expected to know these formulae; they must not be given in the assessment.

Specification reference	Formula required
B3f	In order to carry out stratification, calculating the percentage or proportion of an amount: $\frac{x}{100}$ × amount
C1a, C1b	Calculating the angle for a sector in a pie chart: $\frac{x}{\text{total}}$ × 360
C2	Frequency density for a histogram: $\text{frequency density} = \frac{\text{frequency}}{\text{classwidth}}$
D1a	Calculation of arithmetic mean: $\bar{x} = \frac{\Sigma fx}{\Sigma f}$
D3a	Range = highest value – lowest value
D3a	Interquartile range (IQR) = upper quartile – lower quartile
D7	Probability = $\frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}}$

Formula included in the GCSE Statistics subject content. Students are expected to know these formulae; they must not be given in the assessment.

Specification reference	Formula required
D4	4 point moving average = $\frac{x_1 + x_2 + x_3 + x_4}{4}$
D5	Calculate double mean point ($\bar{x}, \bar{y}$): $\bar{x} = \frac{\Sigma fx}{\Sigma f}$, $\bar{y} = \frac{\Sigma fy}{\Sigma f}$

Specification reference	Formula required
E4a	Formulae for independent events: P(A and B) = P(A) × P(B) P(A | B) = P(A) P(B | A) =P(B)
E4b	Formula for conditional probability $P(B \mid A) = \frac{P(A \text{ and } B)}{P(A)}$
E7c	Index number = $\frac{\text{current value of item}}{\text{value in base year}} \times 100$

Formula that students should be able to use, but need not memorise. These can be given in the assessment, either in the appropriate question, or in a list from which students select

and apply as appropriate.

Specification reference	Formula required
E7b	Rates of change (eg Birth rate = $\frac{\text{number of births} \times 1000}{\text{total population}}$)

Higher Tier

Formula included in the GCSE Mathematics subject content. Students are expected to know these formulae; they must not be given in the assessment.

Specification reference	Formula required
B3f	In order to carry out stratification, calculating the percentage or proportion of an amount: $\frac{x}{100}$ × amount
C1a, C1b	Calculating the angle for a sector in a pie chart: $\frac{x}{\text{total}} \times 360$
C2	Frequency density for a histogram: $\text{frequency density} = \frac{\text{frequency}}{\text{classwidth}}$
D1a	Calculation of arithmetic mean: $\overline{x} = \frac{\Sigma fx}{\Sigma f}$
D3a	Range = highest value – lowest value

Specification reference	Formula required
D3a	Interquartile range (IQR) = upper quartile – lower quartile
D7	Probability = $\frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}}$

Formulae included in the GCSE Statistics subject content. Students are expected to know these formulae; they must not be given in the assessment.

Specification reference	Formula required
C1b	Calculating the radius of a circle for a proportional pie chart: $r = \sqrt{\frac{\text{total} \times \text{old radius}^2}{\text{old total}}}$
D1a	Calculation of weighted mean: $\text{weighted mean} = \frac{\Sigma(\text{value} \times \text{weight})}{\Sigma \text{ weights}}$
D1a	Geometric mean $= \sqrt[n]{\text{value}_1 \times \text{value}_2 \times \ldots \times \text{value}_n}$
D3a	Interpercentile range and interdecile range as appropriate: percentile 1 – percentile 2 (calculation of a percentage needed as in B3 above)
D3b	Identification of an outlier: Small outlier is < LQ – 1.5IQR Large outlier is > UQ + 1.5IQR Outlier is also outside $\mu \pm 3\sigma$
D4	Moving averages (m.a.) *n* point moving average: $m.a. = \frac{x_1 + x_2 + \ldots + x_n}{n}$
D5	Calculate double mean point $(\bar{x}, \bar{y})$: $\bar{x} = \frac{\Sigma fx}{\Sigma f}$, $\bar{y} = \frac{\Sigma fy}{\Sigma f}$
E4a	Formulae for independent events: P(A and B) = P(A) × P(B) P(A | B) = P(A) P(B | A) = P(B)
E4b	Formula for conditional probability $P(B \mid A) = \frac{P(A \text{ and } B)}{P(A)}$

Specification reference	Formula required
E7c	$\text{Index number} = \frac{\text{current varient of item value in base year}}{\text{value in base year}} \times 100$
E7c	$\text{Weighted index number} = \frac{\sum(\text{index} \times \text{weight})}{\sum \text{weights}}$
E12d	Petersen capture recapture formula: $\text{Number in population} = \frac{\text{sample size 1} \times \text{sample size 2}}{\text{number marked in sample 2}}$

Formulae that students should be able to use, but need not memorise. These can be given in the assessment, either in the appropriate question, or in a list from which students select and apply as appropriate.

Specification reference	Formula required
D2	$\text{Skew} = \frac{3(\text{mean} - \text{median})}{\text{standard deviation}}$
D3a	$\text{Standard deviation} = \sqrt{\frac{1}{N}\sum(x-\bar{x})^2}$ alternative formula $\text{Standard deviation} = \sqrt{\frac{\sum x^2}{N} - \left(\frac{\sum x}{N}\right)^2}$
D6	Spearman's rank correlation coefficient $r_s = 1 - \frac{6\sum d_i^2}{n(n^2-1)}$
E7b	Rates of change (eg Birth rate = $\frac{\text{number of births} \times 1000}{\text{total population}}$)

Appendix 2: prior knowledge

Integers, fractions, decimals and percentages

- Work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and $\frac{7}{2}$ or 0.375 and $\frac{3}{8}$). Recognise that some fractions can be written as recurring decimals.
- Identify and work with fractions in ratio problems.
- Interpret fractions and percentages as operators.

Structure and calculation

- Order positive integers, decimals and fractions.
- Understand and use the symbols =, ≠, <, >, ≤, ≥
- Apply the four operations to integers, decimals and simple fractions (proper and improper), and mixed numbers.
- Understand and use place value (eg when working with very large or very small numbers, and when calculating with decimals).
- Understand and use standard form.
- Recognise and use relationships between operations, including inverse operations eg cancellation to simplify calculations and expressions; use conventional notation for priority of operations, including brackets, powers, roots and reciprocals.
- Substitute numerical values into formulae and expressions, including scientific formulae.
- Understand and use standard mathematical formulae; rearrange formulae to change the subject.
- Work with coordinates on Cartesian grid.

Measures and accuracy

- Use standard units of mass, length, time, money and other measures (including standard compound measures) using decimal quantities where appropriate.
- Estimate answers; check calculations using approximation and estimation, including answers obtained using technology.
- Use compound units such as speed, rates of pay, unit pricing.
- Round numbers and measures to an appropriate degree of accuracy (eg to a specified number of decimal places or significant figures); use inequality notation to specify simple error intervals due to truncation or rounding.

Ratio, proportion and rates of change

- Express one quantity as a fraction of another, where the fraction is less than 1 or greater than 1.
- Use ratio notation, including reduction to simplest form.

- Divide a given quantity into two parts in a given part: part or part: whole ratio; express the division of a quantity into two parts as a ratio; apply ratio to real contexts and problems (such as those involving probability).
- Relate ratios to fractions and vice versa.
- Define percentage as 'number of parts per hundred'; interpret percentages and percentage changes as a fraction or a decimal, and interpret these multiplicatively; express one quantity as a percentage of another; compare two quantities using percentages.
- Understand and use the general equation of a straight line $y = mx + c$ where c is the intercept with the $y-$ axis and $m = \frac{(y_1 - y_2)}{(x_1 - x_2)}$

Appendix 3: statistical enquiry cycle

Specifications must encourage the application of techniques within the framework of the statistical enquiry cycle using real data taken from authentic contexts.

Specifications must require students to understand the importance of initial planning when designing a line of enquiry or investigation including:

- defining a question or hypothesis (or hypotheses) to investigate
- deciding what data to collect and how to collect and record it giving reasons
- developing a strategy for how to process and represent the data giving reasons.

Specifications must enable students to recognise the constraints involved in sourcing appropriate data including:

- when designing collection methods for primary data
- when researching sources of secondary data, including from reference publications, the internet and the media
- through appreciating the importance of acknowledging sources
- by recognising where issues of sensitivity may influence data availability.

Specifications must require students to understand the ways that data can be processed and presented including:

- organising and processing data, including an understanding of how technology can be used
- generating diagrams and visualisations to represent the data, including an understanding of outputs generated by appropriate technology
- generating statistical measures to compare data, understanding the advantages of using technology to automate processing.

Specifications must require students to understand that results must be interpreted with reference to the context of the problem including:

- analysing/interpreting the diagrams and calculations/measures
- reaching conclusions that relate to the questions and hypotheses addressed
- making inferences and/or predictions
- discussing the reliability of findings.

Specifications must require students to show an understanding of the importance of the clear and concise communication of findings and key ideas, and awareness of target audience.

Specifications must enable students to understand the importance of evaluating statistical work including:

- identifying weaknesses in approach or representation
- suggesting improvements to processes or the presentation
- refining the process to elicit further clarification of the initial hypothesis.

Get help and support

Visit our website for information, guidance, support and resources at aqa.org.uk/8382

You can talk directly to the Statistics subject team:

E: maths@aqa.org.uk

T: 0161 957 3852