



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

General Certificate of Secondary Education

Statistics 3311 2010

Material accompanying this Specification

- Specimen Assessment Materials
- A Teacher's Guide

SPECIFICATION

This specification will be published annually on the AQA Website (www.aqa.org.uk). If there are any changes to the specification centres will be notified in print as well as on the Website. The version on the Website is the definitive version of the specification.

Further copies of this specification booklet are available from:

AQA Logistics Centre, Unit 2, Wheel Forge Way, Ashburton Park, Trafford Park, Manchester, M17 1EH.

Telephone: 0870 410 1036 Fax: 0161 953 1177

or

download from the AQA Website: www.aqa.org.uk

Copyright © 2008 AQA and its licensors. All rights reserved.

COPYRIGHT

AQA retains the copyright on all its publications. However, registered centres for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to centres to photocopy any material that is acknowledged to a third party even for internal use within the centre.

Set and published by the Assessment and Qualifications Alliance.

Contents

Background Information

1	Introduction	5
2	Specification at a Glance	6
3	Availability of Assessment Units and Entry Details	7

Scheme of Assessment

4	Introduction	8
5	Aims	10
6	Assessment Objectives	11
7	Scheme of Assessment	12

Subject Content

8	Summary of Subject Content	14
9	Subject Content	15

Key Skills and Other Issues

10	Key Skills – Teaching, Developing and Providing Opportunities for Generating Evidence	28
11	Spiritual, Moral, Ethical, Social, Cultural and Other Issues	35

Centre-Assessed Component

12	Nature of the Centre-Assessed Component	37
13	Guidance on Setting the Centre-Assessed Component	37
14	Assessment Criteria	39
15	Supervision and Authentication	42
16	Standardisation	43
17	Administrative Procedures	44
18	Moderation	45

Awarding and Reporting

19	Grading, Shelf-life and Re-sits	46
-----------	---------------------------------	----

Appendices

A	Grade Descriptions	47
B	Formulae Sheets	51
C	Record Forms	52
D	Overlaps with Other Qualifications	53

Background Information

1

Introduction

Following a review of the National Curriculum requirements, and the establishment of the National Qualifications Framework, all the unitary awarding bodies revised their GCSE syllabuses for first examination in 2003.

1.1 Requirements at GCSE

ICT

The subject content of all GCSEs must require candidates to make effective use of ICT and provide, where appropriate, assessment opportunities for ICT. Details of how the teaching of this specification can encourage the application and development of ICT skills are given in Section 11. However, ICT skills are not assessed by any component of this specification.

Key Skills

All GCSE specifications must identify, as appropriate, opportunities for generating evidence on which candidates may be assessed in the “main” Key Skills of communication, application of number and information technology at the appropriate level(s). Also, where appropriate, they must identify opportunities for developing and generating evidence for addressing the “wider” Key Skills of working with others, improving own learning and performance and problem solving.

Communication

All GCSE specifications must ensure that the assessment arrangements require that, when they produce extended written material, candidates have to:

- ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear
- present information in a form that suits its purpose
- use a suitable structure and style of writing.

Further details for this specification are given in Section 6.2.

Tiering

In most subjects the scheme of assessment must include question papers, targeted at two tiers of grades, ie A* - D and C - G.

A safety net of an allowed Grade E will be provided for candidates entered for the Higher tier who just fail to achieve Grade D. The questions will still be targeted at A* - D.

Citizenship

From 2002, students in England have been required to study Citizenship as a national curriculum subject. Each GCSE specification must signpost, where appropriate, opportunities for developing citizenship knowledge, skills and understanding. Further details for this specification are given in Section 11.

Other Issues

All specifications must identify ways in which the study of the subject can contribute to developing understanding of spiritual, moral, ethical, social and cultural issues, European developments, environmental issues, and health and safety. Further details for this specification are given in Section 11.

2

Specification at a Glance

Statistics

GCSE Statistics (3311)	
Written Paper	75% of total marks
Foundation Tier Grades C – G Set on Foundation tier subject content	2 hours
Higher Tier Grades A* – D Set on Higher tier subject content (includes Foundation tier subject content)	2 hours 30 minutes
Coursework	
Both tiers	25% of total marks
Normally one extended piece of work or project, set and marked by the teacher and moderated by AQA	

Foundation Tier	←
3311F	
Higher Tier	
3311H	

3

Availability of Assessment Units and Entry Details

3.1 Availability of Assessment Units	Examinations based on this Specification are available in the June examination series only.
3.2 Entry Codes	<p>Normal entry requirements apply, but the following information should be noted.</p> <p>The Subject Code for entry to the GCSE award is 3311.</p>
3.3 Prohibited Combinations	<p>Candidates may not sit both the Foundation and Higher tiers in the same examination series.</p> <p>Each specification is assigned to a national classification code, indicating the subject area to which it belongs.</p> <p>Centres should be aware that candidates who enter for more than one GCSE qualification with the same classification code will have only one grade (the highest) counted for the purpose of the School and College Performance Tables.</p> <p>The classification code for this specification is 2510.</p>
3.4 Private Candidates	<p>This specification is available to Private Candidates. Private Candidates should write to AQA for a copy of “<i>Supplementary Guidance for Private Candidates</i>”.</p>
3.5 Special Consideration	<p>Special consideration may be requested for candidates whose work has been affected by illness or other exceptional circumstances. The appropriate form and all relevant information should be forwarded to the AQA office which deals with such matters for the centre concerned. Special arrangements may be provided for candidates with special needs.</p> <p>Details are available from the AQA Website (www.aqa.org.uk). Centres contacting AQA should ask for a copy of “<i>Regulations and Guidance relating to Candidates who are Eligible for Adjustments in Examinations</i>”.</p>
3.6 Access Arrangements	<p>Special arrangements may be provided for candidates with special needs.</p> <p>Details are available from the AQA Website (www.aqa.org.uk). Centres contacting AQA should ask for the Candidate Services Departments and a copy of “<i>Regulations and Guidance relating to Candidates who are Eligible for Adjustments in Examinations</i>”.</p>

3.7 Language of Examinations

All assessments will be through the medium of English. Assessment materials will not be provided in Welsh or Gaelic.

Scheme of Assessment

4

Introduction

4.1 National Criteria

This GCSE Statistics Specification complies with the following:
The GCSE, GCE, GNVQ and AEA Code of Practice April 2007;
The GCSE Qualification Specific Criteria;
The Arrangements for the Statutory Regulation of External Qualifications in England, Wales and Northern Ireland: Common Criteria.

4.2 Rationale

Statistics is essentially a practical subject whose main purpose is to obtain and process data with a view to extracting numerical information and making inferences that may extend beyond the data. A basic principle of statistical work is obtaining information about a population from an appropriately drawn sample. It follows that no course in Statistics will convey the essence of the subject if it does not include practical work to be done by the candidate. It is expected that a large part of the course will be practically based and that specification items will arise naturally from practical work rather than from a possibly sterile theoretical treatment. It is hoped that the practical work carried out by candidates will extend beyond that which is part of the formal assessment. Centres are encouraged to make use of ICT to enhance candidates' understanding of Statistics. The Internet, for example, can provide useful data.

Statistics is essentially a holistic subject and as such, should be taught this way, with appropriate connections being made between the various aspects of the subject. This includes the process of determining and analysing the problem to be solved, the use of appropriate statistical language, the determination of the statistical methods required and the interpretation and conclusions drawn from the analysis.

The specification emphasises the relationship between the practical and theoretical aspects of the subject, together with the application of statistics to social, economic, political, environmental and scientific problems. Candidates should be encouraged to draw on the statistical content of other subjects such as Geography, Science and Psychology, so that the value of a study of statistics from the cross-curricular point of view can be appreciated.

Much of what is read and seen in the media has a statistical base and very many occupations demand the use or interpretation of statistical data. This specification is designed to give candidates an insight into the practical uses of statistics and to enable them to make informed judgements on what is presented to them so that they are aware of the dangers of being influenced by misleading statistics.

4.3 Prior level of attainment and recommended prior learning

No prior learning or level of attainment is necessary for candidates to undertake a course of study based on this specification. However, the specification does build on the knowledge, understanding and skills set out in the National Curriculum Key Stage 3 Programme of Study for AO4, Handling Data. A level of mathematical and numerical skills commensurate with having followed a programme of study at Key Stage 3 is expected. This specification builds on the Handling Data part of KS3 Mathematics by developing the areas of specifying problems and planning, collection of data, the processing and representation of data, and the interpretation and discussion of results.

This GCSE specification has been developed from the KS3 Programme of Study for England. Candidates entering for this GCSE in Northern Ireland and Wales need to be aware of any differences in their respective KS3 POS.

Candidates embarking on a course of study in GCSE Statistics are required to be familiar with the material listed, which is regarded as assumed background knowledge. Questions may be set involving the material listed below, but these topics will always appear in context, and will not be examined separately.

Foundation tier

- a Appreciation of accuracy of data.
- b Understanding of significant figures and decimal places.
- c Ability to express x as a percentage of y and to calculate $x\%$ of y .
- d Ability to select suitable scales to represent variables graphically.
- e Ability to use an electronic calculator. There should be awareness of possible redundant figures and that results may have to be rounded to an appropriate degree of accuracy.
- f Ability to read graphs accurately and to obtain interpolated or extrapolated values.
- g Ability to compare two numbers by percentage increase/decrease or by a factor.
- h An understanding of proportion.
- i Fractions and equivalent percentages and decimals.
- j Ability to add, subtract, multiply and divide fractions.
- k Knowledge of Σ notation.

Higher tier

All of the above, plus:

- l The equation of a straight line in the form $y = mx + c$ and the meaning of m and c .

4.4 Progression

This qualification is a recognised part of the National Qualifications Framework. As such, GCSE Statistics compliments GCSE Mathematics provides progression from Key Stage 3 to GCE A/AS Mathematics and / or Statistics or further study at Advanced or Advanced Subsidiary level in other subjects or further study at GNVQ level, or directly into employment.

5

Aims

The aims below describe the educational purposes of following a course in GCSE Statistics. Some of these aims are reflected in the assessment objectives, others are not because they cannot readily be translated into measurable objectives.

A course based on this specification should enable candidates to:

- a acquire an understanding of the basic concepts of probability and statistics in such a way which encourages confidence, satisfaction and enjoyment of the subject in everyday situations familiar to the candidate, in other disciplines and in further study of the subject, if desired;
- b show knowledge of probability and statistical methods and concepts, and to communicate effectively an awareness of the power and limitations of data, methods and concepts;
- c recognise the suitability of data for statistical analysis, apply relevant techniques and be able to make deductions and inferences;
- d interpret statistical information presented in a variety of forms and to communicate their interpretation by written and/or oral report;
- e be aware of the importance and limitations of statistical information to society.

6

Assessment Objectives

6.1 Assessment Objectives

- a Analyse a statistical problem and plan an appropriate strategy. Describe and use appropriate methods to select and collect data.
- b Analyse and present data for comparisons and to solve probability and statistical problems.
- c Use the language and facts of statistics and probability to perform relevant computations.
- d Identify and communicate inferences and interpretation of statistical information.

6.2 Quality of Written Communication

This specification does not formally assess the quality of written communication.

7

Scheme of Assessment

7.1 Assessment Units

The Scheme of Assessment comprises two components.

EITHER

Written Paper
Paper 1
Foundation Tier 2 hours

75% of the marks 100 marks

This component assesses the Foundation tier subject content. All questions are compulsory. Question and answer booklet.

OR

Written Paper
Paper 2
Higher Tier 2 hours 30 minutes

75% of the marks 120 marks

This component assesses the Higher tier subject content (and includes the Foundation tier subject content). All questions are compulsory. Question and answer booklet.

AND

Coursework

25% of the marks 40 marks

Normally one piece of extended work will be assessed in this unit, however, see Page 37 for exceptions.

7.2 Weighting of Assessment Objectives

The approximate relationship between the relative percentage weighting of the Assessment Objectives (AOs) and the overall Scheme of Assessment is shown in the following table:

Assessment Objectives	Component Weightings (%)		Overall Weighting of AOs (%)
	Written Papers (F or H tier)	Coursework	
Analyse a statistical problem and plan an appropriate strategy. Describe and use appropriate methods to select and collect data.	$11\frac{1}{4}$	$6\frac{1}{4}$	$17\frac{1}{2}$
Analyse and present data for comparisons and to solve probability and statistical problems.	$18\frac{3}{4}$	$6\frac{1}{4}$	25
Use the language and facts of statistics and probability to perform relevant computations.	$26\frac{1}{4}$	$7\frac{1}{2}$	$33\frac{3}{4}$
Identify and communicate inferences and interpretation of statistical information.	$18\frac{3}{4}$	5	$23\frac{3}{4}$
Overall Weighting of Units (%)	75	25	100

Candidates' marks for each assessment are scaled to achieve the correct weightings.

7.3 Written Papers

Both the Foundation and Higher tier written papers will consist of short answer questions, longer structured questions and unstructured questions. The Higher tier paper will include a greater number of unstructured questions.

For both written papers, candidates will be expected to use a calculator, where appropriate, which should have at least the following functions:

$+$, $-$, \times , \div , x^2 , \sqrt{x} , $\frac{1}{x}$ and a memory.

The use of calculators with statistical functions is encouraged.

Each written paper at a tier assesses the full range of grades at that tier.

Common questions will be set in the Foundation and Higher tier written papers to assist with consistency in awarding where grades overlap different tiers.

Subject Content

8

Summary of Subject Content

This specification comprises the following areas of subject content:

Data Collection

- 1 Types of Data
- 2 Census Data
- 3 Sampling
- 4 Planning an Investigation
- 5 Obtaining Data

Tabulation and Representation

- 1 Tabulation
- 2 Diagrammatic Representation

Data Analysis

- 1 Measures of Location
- 2 Measures of Spread
- 3 Other Summary Statistics
- 4 Time Series
- 5 Quality Assurance
- 6 Correlation and Regression
- 7 Estimation

Probability

- 1 Probability
- 2 Discrete Probability Distributions

9

Subject Content

Candidates should be given the opportunity to use ICT, particularly calculators, spreadsheets and the Internet.

Throughout a course of study based on this specification candidates will be expected to interpret their results and to comment constructively and critically on the suitability, appropriateness and limitations of the techniques used. Candidates should consider and check their results in context, and modify their approaches if necessary. Calculations and/or statistical results should be interpreted in the initial context of the data where appropriate.

The subject content is set out on pages 14 to 27 in three columns. Column 1 shows the content for the Foundation tier, Column 2 shows the additional content for the Higher tier and Column 3 gives notes for the guidance of teachers. The content of the Higher tier includes the content of the Foundation tier.

9.1 Data Collection

Foundation Tier	Higher Tier	Notes
Types of data		
Primary and secondary data sources. Qualitative and quantitative variables. Discrete and continuous data.		Primary data: obtaining data from a survey or investigation or experiment and by means of questionnaires. Secondary data: use of published statistics and databases.
Classification of data; the need for precise definitions; class limits and intervals.	Implications of grouping for loss of accuracy in presentation and calculation.	
Bivariate data: discrete, continuous; ungrouped and grouped.		

Foundation Tier	Higher Tier	Notes
Census data		
Obtaining information from a well-defined small population.		A census obtains information about every element of the population. The definition of 'population' should be taken as the population in the study, eg, a class of pupils or all the packets of biscuits in the school shop.
Obtaining information from a large population.		Awareness of the National Census.

Sampling

Purpose of sampling; variability between samples.		
Randomness. Random numbers from tables, calculators and computers.		
Sampling from a well-defined population. Sample frame. Simple random sampling; the condition that all members of the population are equally likely to be included in the sample. Stratified sampling with one set of categories.	Systematic sampling. Stratified sampling with no more than two sets of categories. Cluster sampling and quota sampling with particular reference to their use in conducting large scale opinion polls. Strengths and weaknesses of the various sampling methods, including the dangers of convenience sampling. The criteria used for selecting sample members in national opinion polls: geographical area, sex, age group, social and economic backgrounds. Associated sources of bias.	Candidates may be required to demonstrate the process of obtaining a random sample by using a given table of random digits. An appreciation of the sample size selected is required.
Biased samples arising from sampling from a wrong population or non-random choice of individual elements.		How biased samples can occur in practice. Awareness of bias in self-selecting samples, eg,, telephone polling, pressure groups.

Foundation Tier	Higher Tier	Notes
Planning and Investigation		
<p>Specifying a research question to be investigated and breaking it down into sub-questions as necessary.</p> <p>Specifying a hypothesis to be tested.</p>		
<p>Determining the data needed in an investigation and selecting an appropriate method for obtaining the data.</p>	<p>Justifying the choice of method by comparing it with possible alternatives.</p>	
Obtaining Data		
<p>Obtaining data by counting or measuring; accuracy of such measures.</p> <p>Design and use of efficient methods of recording data, appropriate to the purpose for which it will be used.</p>		
<p>Obtaining primary data by questionnaire. Pilot studies and pre-testing.</p> <p>Problems of design, wording, biased questions, definitions, obtaining truthful answers. The advantages and disadvantages of closed and open questions.</p>	<p>The use of opinion scales.</p> <p>The technique of random response, in its simplest form, for obtaining truthful answers to sensitive questions.</p>	

Foundation Tier	Higher Tier	Notes
Obtaining Data cont...		
<p>Awareness of the problems that may arise through:</p> <ul style="list-style-type: none"> • identifying the population; • questionnaire distribution and collection; • non-response; • errors in recording answers; • missing data. 		
<p>Obtaining data by interview. Advantages and disadvantages of interviews compared with written questionnaires.</p>		
<p>Obtaining data by data logging.</p>		<p>Data logging is a mechanical or electronic method of collecting primary data by sampling at (repetitive) set intervals and recording the data in re-usable form (list of graph)</p>
<p>Simulation. Use of, for example, dice, random number tables, ICT.</p>		<p>Use of ICT methods.</p>
<p>Using secondary data: sources, reliability, accuracy, relevance and bias. Difference between sample and census data.</p>		<p>Examples of sources of secondary data are Key Data, Annual Abstract of Statistics, Monthly Digest of Statistics, Social Trends, Economic Trends, the Internet, various almanacs and newspapers.</p>

Foundation Tier	Higher Tier	Notes
Obtaining Data cont....		
Designing and obtaining data from simple statistical experiments. Explanatory and response variables; identification of the variables to be investigated. Use of a control group; use of random allocation to experimental and control groups.	Matched pairs of groups; “before and after” experiments. Identification of extraneous variables and methods of controlling them: the need to hold extraneous variables constant for both groups.	Explanatory and response variables are also referred to as independent and dependent variables respectively.
Surveys.		The difference between a census and a survey.
	The capture/recapture method for obtaining data. Conditions for this method need to be appropriate.	

9.2

Tabulation and Representation**Tabulation**

Construction of frequency tables by tallying raw data.		Both qualitative and quantitative (discrete or continuous) data will be used, in grouped or ungrouped form as appropriate.
Class intervals.	Open-ended classes.	
Simplifying tables by combining categories and reducing the number of significant figures; resulting effects on readability: identifying or masking of patterns/trends; loss of detail.	Problems of under and over simplification resulting from unsuitable choice of group size or number of significant figures.	
Reading and interpreting data presented in tabular or graphical form.		Tables of data drawn from the media and from Government and other statistical sources may be used.

Foundation Tier	Higher Tier	Notes
Tabulation cont...		
Design of tables to summarise data effectively. Design and use of appropriate two-way tables.		To include the listing of all outcomes for single events, and for two successive events in a systematic way.
Diagrammatic Representation		
Qualitative data: bar and pie charts, pictograms. Multiple and composite bar charts.	Comparative pie charts (area proportional to total frequency). Cumulative frequency step polygons.	Detailed drawing of pictograms will not be expected.
Discrete data; vertical line graphs.		
Continuous data; grouped frequency diagrams with equal class intervals. Frequency polygons. Cumulative frequency polygons. Population pyramids.	Histograms with equal or unequal class intervals.	Candidates should know the term frequency density. Comparisons of changes over time and the possible practical consequences are required at the Higher tier only.
Stem and leaf diagrams.		
Shading maps (choropleth maps).		Shading (or choropleth) maps are widely used in Geography as indication of development (levels of income, diet, etc.).

Foundation Tier	Higher Tier	Notes
Diagrammatic Representation cont...		
Transforming data presentation from one form to another.		
The shapes and simple properties of frequency distributions; symmetrical, positive and negative skew.	The shape and simple properties of the normal frequency distribution.	The normal frequency distribution is symmetrical, has approximately 95% of values within two standard deviations of the mean; almost all values are within 3 standard deviations of the mean.
Bivariate data: scatter diagrams.		
Time series: line graphs.		
Other diagrammatic representations for comparisons of data using length.	Use of area and volume. Comparison of the various diagrammatic representations using area or volume, including their advantages and disadvantages.	
Visual misrepresentation: misuse or omission of origin or scale. Broken, incorrect or changed scales. Incomplete definitions and labelling.	Misuse of length, area and volume in pictorial comparison.	
Interpretation of information presented in diagrammatic form; distinction between well and poorly presented data. Spotting possible errors in a data set by recognising outliers that do not fit a general pattern.		Diagrams drawn from the media and from Government and other statistical sources may be used. Where these are not of the types named in the specification, the interpretation required will be at an appropriate level for Foundation or Higher tier.

9.3

Data Analysis

Calculations refer to both continuous and discrete data. Where numerical calculations are involved they should be carried out to a sensible degree of accuracy. Candidates are required to analyse written and statistical evidence as appropriate, as well as consider and check results, modifying their approach if necessary. Calculations and/or statistical results should be interpreted in the initial context of the data where appropriate.

Foundation Tier	Higher Tier	Notes
-----------------	-------------	-------

Measures of Location

Mean, median and mode for raw data.	Use of change of origin when calculating the mean. Effect on the average of changes in the sample, eg, the addition or withdrawal of a sample member.	eg., the mean of the numbers 1003, 1005, 1006, and 1009 is equal to 1000 plus the mean of 3, 5, 6 and 9.
Mean, median and mode for discrete frequency distributions. Modal class for grouped frequency distributions. Median for grouped frequency distributions. Mean for grouped frequency distributions.		Graphical methods of obtaining the median will be acceptable. Candidates may make use of a linear change of scale when calculating the mean.
Advantages and disadvantages of each of the three measures of location in a given situation.	Reasoned choice of a measure of location appropriate to the nature of the data and the purpose of the analysis.	
	Geometric mean.	

Measures of Spread

Range		
Quartiles for discrete data. Quartiles and percentiles, for grouped frequency distributions.	Deciles.	Graphical methods will be accepted.

Foundation Tier	Higher Tier	Notes
Measures of Spread cont...		
Interquartile range for discrete and continuous data.	Interpercentile ranges.	
Advantages and disadvantages of each of these measures of spread.	Variance and standard deviation.	Divisor n. To include grouped frequency distributions. Efficient use of a calculator should be encouraged. The notation $\sum x$, $\sum x^2$ may be used to give data in summarised form.
Construction of box and whisker plots.	Use of box and whisker plots to identify outliers.	An outlier is defined as an observation less than $Q_1 - 1.5(Q_3 - Q_1)$ or greater than $Q_3 + 1.5(Q_3 - Q_1)$, where Q_1 and Q_3 are the lower and upper quartiles respectively.
	Calculation and interpretation of standardised scores.	Only general interpretation is expected.
Use of tabulated data, diagrams, measures of location and measures of spread to compare data sets.	Use of standardised scores to compare values from different frequency distributions.	
Other Summary Statistics		
Simple index numbers.	Weighted index numbers. Chain base numbers. General Index of Retail Prices. (RPI).	
Crude rates.	Standardised rates.	For example, birth, death, unemployment.

Foundation Tier	Higher Tier	Notes
Time Series		
Drawing a trend line by eye and using it for prediction.	Evaluating and plotting appropriately chosen moving averages.	Trend lines will not be required to pass through the mean.
Identification of seasonal variation.	Trend line based on moving averages. Seasonal effect at a given data point. Average seasonal effect. Prediction of future values.	Graphical methods only will be expected.
Quality Assurance		
	Plotting sample means, medians or ranges over time to view consistency and accuracy against a target value.	To include looking for indications where the process is off target or of an increase in variability.
Correlation and Regression		
Scatter diagrams. Recognition by eye of positive correlation, negative correlation, lack of correlation.		
The distinction between correlation and causality.		
	Spearman's rank correlation coefficient as a measure of agreement; its calculation and limitation in interpretation.	Includes the case of tied ranks. Calculations for large samples will not be expected. The formula for Spearman's rank correlation coefficient will be given.

Foundation Tier	Higher Tier	Notes
Correlation and Regression cont....		
Fitting a straight line by eye through (\bar{x}, \bar{y}) to the plotted points on a scatter diagram.	Obtaining the equation of the fitted line in the form $y = mx + c$; the interpretation of m and c . Non-linear data.	Includes discussion of whether such a straight line is appropriate. A 'suggested' relationship will be given, i.e. no more complicated than x^2 , $\frac{1}{x}$, \sqrt{x} .
Interpolation and extrapolation.		Including the dangers of inappropriate extrapolation.
Interpretation of bivariate data presented in the form of a scatter diagram.	Comparison of the degree of correlation between two or more pairs of data sets with reference to scatter diagrams and/or rank correlation coefficients.	
Estimation		
Estimation of population mean from a sample. Estimation of a population proportion from a sample; the use of this method of estimation in opinion polls. Variability in estimates from different samples and the effect of sample size.	Estimation of population size based on the capture/recapture method. An elementary quantitative appreciation of appropriate sample size.	Higher Tier : eg, to include the concept that to halve the variability in an estimate, four times the sample size is required.

9.4 Probability

Foundation Tier	Higher Tier	Notes
Probability		
Set notation will not be required.		
Probability of an event, impossible events, certain events. Use of words such as possible, likely. Putting events into order of probability. Probability on a scale from 0 to 1.		An appreciation of how probability can be interpreted in real-life situations is expected.
Probability as the limit of relative frequency as the number of observations increases. Equally likely events.		Illustrated practically by example. As a special case of the relative frequency definition.
Sample space: pictorial representation; probability by counting. Use of Venn diagrams, tables and Cartesian grids.		List all possible outcomes, eg, results of throwing one dice or the results of tossing two coins.
Exhaustive events.		
Mutually exclusive events, the addition law.	The general addition law.	Candidates should know that the sum of the probabilities of all mutually exclusive outcomes is 1.
Independent events, the multiplication law.	The general multiplication law.	

Foundation Tier	Higher Tier	Notes
Probability cont...		
Tree diagrams.		Use of 'with replacement' and 'without replacement' situations. Up to 3 stages may be expected.
An intuitive approach to conditional probability.		Candidates should be able to write down probabilities in simple cases.
Expected frequencies. Comparison of actual frequencies with expected frequencies.		
Discrete Probability Distributions		
	Simple cases of the binomial and the discrete uniform distribution.	Use of simulation methods.

Key Skills and Other Issues

10

Key Skills – Teaching, Developing and Providing Opportunities for Generating Evidence

10.1 Introduction

The Key Skills Qualification requires candidates to demonstrate levels of achievement in the Key Skills of *Communication*, *Application of Number* and *Information and Communication Technology*.

The units for the ‘wider’ Key Skills of *Working with Others*, *Improving own Learning and Performance* and *Problem-Solving* are also available. The acquisition and demonstration of ability in these ‘wider’ Key Skills is deemed highly desirable for all candidates, but they do not form part of the Key Skills Qualification.

Centres intending to use this specification to meet the Key Skills requirements are advised to cross-check the requirement with the QCA documentation.

Copies of the Key Skills Units may be downloaded from the QCA web site (<http://www.qca.org.uk/keyskills>).

The units for each Key Skill comprise three sections:

- A What you need to know
- B What you must do
- C Guidance

Candidates following a course of study based on this Specification for GCSE Statistics can be offered opportunities to develop and generate evidence of attainment in aspects of the Key Skills of *Communication*, *Application of Number*, *Information and Communication Technology*, *Working with Others*, *Improving own Learning and Performance*, and *Problem Solving*. Areas of study and learning that can be used to encourage the acquisition and use of Key Skills, and to provide opportunities to generate evidence for Part B of the units, are signposted below.

10.2 Key Skills Opportunities in Statistics

Communication Level 1

What you must do ...	Signposting of Opportunities for Generating Evidence in Subject Content
C1.1 Take part in either a one-to-one discussion or a group discussion.	✓
C1.2 Read and obtain information from at least one document.	✓
C1.3 Write two different types of documents.	✓

Communication Level 2

What you must do ...	Signposting of Opportunities for Generating Evidence in Subject Content
C2.1a Take part in a group discussion.	✓
C2.1b Give a talk of at least four minutes.	✓
C2.2 Read and summarise information from at least two documents about the same subject. Each document must be a minimum of 500 words long.	✓
C2.3 Write two different types of documents each one giving different information. One document must be at least 500 words long.	✓

Application of Number Level 1

What you must do ...	Signposting of Opportunities for Generating Evidence in Subject Content
<p>N1.1 Interpret information from two different sources. At least one source must include a table, chart, graph or diagram.</p>	✓
<p>N1.2 Carry out and check calculations to do with:</p> <ul style="list-style-type: none"> a amounts or sizes b scales or proportion c handling statistics. 	✓
<p>N1.3 Interpret the results of your calculations and present your findings – in two different ways using charts or diagrams.</p>	✓

Application of Number Level 2

What you must do ...	Signposting of Opportunities for Generating Evidence in Subject Content
<p>N2.1 Interpret information from a suitable source.</p>	✓
<p>N2.2 Use your information to carry out calculations to do with:</p> <ul style="list-style-type: none"> a amounts or sizes b scales or proportion c handling statistics d using formulae. 	✓
<p>N2.3 Interpret the results of your calculations and present your findings.</p>	✓

Information and Communication Technology Level 1

What you must do ...	Signposting of Opportunities for Generating Evidence in Subject Content
ICT1.1 Find and select relevant information.	✓
ICT1.2 Enter and develop information to suit the task.	✓
ICT1.3 Develop the presentation so that the final output is accurate and fit for purpose.	–

Information and Communication Technology Level 2

What you must do ...	Signposting of Opportunities for Generating Evidence in Subject Content
ICT2.1 Search for and select information to meet your needs. Use different information sources for each task and multiple search criteria in at least one case.	✓
ICT2.2 Enter and develop the information to suit the task and derive new information.	✓
ICT2.3 Present combined information such as text with image, text with number, image with number.	✓

Improving Own Learning and Performance Level 1

What you must do ...	Signposting of Opportunities for Generating Evidence in Subject Content
LP1.1 Confirm your targets and plan how to meet these with the person setting them.	✓
LP1.2 Follow your plan, to help meet targets and improve your performance	✓
LP1.3 Review your progress and achievements in meeting targets, with an appropriate person.	✓

Improving Own Learning and Performance Level 2

What you must do ...	Signposting of Opportunities for Generating Evidence in Subject Content
LP2.1 Help set targets with an appropriate person and plan how these will be met.	✓
LP2.2 Take responsibility for some decisions about your learning, using your plan to help meet targets and improve your performance.	✓
LP2.3 Review progress with an appropriate person and provide evidence of your achievements.	✓

Working with Others Level 1

What you must do ...	Signposting of Opportunities for Generating Evidence in Subject Content
WO1.1 Confirm you understand the given objectives and plan for working together.	✓
WO1.2 Work with others towards achieving the given objectives.	✓
WO1.3 Identify ways you helped to achieve things and how to improve your work with others.	✓

Working with Others Level 2

What you must do ...	Signposting of Opportunities for Generating Evidence in Subject Content
WO2.1 Plan work with others.	✓
WO2.2 Work co-operatively towards achieving the identified objectives.	✓
WO2.3 Review your contributions and agree ways to improve work with others.	✓

Problem Solving Level 1

What you must do ...	Signposting of Opportunities for Generating Evidence in Subject Content
PS1.1 Confirm with an appropriate person that you understand the given problem and identify different ways of tackling it.	✓
PS1.2 Confirm with an appropriate person what you will do and follow your plan for solving the problem.	✓
PS1.3 Check with an appropriate person if the problem has been solved and how to improve your problem solving skills.	✓

Problem Solving Level 2

What you must do ...	Signposting of Opportunities for Generating Evidence in Subject Content
PS2.1 Identify a problem, with help from an appropriate person, and identify different ways of tackling it.	✓
PS2.2 Plan and try out at least one way of solving the problem.	✓
PS2.3 Check if the problem has been solved and identify ways to improve problem solving skills.	✓

10.3 Further Guidance

More specific guidance and examples of tasks that can provide evidence of single Key Skills, or composite tasks that can provide evidence of more than one Key Skill are given in the AQA specification support material, particularly the document ‘A Teacher’s Guide’.

11

Spiritual, Moral, Ethical, Social, Cultural and Other Issues

11.1 Spiritual, Moral, Ethical, Social, Cultural and Other Issues

Statistics provides opportunities to promote:

- *spiritual development*, through explaining the underlying statistical principles behind some of the natural forms and patterns in the world around us;
- *moral development*, helping pupils recognise how logical reasoning can be used to consider the consequences of particular decisions and choices helping them learn the value of mathematical truth and statistical truth.
- *social development*, through helping pupils work together productively on complex statistical tasks and helping them see that the result is often better than could be achieved separately;
- *cultural development*, through helping candidates to appreciate the wide use of statistics and statistical information which contributes to the development of our culture and is becoming increasingly central to our highly technological future.

11.2 European Dimension

AQA has taken account of the 1988 Resolution of the Council of the European Community in preparing this specification and associated specimen papers.

11.3 Environmental Issues

AQA has taken account of the 1988 Resolution of the Council of the European Community and the Report “*Environmental Responsibility: An Agenda for Further and Higher Education*” 1993 in preparing this specification and associated specimen papers.

11.4 Citizenship

The centre-assessed component in particular, can promote the skills of enquiry and communication. Coursework also encourages the skill of participation and responsible action in the educational establishment and/or communication.

11.5 Avoidance of Bias

AQA has taken great care in the preparation of this specification and associated specimen papers to avoid bias of any kind.

11.6 Health and Safety

The centre-assessed component provides opportunities to promote Health and Safety issues.

11.7 ICT

(a) Pupils should be given opportunities to apply and develop their ICT capability through the use of ICT tools to support their learning in all subjects (with the exception of physical education at Key Stages 1 and 2).

Possible ICT tools which could be used to support and enhance candidates' work include:

Statistical packages

Simulation software

Databases

Data logging software

Spreadsheets

Graph/chart drawing software

Word processing software.

(b) Pupils should be given opportunities to support their work by being taught to:

- (i) find things out from a variety of sources, selecting and synthesising the information to meet their needs and developing an ability to question its accuracy, bias and plausibility
 - (ii) develop their ideas using ICT tools to amend and refine their work and enhance its quality and accuracy
 - (iii) exchange and share information, both directly and through electronic media
 - (iv) review, modify and evaluate their work, reflecting critically on its quality, as it progresses.
-

11.8 Other issues

Statistics provides opportunities to promote:

- *thinking skills*, through developing pupils' problem-solving skills and deductive reasoning
 - *financial capability*, through applying statistics to problems set in financial contexts
 - *enterprise and entrepreneurial skills*, through developing pupils' abilities to apply statistics in science and technology, in economics and in risk assessment
 - *work related learning*, through developing pupils' abilities to use and apply statistics in workplace situations and in solving real-life problems.
-

Centre-Assessed Component

12

Nature of the Centre-Assessed Component

12.1 Introduction

Coursework should consist of an extended piece of work or project and should normally comprise a single piece of work. The task chosen and data collected should enable the candidate to satisfy all of the assessment objectives.

However, in exceptional circumstances, if the nature of the task or the data collected has limited the candidate's ability to fully satisfy one of the assessment objectives, a further (extended) piece of work may be submitted. Examples of such limitations could include restricted possibilities for a variety of graphical presentation skills or limited opportunities for calculating statistical measures. It must be emphasised that if the task chosen **should** have enabled the candidate to satisfy all of the assessment objectives, but opportunities offered to analyse the data fully have been missed, a second piece of work can not be accepted.

13

Guidance on Setting the Centre-Assessed Component

13.1 General

The weighting of the coursework component is 25% and this should be reflected in the time given to production of coursework.

Candidates are free to choose any areas of study, in consultation with the teacher. It should be on a topic of personal or local interest and should be chosen to ensure that the statistical aspects can be clearly identified, giving sufficient scope for collection of data, for graphical representation and for calculation work to be performed.

Coursework must be based on data collected from appropriate primary and/or secondary sources by the candidate. Data should **not** be given to the candidates. Collection of qualitative data only can often be restricting.

The topic chosen should enable the candidate to carry out an extended piece of work and should involve:

- the design and planning of the overall strategy, identification of aims and hypotheses, identifying data which needs to be collected and variables to be considered
- selection and collection of appropriate data, describing the primary and/or secondary sources to be used and methods of collection and selection, including a clear description of the sampling method
- recording of data in appropriate tables, sorting and re-sorting of data according to different criteria, control of variables, use of a range of well selected graphical methods of representation to describe, compare and relate the data
- selection and computation of appropriate measures to describe, compare and relate the variables, which analyse the data fully
- interpretation of the tables, graphs and calculated measures in the context of the problem, to show clear understanding of the work undertaken or to prove or disprove hypotheses and to draw conclusions.

Group Work

The study may be undertaken by a group of candidates, provided that the contribution of each individual candidate can be reliably assessed. In particular, collection of data may be a shared task in order to provide a sufficiently large sample. Each candidate should then identify their own problem to solve and produce an individual piece of work.

Cross-curricular studies

Cross-curricular studies are often suitable and welcome. Data collected for subjects such as Geography, Science and Psychology can often be given a more detailed statistical analysis, which is suited to GCSE Statistics coursework. Work carried out for GCSE Statistics coursework may also form part of the project or coursework submitted for assessment of another GCSE subject, provided that it also meets the assessment objectives of each specification.

Use of ICT

The use of ICT is to be promoted. Candidates should be encouraged to create and interrogate databases and to use a computer to carry out simulations. Graphical work and computations may also be carried out by computer, but the emphasis should be on the selection, with reasons, of appropriate representations and measures and on the interpretation of these. Effective use of the Internet, for example, can provide a rich source of data.

13.3 Coursework Advisers

Coursework Advisers are available to assist centres with any matters relating to coursework.

14

Assessment Criteria

14.1 Introduction

Coursework is marked on a common spine, irrespective of tier of entry. The maximum mark is 40.

Each piece of work must be assessed under the following headings and the mark for each table recorded on the Candidate Record Form. Candidate Record Forms are available on the AQA website in the Administration area. The exact design may be modified before the operational version is issued and the correct year's Candidate Record Forms should always be used. The descriptions are designed to reflect increasing competence and understanding. The mark awarded in each table must reflect the sophistication of the study. Candidates can not be awarded high marks for a well-executed routine task. Teachers should use their professional judgement to determine the exact mark within a range.

Where, exceptionally, two pieces of work are submitted, the higher mark over the two pieces of work in each strand should go forward to make up the final total.

14.2 Criteria

Aims, Design and Strategy

Marks	
0	No evidence of planning a strategy. No aims or hypotheses given.
1	A simple routine problem. A clear statement of the purpose of the study and an appropriate strategy shown.
2-3	A straight-forward but possibly non-routine problem. Clear explanation of purpose, selection of an appropriate strategy, explanation of any assumption or simplifications made.
4	A substantive statistical problem involving the interrelationship of a number of variables. A clear and thorough explanation of the purpose of the study, selection of an appropriate strategy with reasons for choice. Clear explanation and justification of any assumptions and simplifications made.

Selection and Collection of Data

Marks	
0	No data source given. No attempt to state an appropriate method to select and collect the data.
1-2	Relevant data collected. A simple explanation of source and method of collection. The sample may be small.
3-4	Relevant data collected from one or more sources with some attempt to justify choice. A clear description of methods of selection and collection, using a recognised method of sampling.
5-6	Relevant data collected from one or more sources, with justification of choices made. Detailed, clear description of methods of selection and collection showing knowledge of named sampling methods, appropriate to the problem. Description of any problems encountered. A good sized sample used.

Presentation of Data

Marks	
0	No attempt to record or present data, using tables and diagrams.
1-2	Some attempt to use a suitable method of recording data. Use of one or more diagrams to illustrate the data.
3-5	Appropriate methods of recording data. Use of several types of pictorial representation, accurately and appropriately drawn.
6-8	Appropriate methods of recording data, demonstrating the ability to sort and re-sort data and record according to different criteria. Use of a range of appropriate methods of pictorial representation, accurately and appropriately drawn.
9-10	A range of appropriate methods of recording data, with clear justification of the methods and criteria used at each stage. Use of a range of appropriate and effective methods of pictorial representation including Higher tier methods, to describe, compare and relate the data, with justification for choices made.

Calculations

Marks	
0	No meaningful statistical calculations.
1-3	An attempt to carry out some statistical calculations, but the work may be simplistic and not fully suited to their purpose. Measures may not be used or interpreted.
4-6	Calculation and use of several appropriate statistical measures.
7-9	Calculation and use of a range of appropriate statistical measures to explore the data, with some justification for choice.
10-12	Calculation and use of a range of appropriate statistical measures, including techniques included in the Higher tier specification, demonstrating an awareness of the most appropriate measures to be calculated at each stage, to analyse the data fully.

Interpretation and
Conclusions

Marks	
0	No attempt to identify, explain or interpret graphs and measures.
1-2	Simple identification and interpretation of some of the findings, based on measures and graphs used. A simple conclusion.
3-4	Identification and interpretation of most of the findings, based on the graphs and measures, including comparisons. A clear statement of the conclusions reached.
5-6	Detailed explanation of findings with correct interpretation of all measures, tables and diagrams used, valid comparisons, detailed and valid conclusions. Some awareness of limitations of the study, if appropriate.
7-8	Detailed explanation of all findings with correct interpretation of all measures, tables and diagrams used, within the context of the problem, valid comparisons drawn, all showing full understanding of the statistical significance of the work done. Valid conclusions, drawing together the results from the different aspects of the study. Full consideration of the effectiveness and limitations of the investigation.

14.3 Evidence to Support the Award of Marks

Teachers should keep records of their assessments during the course, in a form which facilitates the complete and accurate submission of the final assessments at the end of the course.

When the assessments are complete, the marks awarded under each of the assessment criteria must be entered on the *Candidate Record Form*, with supporting information given in the spaces provided.

15

Supervision and Authentication

15.1 Supervision of Candidates' Work

Candidates' work for assessment must be undertaken under conditions which allow the teacher to supervise the work and enable the work to be authenticated. If it is necessary for some assessed work to be done outside the centre, sufficient work must take place under direct supervision to allow the teacher to authenticate all of the candidate's work with confidence.

Private candidates who follow an open-learning course with a tutorial college, or attend a part-time course at a school or college, may have their work authenticated by their tutor. Candidates who do not have a tutor must make arrangements to have their work authenticated by a professional person who is in a position to judge that the work is the candidate's own. This will usually be a member of staff at the centre through which the candidate is entered.

15.2 Guidance by the Teacher

The work assessed must be solely that of the candidate concerned. Any assistance given to an individual candidate which is beyond that given to the group as a whole must be recorded on the Candidate Record Form.

Further details on the supervision of coursework and on appropriate guidance for candidates can be found in the document *A Teacher's Guide*.

15.3 Unfair Practice

At the start of the course, the supervising teacher is responsible for informing candidates of the AQA *Regulations* concerning malpractice. Candidates must not take part in any unfair practice in the preparation of coursework to be submitted for assessment, and must understand that to present material copied directly from books or other sources without acknowledgement will be regarded as deliberate deception. Centres must report suspected malpractice to AQA. The penalties for malpractice are set out in the AQA *Regulations*.

15.4 Authentication of Candidates' Work

Both the candidate and the teacher are required to sign declarations confirming that the work submitted for assessment is the candidate's own. The teacher declares that the work was conducted under the specified conditions, and records details of any additional assistance.

When two extended pieces of coursework are to be submitted, the teacher must indicate the reason for the inclusion of the second piece of coursework on the Candidate Record Form.

16

Standardisation

16.1 Standardising Meetings

Annual standardising meetings will usually be held in the autumn term. At these meetings support will be provided for centres in the development of appropriate coursework tasks and assessment procedures.

Centres entering candidates for the first time must send a representative to the meetings. Attendance is also mandatory in the following cases:

- where there has been a serious misinterpretation of the specification requirements
- where the nature of the coursework tasks set by a centre has been inappropriate
- where a significant adjustment has been made to a centre's marks in the previous year's examination.

Otherwise attendance is at the discretion of centres.

Copies of the material used at the Standardising Meetings are available, free of charge, from AQA.

16.2 Internal Standardisation of Marking

The centre is required to standardise the assessments across different teachers and teaching groups to ensure that all candidates at the centre have been judged against the same standards. If two or more teachers are involved in marking a component, one teacher must be designated as responsible for internal standardisation. Common pieces of work must be marked on a trial basis and differences between assessments discussed at a training session in which all teachers involved must participate. The teacher responsible for standardising the marking must ensure that the training includes the use of reference and archive materials such as work from a previous year or examples provided by AQA for use at the standardising meeting referred to in 16.1 above. The centre is required to send to the moderator the *Centre Declaration Sheet*, duly signed, to confirm that the marking of centre-assessed work at the centre has been standardised. If only one teacher has undertaken the marking, that person must sign this form.

Centre Declaration Sheets are available on the AQA website in the administration area.

17

Administrative Procedures

17.1 Recording Assessments

The candidates' work must be marked according to the assessment criteria set out in Section 14.2. The marks and supporting information must be recorded in accordance with the instructions in Section 17.2. The completed *Candidate Record Form* for each candidate must be attached to the work and made available to AQA on request.

17.2 Submitting Marks and Sample Work for Moderation

The total mark for each candidate must be submitted to AQA on the mark sheets provided or by Electronic Data Interchange (EDI) by the specified date. Centres with 21 or more entries should send the remaining two copies of the Centre Mark Form to the moderator who will then inform the centre which candidates' work is required in the sample. Centres with 20 or less candidates should send one copy of the Centre Mark Form and the work of all the candidates to the moderator.

17.3 Factors affecting Individual Candidates

Teachers should be able to accommodate the occasional absence of candidates by ensuring that the opportunity is given for them to make up missed assessments.

Special consideration should be requested for candidates whose work has been affected by illness or other exceptional circumstances. Information about the procedure to be followed is issued separately.

If work is lost, AQA should be notified immediately of the date of the loss, how it occurred, and who was responsible for the loss. AQA will advise on the procedures to be followed in such cases.

Where special help which goes beyond normal learning support is given, AQA must be informed so that such help can be taken into account when assessment and moderation take place. This should be recorded on the individual *Candidate Record Forms*.

Candidates who move from one centre to another during the course may require different procedures. Possible courses of action depend on the stage at which the move takes place. If the move occurs early in the course the new centre should take responsibility for assessment. If it occurs late in the course it may be possible to accept the assessments made at the previous centre. Centres should contact AQA at the earliest possible stage for advice about appropriate arrangements in individual cases.

17.4 Retaining Evidence and Re-using Marks

The centre must retain the work of all candidates, with the completed *Candidate Record Forms* attached, under secure conditions, from the time it is assessed, to allow for the possibility of an enquiry about results. The work may be returned to candidates after the issue of results provided that no enquiry about result is to be made which will include re-moderation of the coursework. If an enquiry about result is to be made, the work must be retained under secure conditions until requested by AQA.

Candidates re-taking the examination may carry forward their moderated coursework marks. These marks have a shelf-life which is limited only by the shelf-life of the specification, and they may be carried forward an unlimited number of times within this shelf-life.

18

Moderation

18.1 Moderation Procedures

Moderation of the coursework is by inspection of a sample of candidates' work, sent by post from the centre to a moderator appointed by AQA. The centre marks must be submitted to AQA and the sample of work must reach the moderator by the 5th May 2010.

Following the re-marking of the sample work, the moderator's marks are compared with the centre marks to determine whether any adjustment is needed in order to bring the centre's assessments into line with standards generally. In some cases it may be necessary for the moderator to call for the work of other candidates. In order to meet this possible request, centres must have available the coursework and *Candidate Record Form* of every candidate entered for the examination and be prepared to submit them, to the Moderator, on demand. Mark adjustments will normally preserve the centre's order of merit, but where major discrepancies are found, AQA reserves the right to alter the order or merit.

18.2 Post-Moderation Procedures

On publication of the GCSE results, the centre is supplied with details of the final marks for the coursework.

The candidates' work is returned to the centre after the examination with a report form from the moderator giving feedback to the centre on the appropriateness of the tasks set, the accuracy of the assessments made, and the reasons for any adjustments to the marks.

Some candidates' work may be retained by AQA for archive purposes or for use at AQA Standardising Meetings.

Awarding and Reporting

19

Grading, Shelf-life and Re-sits

19.1 Qualification Titles

The qualification based on this specification has the following title: AQA General Certificate of Secondary Education in Statistics.

19.2 Grading System

The qualification will be graded on an 8 point grade Scale A*, A, B, C, D, E, F, G. Candidates who fail to reach the minimum standard for grade G will be recorded as U (unclassified) and will not receive a qualification certificate.

Candidates must be entered for either the Foundation tier or Higher tier. For candidates entered for the Foundation tier, grades C–G are available. For candidates entered for the Higher tier grades A*–D are available. There is a safety net for candidates entered for the Higher tier, where an allowed Grade E will be awarded where candidates just fail to achieve Grade D. Candidates who fail to achieve a Grade E on the Higher tier or Grade G on the Foundation tier will be reported as U (unclassified).

19.3 Minimum Requirements

Candidates will be graded on the basis of work submitted for assessment.

19.4 Carrying Forward of Centre-assessed Marks

Candidates re-taking the examination may carry forward their moderated or examiner-marked coursework marks. These marks have a shelf-life which is limited only by the shelf-life of the specification, and they may be carried forward an unlimited number of times within this shelf-life.

19.5 Awarding and Reporting

The procedures for Awarding Grades and Reporting Results to centres comply with the GCSE, GCE, GNVQ and AEA Code of Practice April 2008 issued by the Regulatory Authorities.

Appendices

A

Grade Descriptions

The following grade descriptors indicate the level of attainment characteristic of the given grade at GCSE. They give a general indication of the required learning outcomes at each specific grade. The descriptors should be interpreted in relation to the content outlined in the specification; they are not designed to define that content.

The grade awarded will depend in practice upon the extent to which the candidate has met the assessment objectives (as in section 6) overall. Shortcomings in some aspects of the examination may be balanced by better performances in others.

There will be no system of hurdles for a particular grade. Candidates will gain credit from any positive achievement in different sections of the specification.

Grade A Candidates identify situations in which the appropriate statistical skills are: designing two-way tables, cumulative frequency polygons, histograms, box and whisker plots, line graphs, transforming data from one form of representation to another, standard deviation, standardised scores, correlation, and estimating the population proportion from a sample. They recognise when and how to use conditional probability and tree diagrams.

They identify a statistical problem in a new context and choose appropriate methods of analysis and draw sensible inferences.

Candidates identify a sample frame and sample at random or by strata as appropriate. Candidates identify and specify a research question to be investigated in practical contexts which lead to sample surveys or experiments. They collect data by using questionnaires, critically evaluating for bias. They identify explanatory and response variables and carry out experiments using matched pairs. They identify their errors and correct them. They are able to overcome minor difficulties in their investigations.

Candidates design and use two way tables to present data they simplify two way tables by reducing the number of significant figures. They draw and use cumulative frequency polygons, histograms, box and whisker plots, line graphs. They transform data from one form of representation to another.

Candidates calculate the standard deviation for grouped data. They standardise scores. They identify outliers using box and whisker plots. They calculate weighted index numbers. They identify trends and seasonal effects in a time series. They obtain from a graph the equation of a fitted line. They calculate combined probabilities when the events are not independent and when they are not mutually exclusive.

Candidates read and interpret cumulative frequency polygons, histograms, line diagrams (including time series) and box and whisker plots. They compare two distributions by using box plots and by using the mean and standard deviation. They identify interpercentile ranges. They interpret the results. They read and interpret published tables of secondary data and identify the major features. They compare actual with expected frequencies and draw appropriate conclusions.

Candidates identify data which is misleadingly presented by confusing area or volume with length or in unusual contexts.

Candidates understand how different methods of sampling affect the reliability of results. They recognise when the sampling process is biased and allow for this in interpreting the results. They use interpolation and extrapolation sensibly.

Candidates communicate complex conclusions in an understandable way using an appropriate mixture of writing and suitable tabular and graphical methods. Their conclusions are correct and based on the data.

Grade C Candidates identify situations in which the appropriate statistical skills are: choosing class intervals, multiple bar charts, frequency polygons, stem and leaf diagrams, mean and median for grouped data, interquartile range, simple index numbers, fitting lines by eye, estimating population means from samples. They understand relative frequency as an estimate of probability and use this to compare outcomes of experiments. They identify mutually exclusive and independent events.

They identify the statistical elements of familiar situations and apply standard methods and analysis to draw inferences.

Candidates formulate a research question that would lead to a sample survey. They collect data by designing a questionnaire to collect opinions and by carrying out an experiment using a control group. They administer a questionnaire in a written form to a sample from a larger population. They write their own questions. They identify variables to be investigated and use random allocation as part of an experiment to obtain data. They only need help with their investigation if the unexpected occurs. They obtain data from a specified secondary source.

Candidates choose sensible class intervals for a set of raw data and tabulate the results. They represent data as multiple bar charts, frequency polygons and stem and leaf diagrams. They compare two distributions using frequency polygons. They plot time series. They enter data in two way tables.

Candidates calculate the mean and median for grouped data. They find quartiles and the interquartile range. They calculate simple index numbers, fit lines by eye to bivariate data and recognise whether the correlation is positive, zero or negative. They estimate population means from samples. They carry out calculations on probabilities when the events are mutually exclusive and when the events are independent.

Candidates read and interpret multiple bar charts, frequency diagrams, frequency polygons and stem and leaf diagrams. They compare two distributions using stem and leaf diagrams and by using the interquartile range and a measure of average. They read and interpret simple published tables of secondary data, including tables involving percentages.

Candidates identify data which is misleadingly presented because of broken, incorrect or changed scales.

Candidates understand that large properly drawn samples give more reliable estimates of population measures than do small samples. They recognise bias in questions on a questionnaire and interpret the results accordingly. They distinguish between correlation and causality.

Candidates communicate conclusions in writing, tabular and graphical form, suitably linked together. Their conclusions are usually correct

Grade F Candidates, having worked through a simple problem, and been shown its standard analysis, standard methods and inferences drawn, do the same for a similar statistical problem.

Candidates identify situations in which the appropriate statistical skills are: frequency tables, bar charts, pie charts and line graphs, scatter diagrams, the mean, the median and the mode for raw data. They understand and use the probability scale from 0 to 1; they make and justify estimates or probability by selecting and using a method based on equally likely outcomes or on experimental evidence as appropriate. They understand that different outcomes may result from repeating an experiment. Candidates recall the process for the formulation of a hypothesis in a simple situation and formulate the hypothesis in a parallel situation. They collect data by designing a simple questionnaire to collect facts and by carrying out a simple experiment. Candidates administer orally a given questionnaire to a well-defined small population and carry out a simple experiment to obtain data. They need some help to complete the investigation.

Candidates take a set of raw data and, by tallying, complete a frequency table. They present data as bar charts, pie charts and line graphs. They represent bivariate data on a scatter diagram

Candidates calculate the mean, median, mode and range for a set of raw data.

Candidates read frequency tables, bar charts, pie charts, line graphs and scatter diagrams and draw conclusions. They identify individual entries in two way tables. They compare two simple distributions using the range and a measure of average.

Candidates identify data which is misleadingly presented because of the omission of the origin.

Candidates draw conclusions from samples that allow for variability between samples; they know the population measure will not usually be the same as the sample value. They identify major errors of bias in samples and do not draw false conclusions from these samples.

Candidates communicate simple conclusions in writing and by using simple tabular and graphical presentation.

B

Formulae Sheets

The formulae below may be required in the written papers, and are listed additionally on the inside front cover of the question and answer booklets.

Foundation tier

$$\text{Mean of a frequency distribution} = \frac{\sum fx}{\sum f}.$$

$$\text{Mean of a grouped frequency distribution} = \frac{\sum fx}{\sum f}, \text{ where } x \text{ is}$$

the mid-interval value.

Higher tier

The following formulae are required in addition to those for the Foundation tier, as listed above.

Standard deviation for a set of numbers x_1, x_2, \dots, x_n having a mean value of \bar{x} is given by

$$\sqrt{\frac{\sum (x - \bar{x})^2}{n}} \text{ or } \sqrt{\frac{\sum x^2}{n} - \bar{x}^2}.$$

Standard deviation for a discrete frequency distribution

$$\sqrt{\frac{\sum f(x - \bar{x})^2}{\sum f}} \text{ or } \sqrt{\frac{\sum fx^2}{\sum f} - \bar{x}^2}.$$

The same formula applies to the standard deviation of a grouped frequency distribution where x is the mid-interval value.

$$\text{Spearman's rank correlation coefficient} = 1 - \frac{6 \sum d^2}{n(n^2 - 1)}.$$

C

Record Forms

CANDIDATE RECORD FORMS AND CENTRE DECLARATION SHEETS ARE AVAILABLE ON THE AQA WEBSITE IN THE ADMINISTRATION AREA.

THEY CAN BE ACCESSED VIA THE FOLLOWING LINK

http://www.aqa.org.uk/admin/p_course.php

D

Overlaps with other Qualifications

Some topics from probability and measures of spread and locations are included in the AO4 (Handling Data) part of GCSE Mathematics.