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Specification

Edexcel GCSE in Statistics (2ST01)

Ofqual

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Welcome to the Edexcel GCSE in Statistics Specification

Issue 2
As a result of feedback from centres we have made changes.
This version is Issue 2 and key changes are indicated by a sideline.

This specification has been written to help all your students succeed. It has been designed in sections to help you find your way around the content.

- The 'specification at a glance' pages give a clear and simple summary of the qualification, including the assessment arrangements, so you have all the important information in one handy place.

- Section A features the unit content. Written by our team of teachers and examiners, it is presented in a style that allows you to quickly and easily see what you need to teach and students need to learn.

- Section B provides clear and concise information about the assessment, including guidance about controlled assessment. You will also find all the practical information you need on making entries and assessing your students.

- Section C includes information on the full range of support, services and training available to help you plan and deliver the course. You will find information on the range of teaching and learning material that will help you implement the course effectively, and a summary of all our services designed to support you every step of the way.

However, that's not all.

The Edexcel GCSE in Statistics qualification will be supported better than ever before. Keep up to date with the latest news and services available by visiting our website: **www.edexcel.com/gcse2009**

Introduction

The Edexcel GCSE in Statistics is designed for use in schools and colleges. It is part of a suite of GCSE qualifications offered by Edexcel.

About this specification

This specification:

- complements the Edexcel GCSE in Mathematics
- is suitable for either one-year or two-year study
- is based on good practice in statistics
- emphasises the theoretical, practical and applied nature of the subject
- is suitable for cross-curricular studies and activities
- provides a background for the study of statistics beyond GCSE level
- is supported by:
  - controlled assessment guidance and support
  - a course textbook, written by the senior examining team
  - professional development and training events
  - Edexcel ResultsPlus
  - Exam Wizard
  - an e-spec
  - data handling tool.

For more information, please see our website (www.edexcel.com).

Key subject aims

This specification:

- actively engages students in an accessible and relevant discipline
- helps students acquire knowledge and understanding of statistical techniques and concepts
- encourages statistical problem solving
- develop student understanding of the importance and limitations of statistics
- supports students in their progression through statistics and other related disciplines.

Contents

Contents

Specification at a glance

The Edexcel GCSE in Statistics is assessed through:

- a written paper
- an internal assessment with controlled conditions.

Unit 1

***Unit codes: 5ST1F/5ST1H**

- Externally assessed
- Availability: June series
- First assessment June 2011

75% of the total GCSE

Overview of content

- Planning and data collection
- Processing, representing and analysing data
- Reasoning, interpreting and discussing results
- Probability

Overview of assessment

Foundation Tier (targeting grades G–C)

- One written paper lasting 1 hour 30 minutes
- 80 marks in total
- Consists of questions in familiar and unfamiliar contexts
- Contains short answer and long answer questions
- Questions set on standard statistical techniques, diagrams and probability
- Questions which give the student the opportunity to analyse written and statistical evidence

Higher Tier (targeting grades D–A*)

- One written paper lasting 2 hours
- 100 marks in total
- Consists of questions in familiar and unfamiliar contexts
- Contains short answer and long answer questions
- Questions set on standard statistical techniques, diagrams and probability
- Questions which give the student the opportunity to analyse written and statistical evidence

Unit 2

Unit code: 5ST02

- Controlled conditions
- Availability: June series
- First assessment: June 2010

25% of the total GCSE

Overview of content

- Planning and data collection
- Processing, representing and analysing data
- Reasoning, interpreting and discussing results
- Probability

Overview of assessment

- Not tiered (targeting grade A*–G)
- One controlled assessment
- Three sections:
  - planning
  - data collection and processing and representing data
  - interpreting and evaluating data
- Tasks provided by Edexcel each year
- Students and centres able to personalise investigation within the task

*See *Appendix 3* for a description of this code and all other codes relevant to this qualification.

A Qualification content

Knowledge and understanding

The Edexcel GCSE in Statistics requires students to develop knowledge and understanding in the following areas:

Planning and data collection

- Planning a line of enquiry or investigation
- Types of data
- Census and sample data
- Sampling techniques
- Collecting or obtaining data

Processing, representing and analysing data

- Methods of tabulation
- Diagrams and similar forms of representation
- Measures of central tendency
- Measure of dispersion
- Summary statistics
- Scatter diagrams, correlation and regression
- Time series
- Quality assurance
- Estimation

Reasoning, interpreting and discussing results

- Inference and other reasoning
- Predictions
- Interpretation and conclusion

Probability

- Definitions and calculations
- Discrete probability distributions

Skills

The Edexcel GCSE in Statistics provides students with the opportunity to develop skills in the following areas:

- planning a statistical enquiry
- collecting data
- processing, analysing and representing data
- interpreting and evaluating results
- communicating plans, results and conclusions in a variety of forms, including using ICT.

Specification content

Using the specification content

The subject content for GCSE Statistics examination papers is presented in two tiers: Foundation and Higher.

In each tier the content is divided into two sections:

- the concise content description
- *italicised* statements giving further guidance in the form of examples, or more detailed description.

Material introduced in the Higher Tier and not included in the Foundation Tier is shown in **bold**.

Foundation Tier

The collection of data

(a) Planning

Students should be taught to:

specify a line of enquiry to be investigated; breaking it down into more manageable parts and sub-questions when necessary

specify a hypothesis to be tested

Terminology such as null hypothesis will not be required. A hypothesis such as 'as motor cycles get older their value is likely to go down' is expected.

determine the data required for a line of enquiry, selecting an appropriate method of obtaining the data

Use a questionnaire rather than an open-ended interview.
Explain the rationale behind a sampling method.

(b) Types of data

Students should be taught to:

recognise that data can be obtained from primary or secondary sources

Primary sources could include raw data, surveys, questionnaires which may have more than two categories, investigations and experiments, whilst secondary sources could include databases, published statistics, newspapers, internet pages.

recognise the difference between quantitative and qualitative variables

Number of pets is quantitative, favourite name is qualitative.

recognise the difference between discrete and continuous data

Number of people is discrete, whilst height is continuous.

recognise, understand and use scales of measurement — categorical, rank

Categorical: hair colour, rank: exam grades.

categorise data through the use of well-defined, precise definitions, intervals or class boundaries

The use of class boundaries such as $0 < a \leq 5$ and terms such as class width and class interval is expected.

understand the meaning of bivariate data which may be discrete, continuous, grouped or ungrouped

Plotting and interpreting points in a 2D framework is expected.

understand, use and define situations for grouped and ungrouped data

The construction and use of two-way tables, obtained from surveys and questionnaires.

(c) Population and sampling

Students should be taught to:

understand the meaning of the term population

The definition of 'population' can vary — for example, it could be a class group or the cars in a car park.

understand the word census, especially with regard to well defined, small-scale and large populations, for example national census

A census obtains information about every member of a population.

understand the reasons for sampling and that sample data is used to estimate values in the population

Reasons to include time and efficiency, and impossibility of reaching the whole population in many circumstances.

understand the terms random, randomness and random sample

The relation between 'random' and 'equally likely' may be tested.

generate and use random numbers

Using a calculator, or a computer (including the use of a spreadsheet) or by experiment.

understand, design and use a sampling frame

Designing a sampling frame is expected.

be able to select a simple random sample or a stratified sample by one category as a method of investigating a population

An appreciation of an appropriate sample size is expected, as is the ability to make a random selection or sample from a population using calculators or computers.

Examples of one category might include male/female or KS2/KS3/KS4.

have a basic idea of the concept of bias, how it might occur in a sampling procedure and how it might be minimised

Possible bias in sources of secondary data, for example vested interests.

(d) Collecting data

Students should be taught to:

collect or obtain data by observation, surveys, experiments (including controlled experiments), counting, data logging, questionnaires and measurement

Writing improved or good questions for a questionnaire is expected.

obtain primary data by questionnaires or experiment

understand the effects of accuracy on measurements

Knowing that measured data such as length or time is subject to some error.

For example, that every measurement is taken to a given level of accuracy.

understand the advantages and disadvantages of using interviews versus questionnaires

Deciding which technique might be more appropriate, and why, is expected.

design and use efficient and effective data capture sheets and methods of recording data

understand the role and use of pilot studies and pre-testing

The rationale behind pilots for questionnaires and pre-tests for experiments is expected.

understand and account for the problems of design, ambiguity of wording, leading and biased questions, definitions and obtaining truthful responses

The minimisation of ambiguity and bias is expected.

understand the advantages and disadvantages of open and closed questions

As used in questionnaires.

be aware of, and understand, the problems related to identifying the appropriate population, the distribution and collection of questionnaires, errors in recorded answers, non-responses and missing data

Dealing with problems such as non-response and rogue values is expected.

identify appropriate sources of secondary data

Newspapers, Office of National Statistics, the internet and others.

Students should be taught to:

extract data from secondary sources, including those based on ICT

The sampling of secondary data from sources such as the Office of National Statistics is expected or data on subjects of students' own interests, including that extracted from the internet.

understand the aspects of accuracy, reliability, relevance and bias as related to secondary data

Questioning the reliability of secondary sources and data is expected. Examples of secondary data include the internet, Retail Price Index (RPI) or Consumer Price Index (CPI), Key Data and Abstract of Statistics, GCSE results.

design simple statistical experiments to obtain data

Students will be expected to comment on the design of experiments, for example using controls and random allocation.

understand the meaning of explanatory and response variables

The identification of explanatory (independent) and response (dependent) variables is expected.

understand the need for identification of the variables to be investigated

Knowledge of redundant variables is expected.

understand surveys

Examples from other school subjects (including science) and everyday life.

Processing, representing and analysing data

Students should be taught to:

construct frequency tables by tallying raw data where appropriate

The use and interpretation of the standard five- point tally in a tally chart is expected, ie tallying a frequency of 5 with four vertical bars and one diagonal bar across them.

tabulate using class intervals as appropriate

For continuous or discrete data.

tabulate using various forms of grouping the data

Could include qualitative or quantitative categories.

combine categories to simplify tables with an understanding of the problems of over simplification, the effects on readability, the identification or masking of trends and the loss of detail

Students will be expected to comment on aspects such as loss of detail or masking of trends.

read and interpret data presented in tabular or graphical form

Tables of data drawn from media and from government and other statistical sources may be used, for example social trends.

design suitable tables, including summary tables; design and use appropriate two-way tables

Systematically listing outcomes from single or two successive events.

convert raw data to summary statistics, design, construct and present summary tables

Understanding of the difference between raw data and summary statistics is expected.

(b) Diagrams and representations

Students should be taught, as appropriate, to construct, draw, use and understand:

correct and precise labelling of all forms of diagrams

The labelling and scaling of axes is expected.

pictograms, bar charts, multiple or composite bar charts and pie charts for qualitative, quantitative and discrete data

The reasons for choosing one form of representation are expected.

vertical line (stick) graphs for discrete data

Comparative line graphs are expected.

for continuous data: pie charts, histograms with equal class intervals, frequency diagrams, cumulative frequency diagrams, population pyramids

No distinction will be made between cumulative frequency polygons and curves, whilst frequency polygons could be open or closed.

stem and leaf diagrams for discrete and continuous data

Students may need to define the stem for themselves.

A key is expected.

scatter diagrams for bivariate data

Students may be required to define their own scales.

line graphs and time series

Trend lines by eye and seasonal variation are expected.

choropleth maps (shading)

For example, showing temperature across Europe by shading regions.

simple properties of the shape of distributions of data including symmetry, positive and negative skew

the distinction between well-presented and poorly presented data

Poorly presented data can be misleading.

Students should be taught, as appropriate, to construct, draw, use and understand:

the shape and simple properties of frequency distributions; symmetrical positive and negative skew

the potential for visual misuse, by omission or misrepresentation

Knowledge of causes such as unrepresentative scales is expected.

the transformation from one presentation to another

Bar chart to pie chart, etc.

how to discover errors in data and recognise data that does not fit a general trend or pattern

Analytical definition of an outlier will not be required.

(c) Measures of central tendency

Students should be taught to:

work out and use the mean, mode and median of raw data presented as a list

No more than 30 numbers in the list will be examined.

work out the mean, mode and median for discrete data presented as a frequency distribution

Graphical and other methods for the median are expected.

Σ *notation is expected.*

identify the modal class interval for grouped frequency distributions for discrete or continuous data

Frequency distributions with equal class intervals only.

work out and use estimates for the mean and median of grouped frequency distributions for discrete or continuous data

Graphical and other methods for the median are expected.

The use of sigma notation is expected.

understand the appropriateness, advantages and disadvantages of each of the three measures of central tendency

Explanation of why certain measures are inappropriate is expected.

be able to make a reasoned choice of a measure of central tendency appropriate to a particular line of enquiry

(d) Measures of dispersion

work out and use the range for data presented in a list or frequency distribution

The possible effect of an outlier on range is expected.

work out the quartiles, percentiles and interquartile range for discrete and continuous data presented either as a list, frequency table or grouped frequency table

Graphical and other methods are expected.

construct, interpret and use box plots

The use of box plots includes comparisons.

understand the advantages and disadvantages of each of the measures of dispersion range, quartiles, interquartile range, percentiles

use an appropriate measure of central tendency, together with range, quartiles, interquartile range and percentiles to compare distributions of data

An awareness that a full comparison needs at least both a measure of central tendency and a measure of dispersion is expected.

Extra measures are included.

(e) Further summary statistics

Students should be taught to:

simple index numbers

Price relative = (Price ÷ Price in base year) × 100

(f) Scatter diagrams and correlation

Students should be taught to:

plot data as points on a scatter diagram

The labelling and scaling of axes is expected.

recognise positive, negative and zero linear correlation by inspection

Terms such as strong or weak are expected.

understand the distinction between correlation, causality and a non-linear relationship

The points lying on the circumference of a circle are related but show zero correlation.

fit a line of best fit passing through $(\overline{x}, \overline{y})$ to the points on a scatter diagram, by eye may be required

Questions will state when $(\overline{x}, \overline{y})$ *is required.*

to use interpolation and extrapolation and understand the pitfalls

Particularly the problem of extrapolating beyond the range.

interpret data presented in the form of a scatter diagram

(g) Time series

Students should be taught to:

plot points as a time series; draw a trend line by eye and use it to make a prediction

No more than 20 points are expected.

calculate and use appropriate moving averages

Up to and including a 5-point moving average.

identify and discuss the significance of seasonal variation by inspecting time series graphs

(h) Estimation

Students should be taught to:

estimate population means from samples

estimate population proportions from samples with application in opinion polls and elsewhere

understand the effect of sample size on estimates and the variability of estimates

Reasoning, interpreting and discussing results

Students should be taught, in the context of real data, to:

apply statistical reasoning, explain and justify inferences, deductions, arguments and solutions

Cases clearly restricted to the content of the specification at the appropriate level.

explore connections and look for and examine relationships between variables

For example, height and weight, age and depreciation of a car, GNP and mortality in infants.

consider the limitations of any assumptions

Simple cases only, for example honest replies to questionnaires, equally likely outcomes in probabilities, representativeness of sample of population, reliability of secondary data.

relate summarised data to any initial questions or observations

The relevance of measures of central tendency.

interpret all forms of statistical tables, diagrams and graphs

To include real published tables and graphs.

compare distributions of data and make comparisons using measures of central tendency, measures of dispersion and percentiles

The shapes of distributions and graphs may be used.

Formula for variance and standard deviation to be given.

check results for reasonableness and modify their approaches if necessary

For example, the mean must lie between the maximum and minimum, 'the average bicycle speed was 130 km per hour' is not reasonable.

interpret correlation as a measure of the strength of the association between two variables

The use of words such as 'weak' or 'strong' are expected.

Probability

Students should be taught to:

understand the meaning of the words event and outcome

Tossing a coin is an event with outcomes landing heads or tails.

understand words such as: impossible, certain, highly likely, likely, unlikely, possible, evens, and present them on a likelihood scale

Interpretation of real-life situations will be expected, for example 'the probability that the horse will win the next race is 0.3'; 'the probability that I will get a grade C or better in my GCSE Statistics is $\frac{3}{4}$ *'*

put outcomes in order in terms of probability

Use of $\leq$ *is expected.*

put probabilities in order on a probability scale

Labelling of the scale will be expected.

understand the terms 'random' and 'equally likely'

understand and use measures of probability from a theoretical perspective and from a limiting frequency or experimental approach

Formal definition and notation of a limit will not be required but terminology such as 'as the number of trials increases' is expected.

understand that in some cases the measure of probability based on limiting frequency is the only viable measure

The probability of a sports team winning can only be measured from a limiting frequency perspective.

For example, medical statistics for the assessment of health risks.

compare expected frequencies and actual frequencies;

use probability to assess risk

Examples may be taken from insurance scenarios.

Students should be taught to:

produce, understand and use a sample space

Listing all outcomes of single events and two successive events, in a systematic way.

understand the terms mutually exclusive and exhaustive and understand the addition law P(A or B) = P(A) + P(B) for two mutually exclusive events

P(A or B) = P(A) + P(B);

'Mutually exclusive' means that the occurrence of one outcome prevents another, $\Sigma p = 1$ *when summed over all mutually exclusive outcomes.*

know, for mutually exclusive outcomes, that the sum of the probabilities is 1 and in particular the probability of something not happening is 1 minus the probability of it happening

If P(A) = p *then* P(not A) = 1 – p

draw and use tree diagrams and probability tree diagrams for independent events

Listing all possible joint or compound outcomes.

understand, use and apply the addition law for mutually exclusive events and the multiplication law for independent events

To correctly apply

P(A and B) = P(A) × P(B),

P(A or B) = P(A) + P(B).

Higher Tier

The collection of data

(a) Planning

Students should be taught to:

specify a line of enquiry to be investigated; breaking it down into more manageable parts and sub-questions when necessary;

specify a hypothesis to be tested

Terminology such as null hypothesis will not be required. A hypothesis such as 'as motor cycles get older their value is likely to go down' is expected.

determine the data required for a line of enquiry, selecting an appropriate method of obtaining the data **and justifying the choice of method by comparing it with possible alternatives**

Use a questionnaire rather than an open-ended interview. Explain the rationale behind a sampling method, in relation to ***size or type of sample****.*

(b) Types of data

Students should be taught to:

recognise that data can be obtained from primary or secondary sources

Primary sources could include raw data, surveys, questionnaires which may have more than two categories, investigations and experiments, whilst secondary sources could include databases, published statistics, newspapers, internet pages, etc.

recognise the difference between quantitative and qualitative variables

Number of pets is quantitative, favourite name is qualitative.

recognise the difference between discrete and continuous data

Number of people is discrete, whilst height is continuous.

recognise, understand and use scales of measurement – categorical, rank

Categorical: hair colour, rank: exam grades.

categorise data through the use of well-defined, precise definitions, intervals or class boundaries

The use of class boundaries such as $0 < a \leq 5$ and terms such as class width and class interval is expected

appreciate the implications of grouping for loss of accuracy in both calculations and presentations

understand the meaning of bivariate data which may be discrete, continuous, grouped or ungrouped

Plotting and interpreting points in a 2D framework is expected.

understand, use and define situations for grouped and ungrouped data

The construction and use of two-way tables obtained from surveys and questionnaires.

(c) Population and sampling

Students should be taught to:

understand the meaning of the term population

The definition of 'population' can vary — for example it could be a class group or the cars in a car park.

understand the word census, especially with regard to well defined, small scale and large populations, eg National census

A census obtains information about every member of a population.

The types of questions used for a census and how the collected data is used.

understand the reasons for sampling and that sample data is used to estimate values in the population

Reasons to include time and efficiency, and the impossibility of reaching the whole population in many circumstances.

understand the terms random, randomness and random sample

The relation between 'random' and 'equally likely' may be tested.

understand the use of random numbers

using a random number table, calculator or computer (including the use of a spreadsheet);

understand, design and use a sampling frame

Designing a sampling frame is expected.

be able to select a simple random sample or a stratified sample by **more than** one category as a method of investigating a population

An appreciation of an appropriate sample size is expected, as is the ability to make a random selection or sample from a population using calculators or computers.

Examples of one category might include male/female or KS2/KS3/KS4.

Students should be taught to:

understand and use systematic, quota and cluster sampling

With particular reference to large-scale lines of enquiry such as quality control or opinion polls.

Quota sampling: for example, market research, using a quota of subjects of specified type.

Cluster sampling: for example, grouping subjects by area.

have a basic idea of the concept of bias, how it might occur in a sampling procedure and how it might be minimised

Possible bias in sources of secondary data, for example vested interests.

understand the strengths and weaknesses of various sampling methods, including bias, influences and convenience

An awareness of influences such as gender, social background or geographical area is expected.

(d) Collecting data

Students should be taught to:

collect or obtain data by observation, surveys, experiments (including controlled experiments), counting, data logging, **convenience sampling**, questionnaires and measurement

Writing improved or good questions for a questionnaire is expected.

obtain primary data by questionnaires, experiments **or simulations**

Simulations such as the rolling of a die can be obtained using a calculator or a spreadsheet.

understand the effects of accuracy on measurements

Knowing that measured data such as length or time is subject to some error.

For example, ***recognise*** *that every measurement is taken to a given level of* ***accuracy and that measurements given to the nearest whole unit may be inaccurate by up to*** $\pm \frac{1}{2}$ ***unit****.*

understand the advantages and disadvantages of using interviews versus questionnaires

Deciding which technique might be more appropriate, and why, is expected.

design and use efficient and effective data capture sheets and methods of recording data

understand the role and use of pilot studies and pre-testing

The rationale behind pilots for questionnaires and pre-tests for experiments is expected.

understand and account for the problems of design, ambiguity of wording, leading and biased questions, definitions and obtaining truthful responses **with simplest form of random response in sensitive cases**

The minimisation of ambiguity and bias is expected.

Example of a sensitive case, when emotions, finance, politics or criminal activity are involved*.*

Students should be taught to:

understand the advantages and disadvantages of open and closed questions

As used in questionnaires.

be aware of, and understand, the problems related to identifying the appropriate population, the distribution and collection of questionnaires and surveys, errors in recorded answers, non-responses and missing data

Dealing with problems such as non-response and rogue values is expected.

identify appropriate sources of secondary data

Newspapers, Office of National Statistics, the internet and others.

extract data from secondary sources, including those based on ICT

The sampling of secondary data from sources such as Office of National Statistics is expected or data on subjects of students' own interests, including that extracted from the internet.

understand the aspects of accuracy, reliability, relevance and bias as related to secondary data

Questioning the reliability of secondary sources and data will be expected. Examples of secondary data include the internet, Retail Price Index (RPI), Consumer Price Index (CPI), Key Data and Abstract of Statistics, GCSE results.

design simple statistical experiments to obtain data

Students will be expected to comment on the design of experiments, eg using controls and random allocation ***including replication, randomisation and matched pairs****.*

understand the meaning of explanatory and response variables

The identification of explanatory (independent) and response (dependent) variables is expected.

understand the need for identification of the variables to be investigated

Knowledge of redundant variables will be expected.

understand surveys; **the appropriateness of the conditions**

Examples from other subjects (including science) and everyday life.

Processing, representing and analysing data

(a) Tabulation

Students should be taught to:

construct frequency tables by tallying raw data where appropriate

The use and interpretation of the standard five-point tally in a tally chart is expected, ie tallying a frequency of 5 with four vertical bars and one diagonal bar across them.

tabulate using class intervals as appropriate, **including open-ended classes and classes of varying width**

For continuous or discrete data.

tabulate using various forms of grouping the data

Could include qualitative or quantitative categories.

combine categories to simplify tables with an understanding of the problems of over simplification, the effects on readability, the identification or masking of trends and the loss of detail

Students will be expected to comment on aspects such as loss of detail or masking of trends.

problems associated with under and over simplification through inappropriate number of significant figures or an unsuitable group size

An awareness of problems associated with creating categories that are too broad, too narrow or redundant.

read and interpret data presented in tabular or graphical form

Tables of data drawn from media and government and other statistical sources may be used, for example social trends.

design suitable tables, including summary tables; design and use appropriate two-way tables

Systematically listing outcomes from single or two successive events.

convert raw data to summary statistics, design, construct and present summary tables

Understanding the difference between raw data and summary statistics is expected.

(b) Diagrams and representations

Students should be taught, as appropriate, to construct, draw, use and understand:

correct and precise labelling of all forms of diagrams

The labelling and scaling of axes is expected.

pictograms, bar charts, multiple or composite bar charts and pie charts for qualitative, quantitative and discrete data **and comparative pie charts with area proportional to frequency**

The reasons for choosing one form of representation are expected.

vertical line (stick) graphs for discrete data **and cumulative frequency step polygons**

Comparative line graphs are expected, ***as are comparative step polygons****.*

for continuous data: pie charts, histograms with equal class intervals, frequency diagrams, cumulative frequency diagrams, population pyramids, **histograms with unequal class intervals and the concept of frequency density**

No distinction will be made between cumulative frequency polygons ***(other than step polygons)*** *and curves, whilst frequency polygons could be open or closed.* ***Changes over time, for example population pyramids. Practical consequences applied to all forms of representation****.*

stem and leaf diagrams for discrete and continuous data

Students should be able to define the stem for themselves.

A key is expected.

scatter diagrams for bivariate data

Students should be able to define their own scales.

line graphs and time series

Trend lines by eye and seasonal variation are expected.

Students should be taught, as appropriate, to construct, draw, use and understand:

choropleth maps (shading)

For example, showing temperature across Europe by shading regions.

simple properties of the shape of distributions of data including symmetry, positive and negative skew

the distinction between well-presented and poorly presented data

Poorly presented data can be misleading, ***for example, 3D angled pie charts and 3D pie charts with slices pulled out, scales that do not start at 0****.*

the shape and simple properties of frequency distributions

symmetrical positive and negative skew

that many populations can be modelled by the Normal distribution

the potential for visual misuse, by omission or misrepresentation

Knowledge of causes such as unrepresentative scales ***or other measures*** *is expected.*

the transformation from one presentation to another

Bar chart to pie chart, etc.

how to discover errors in data and recognise data that does not fit a general trend or pattern, **including outliers**

Analytical definition of an outlier ***will*** *be required.*

(c) Measures of central tendency

Students should be taught to:

work out and use the mean, mode and median of raw data presented as a list

No more than 30 numbers in the list will be examined.

work out the mean, mode and median for discrete data presented as a frequency distribution

Graphical and other methods for the median are expected.

Σ *notation is expected.*

identify the modal class interval for grouped frequency distributions for discrete or continuous data

Frequency distributions with equal class intervals only. work out and use estimates for the mean and median of grouped frequency distributions for discrete or continuous data

Graphical and other methods for the median are expected.

The use of sigma notation is expected

understand the effects of transformations of the data on the mean, mode and median

Transformations will be restricted to those of the type $x \rightarrow ax + b$ (ie affine transformations).

understand the effect on the mean, mode and median of changes in the data including the addition or withdrawal of a population or sample member

understand the appropriateness, advantages and disadvantages of each of the three measures of central tendency

Explanation of why certain measures are inappropriate is expected.

be able to make a reasoned choice of a measure of central tendency appropriate to a particular line of enquiry, **nature of the data and purpose of the analysis;**

Full explanation of why a particular measure is chosen, including cases where a comparison is to be made, is expected.

calculate and use a weighted mean

No more than four categories are expected.

(d) Measures of dispersion

Students should be taught to:

work out and use the range for data presented in a list or frequency distribution

The possible effect of an outlier on range is expected.

work out the quartiles, percentiles and interquartile range for discrete and continuous data presented either as a list, frequency table or grouped frequency table

Graphical and other methods will be expected.

Numerical interpolation is expected.

work out interpercentile ranges for discrete and continuous data presented as a list, frequency distribution or grouped frequency distribution

Numerical interpolation is expected.

construct, interpret and use box plots

The use of box plots includes comparisons.

formally identify outliers

Outliers are defined as:

less than LQ – 1.5 × IQR and

greater than UQ + 1.5 × IQR,

where LQ and UQ are lower and upper quartiles and IQR is interquartile range.

Effect of anomalous data.

calculate and use variance and standard deviation

Division by n is expected, as is use of Σ notation.

understand the advantages and disadvantages of each of the measures of dispersion range, quartiles, interquartile range, percentiles, **deciles, interpercentile range, variance and standard deviation**

Students should be taught to:

use an appropriate measure of central tendency together with range, quartiles, interquartile range, percentiles, **deciles, interpercentile range, variance and standard deviation** to compare distributions of data

An awareness that a full comparison needs at least both a measure of central tendency and a measure of dispersion is expected.

calculate, interpret and use standardised scores to compare values from different frequency distributions

Extra measures are included.

(e) Further summary statistics

Students should be taught to:

simple index numbers

Price relative = (Price ÷ Price in base years) × 100

chain base index numbers

Used to calculate the annual percentage change.

weighted index numbers

Weighted index number = Σ (Index number × Weight) ÷ Σ (Weight)

For example, CPI (Consumer Price Index), AEI, (Average Earnings Index).

Retail Price Index (RPI)

What items are in the index, how items change over time, how prices are established from survey, how the index is used in assessing real price change and the limitations.

(f) Scatter diagrams and correlation

Students should be taught to:

plot data as points on a scatter diagram

The labelling and scaling of axes is expected.

recognise positive, negative and zero correlation by inspection

Terms such as strong or weak are expected.

understand the distinction between correlation, causality and a non-linear relationship

The points lying on the circumference of a circle are related but show zero correlation.

draw a line of best fit passing through $(\bar{x}, \bar{y})$ to the points on a scatter diagram

Questions will state when $(\bar{x}, \bar{y})$ *is required.*

find the equation of a line of best fit in the form $y = ax + b$ and a practical interpretation of a and b in context

Commenting on whether a straight line is appropriate will be expected.

Finding the values of a and b from the diagram.

fit non-linear models of the forms $y = ax^n + b$ and $y = ka^x$

The relationship will be suggested; n could be 2, −1 or $\frac{1}{2}$ only.

For example, population growth or nuclear decay.

understand the pitfalls of interpolation and extrapolation

Particularly the problem of extrapolating beyond the range.

interpret data presented in the form of a scatter diagram

calculate, in appropriate cases, Spearman's rank correlation coefficient and use it as a measure of agreement or for comparisons of the degree of correlation

The formula will be given. Although students should have experience of dealing with tied ranks, this will not be tested in the examination.

(g) Time series

Students should be taught to:

plot points as a time series; draw a trend line by eye and use it to make a prediction

No more than 20 points is expected.

calculate and use appropriate moving averages

Up to and including a 7-point moving average.

identify and discuss the significance of seasonal variation by inspection of time series graphs

Students will be expected to work out the average seasonal variation from their time series graphs.

draw a trend line based on moving averages;

recognise seasonal effect at a given data point and average seasonal effect.

Interpretations are expected.

(h) Quality assurance

Students should be taught to:

plot sample means, medians and ranges over time on quality control charts that have target values, and action and warning limits

For example, in the manufacture of clothes to test that the variation in waist size is within allowable limits and that production may continue; in the manufacture of engineering components that certain measurements are within allowable limits and production may continue.

understand that in a process under control almost all of the means, medians or ranges fall inside the action limits, and only 1 in 20 fall outside the warning limits

know the action to be taken if a sample mean, median or range falls outside of each type of limit

If a sample mean is outside the action limits the process is stopped. If a sample mean is between the warning and action limits another sample is taken.

(i) Estimation

Students should be taught to:

estimate population means from samples

estimate population proportions from samples with applications in opinion polls and elsewhere

estimate population size based on the Petersen capture/recapture method

The appropriateness of the assumptions in practice.

understand the effect of sample size on estimates and the variability of estimates, **with a simple quantitative appreciation of appropriate sample size**

Reasoning, interpreting and discussing results

Students should be taught to:

apply statistical reasoning, explain and justify inferences, deductions, arguments, solutions and decisions

Cases clearly restricted to the content of the specification at the appropriate level.

explore connections and look for and examine relationships between variables, **including fitting the equation to a line of best fit or trend line**

For example, height and weight, age and depreciation of a car, GNP and mortality in infants.

Interpretations of gradient and intercept are expected.

consider the limitations of any assumptions

Simple cases only, for example, honest replies to questionnaires, equally likely outcomes in probabilities, representativeness of sample of population, reliability of secondary data.

formally identify outliers using quartiles

Dealing with outliers is expected.

relate summarised data to any initial questions or observations

The relevance of measures of central tendency.

interpret all forms of statistical tables, diagrams and graphs

To include real published tables and graphs.

compare distributions of data and make comparisons using measures of central tendency and measures of dispersion, such as percentiles, **deciles, interpercentile range, mean deviation, variance and standard deviation**

The shapes of distributions and graphs may be used.

Formula for variance and standard deviation to be given.

Students should be taught to:

check results for reasonableness and modify their approaches if necessary

For example, the mean must lie between the maximum and minimum, 'the average bicycle speed was 130 km per hour' is not reasonable.

interpret correlation as a measure of the strength of the association between two variables, **including Spearman's rank correlation coefficient for ranked data**

The use of words such as weak or strong is expected; ***the closer to*** $\pm$ **1** ***the better the correlation for a given sample size.***

Beware the use of correlation in small samples.

make predictions

The use of a trend line by eye, drawing or formula will be expected.

compare or choose by eye between a line of best fit and a model based on

$y = ax^n + b$ **for** $n = 2, 1$ **or** $\frac{1}{2}$, $y = ax^2 + bx$ **or** $y = ka^x$

Based on an informal awareness of the spread of points around a proposed model.

Probability

Students should be taught to:

understand the meaning of the words event and outcome

Tossing a coin is an event with outcomes landing heads or tails.

understand words such as: impossible, certain, highly likely, likely, unlikely, possible, evens and present them on a likelihood scale

Interpretation of real-life situations is expected, for example, 'the probability that the horse will win the next race is 0.3'; 'the probability that I will get a grade C or better in my GCSE Statistics is $\frac{3}{4}$*.'*

put outcomes in order in terms of probability

Use of $\leq$ *is expected.*

put probabilities in order on a probability scale

Labelling of the scale is expected.

understand the terms random and equally likely

understand and use measures of probability from a theoretical perspective and from a limiting frequency or experimental approach

Formal definition and notation of a limit will not be required but terminology such as 'as the number of trials increases' is expected.

Understand that increasing sample size generally leads to better estimates of probability and population parameters.

understand that in some cases the measure of probability based on limiting frequency is the only viable measure

The probability of a sports team winning can only be measured from a limiting frequency perspective.

For example, medical statistics for the assessment of health risks.

compare expected frequencies and actual frequencies

Students should be taught to:

use simple cases of the binomial and discrete uniform distribution

The expansion of $(p + q)^2$ is expected.

In all other cases the expansion of $(p + q)^n$ will be given.

(n will be limited to 5)

use simulation to estimate more complex probabilities

use probability to assess risk

Examples may be taken from insurance scenarios.

produce, understand and use a sample space

Listing all outcomes of single events and two successive events, in a systematic way is expected.

understand and use Venn diagrams and Cartesian grids

for example, using a 6 × 6 Cortesion grid to show the sum of two dice.

understand the terms mutually exclusive and exhaustive and to understand the addition law P(A or B) = P(A) + P(B) for two mutually exclusive events

'Mutually exclusive' means that the occurrence of one outcome prevents another,

Σ*(probabilities) = 1 when summed over all mutually exclusive outcomes.*

know, for mutually exclusive outcomes, that the sum of the probabilities is 1 and in particular the probability of something not happening is 1 minus the probability of it happening

If P(A) = p then P(not A) = 1 – p

draw and use tree diagrams and probability tree diagrams for independent events **and conditional cases**

Listing all possible joint or compound outcomes ***with and without replacement for up to three outcomes and three sets of branches.***

Students should be taught to:

understand, use and apply the addition for mutually exclusive events, **general addition** and multiplication laws for independent events **and conditional events and outcomes**

To correctly apply

$P(A \text{ and } B) = P(A) \times P(B)$,

$P(A \text{ or } B) = P(A) + P(B)$,

$\mathbf{P(A \cup B) = P(A) + P(B) - P(A \cap B)}$,

$\mathbf{P(A \cap B) = P(B \mid A) \times P(A)}$.

the shape and simple properties of the Normal distribution

The distribution is symmetrical with mean, mode and median equal; approximately 95% of values are within ± 2 standard deviations of the mean; virtually all values are within ± 3 standard deviations of the mean. Use of the Normal distribution to model some populations.

Use of Normal distribution tables will not be required.

B Assessment

Assessment summary

- One written paper
- One internal assessment with controlled conditions

Summary table of assessment

Unit 1 Paper 1F — Unit code: 5ST1F/01

- 75% of the final assessment
- Content aimed at grades C–G
- Covers all Assessment Objectives
- One written paper lasting 1 hour and 30 minutes
- 80 marks in total
- Consists of questions in familiar and unfamiliar contexts
- Contains short answer and long answer questions
- Questions set on standard statistical techniques, diagrams, and probability
- Questions which give students the opportunity to analyse written and statistical evidence

Unit 1 Paper 1H — Unit code: 5ST1H/01

- 75% of the final assessment
- Content aimed at grades A*–D
- Covers all Assessment Objectives
- One written paper lasting 2 hours
- 100 marks in total
- Consists of questions in familiar and unfamiliar contexts
- Contains short answer and long answer questions
- Questions set on standard statistical techniques, diagrams, and probability
- Questions which give students the opportunity to analyse written and statistical evidence

Unit 2 — Unit code: 5ST02

- 25% of the final assessment
- Untiered: grades A*–G available
- Covers all assessment criteria
- The tasks consist of three stages:
  - planning
  - data collection and processing and representing data
  - interpreting and evaluating data
- 40 marks in total
- Approximately 8–10 hours curriculum time
- Planning and interpreting stages under formal supervision, data collection and processing and representing data under informal supervision

Assessment Objectives and weightings

	% in GCSE
AO1: Analyse a statistical problem and plan an appropriate strategy	10–20%
AO2: Describe and use appropriate methods to select and collect data	10–20%
AO3: Process, analyse and present data appropriately	40–50%
AO4: Use statistical evidence to identify inferences, make deductions	25–35%
TOTAL	**100%**

Relationship of assessment Objectives to assessments

Assessment	Assessment Objective				
	AO1	AO2	AO3	AO4	Total for AO1, AO2, AO3 and A04
Unit 1	4–14%	5–15%	32–42%	19–29%	75%
Unit 2	6.25%	5%	7.5%	6.25%	25%
Total for GCSE	**10–20%**	**10–20%**	**40–50%**	**25–35%**	**100%**

External assessment

Examination papers 1F and 1H

- Examination papers 1F and 1H will be combined question and answer books containing both shorter and longer questions.
- Examination papers will assess across all the grades available in the tier.
- Questions on the Higher Tier examination paper (1H) will assume knowledge from the Foundation Tier (1F).
- Diagrams will not necessarily be drawn to scale and measurements should not be taken from diagrams unless instructions to this effect are given.
- Formulae sheets will be provided in the question and answer booklets for both the Foundation and the Higher Tier.

Calculators

- Students will be expected to have access to a suitable electronic calculator for the examination papers.
- The electronic calculator to be used by students attempting examination paper 1F should have, as a minimum, the following functions:

  $+$, $-$, $\times$, $\div$, x^2, $\sqrt{x}$, memory, constant function, brackets, x, Σx, Σfx, a random number key, and the facility to enter data for statistical calculation.
- The electronic calculator to be used by students attempting examination paper 1H should have, as a minimum, the following functions:

  $+$, $-$, $\times$, $\div$, x^2, $\sqrt{x}$, memory, constant function, brackets, x, Σx, Σfx, σ, a random number key, and the facility to enter data for statistical calculation.
- Calculators with any of the following facilities are prohibited from any examination:
  - databanks
  - retrieval of text or formulae
  - QWERTY keyboards
  - built-in symbolic algebra manipulation
  - symbolic differentiation or integration.

Entering your students for assessment

Student entry

Details of how to enter students for this qualification can be found in Edexcel's *Information Manual*, a copy is sent to all examinations officers. The information can also be found on Edexcel's website: www.edexcel.com.

Students studying this unitised GCSE qualfication are required to complete at least 40 per cent of the overall assessment requirements as terminal assessment.

Forbidden combinations and Classification Code

Centres should be aware that students 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.

Students should be advised that, if they take two specifications with the same classification code, schools and colleges are very likely to take the view that they have achieved only one of the two GCSEs. The same view may be taken if students take two GCSE specifications that have different classification codes but have significant overlap of content. Students who have any doubts about their subject combinations should check with the institution to which they wish to progress before embarking on their programmes.

Access arrangements and special requirements

Edexcel's policy on access arrangements and special considerations for GCE, GCSE, and Entry Level aims to enhance access to the qualifications for students with disabilities and other difficulties (as defined by the Disability Discrimination Act 1995 and the amendments to the Act) without compromising the assessment of skills, knowledge, understanding or competence.

Please see the Edexcel website (www.edexcel.com/sfc) for:

- the Joint Council for Qualifications (JCQ) policy '*Access Arrangements and Special Considerations, Regulations and Guidance Relating to students who are Eligible for Adjustments in Examinations*'
- the forms to submit for requests for access arrangements and special considerations
- dates for submission of the forms.

Requests for access arrangements and special considerations must be addressed to:

Special Requirements
Edexcel
One90 High Holborn
London WC1V 7BH

Disability Discrimination Act (DDA)

Please see the Edexcel website (www.edexcel.com/sfc) for information with regard to the Disability Discrimination Act.

Controlled assessment

In controlled assessments, control levels are set for three linked processes: task setting, task taking and task marking. The control levels (high, medium or limited, dependent on the subject) are set for each process so that the overall level of control secures validity and reliability, provides good manageability for all involved and allows teachers to authenticate student work confidently.

A summary of the controlled conditions for this specification are shown below.

Summary of conditions for controlled assessment

The minimum controlled assessment requirement is one major statistical project which allows students to apply statistical knowledge, skills and techniques in a specific context.

Students may submit one statistical project only.

The project chosen and the data collected should enable students to satisfy the Assessment Objectives and controlled assessment criteria.

Edexcel will provide centres with tasks.

It is anticipated that centres will spend approximately 8–10 weeks curriculum time (approximately 8–10 hours) on the controlled assessment.

Some tasks may relate to data generated in other subject areas such as geography, science, citizenship or physical education.

Work carried out as part of a statistical project might also be used towards a controlled assessment submitted for another curricular area.

Students should be encouraged to use ICT.

Students can interrogate databases for secondary data, or set up their own database for storage of collected information.

ICT can be used to model situations or assist in the analysis and presentation of data.

It is important that when using the computer, each student details the decisions taken at each stage. Detailed reasons should be given as to why particular computer facilities have been used, as distinct from other possible avenues of presentation.

Task setting

Tasks will be set on an annual basis.

Further details on these tasks will be available in the Edexcel Information Manual.

Tasks will be replaced each year.

Centres will be able to contextualise the tasks to suit their individual circumstances.

Task taking

Tasks will be broken down into three stages:

- planning
- data collection and processing and representing data
- interpreting and evaluating data.

1: Planning

Students complete all work under **formal supervision**.

Students spend 1–2 weeks' curriculum time (approximately 1–2 hours) under supervised conditions planning how they are going to investigate the task.

They should state the hypothesis (or hypotheses) they intend to investigate.

They must consider what data they want to collect, how they are going to collect this data and their reasons for collecting the data, including any sampling work.

They must also provide a strategy of how they intend to process and represent the data.

Once students have planned their investigation, they should hand their work in to the teacher. The teacher will then mark and give feedback on the plan to the student and note the feedback on the *Student Record Form*.

Students must complete all work independently.

Student access to resources is determined by what is available in the centre. For example, the use of ICT at this stage is to be determined by the centre, but they need to ensure all word processed material is stored safely.

2a: Data collection and research

Students complete all work under **informal supervision**.

The collection and sampling of data should take place under time constraints determined by the centre.

Students can work in teams or individually to collect data.

Teachers need to ensure that data collection is considered in advance, and that they consider on any potential health and safety issues which may occur during the collection of data.

The project must be based on data collected from primary and/or secondary sources by the student, and these sources must be clearly acknowledged.

Students can summarise their data in diagrams and tables at this point.

2b: Processing and representing data

Students to complete all work under **informal supervision**.

Students should have access to their plan and their collected data.

The processing and representing of data should take place under time constraints determined by the centre.

Student access to and use of ICT for this stage is to be determined by the centre.

Students should complete all work independently.

3: Interpreting and evaluating data

Students to complete all work under **formal supervision**.

Students should have access to their previous work from earlier stages in the task.

Students should be given a maximum of 2 weeks' of curriculum time (approximately up to 2 hours) within which to interpret and evaluate their data.

Student access to and use of ICT for this stage is to be determined by the centre.

Students must complete all work independently.

At the end of this time, the student will hand in their materials to the teacher. The teacher will record their marks for this work on the *Student Record Form*, using the assessment criteria for each stage.

It is at this point the teacher may note any other comments or feedback on the *Student Record Form*, for example, any problems such as absence or IT problems the student has faced.

Task marking

Tasks are to be marked against the controlled assessment marking criteria, alongside any task specific guidance on marking for that task.

Use of assessment criteria for internal assessment

The assessment criteria for statistical projects are sub-divided into four Assessment Objectives.

These objectives are:

- planning
- data collection
- processing, analysing and representing data
- interpreting and evaluating results.

Mark descriptions comprising of a number of statements are provided for each area of the project. Descriptions are given for mark bands within each area. A student who fails to satisfy the description for a mark of 1 in an area should be awarded a mark of 0 (zero) for that area.

Whenever assessments are made, the mark descriptions given in the assessment criteria should be used to judge the mark within each area which best fits the student's performance.

The statements within a description should not be taken as discrete and literal hurdles, all of which must be fulfilled, for a mark to be awarded.

The mark descriptions within an area are designed to be broadly hierarchical.

This means that, in general, a description at a particular mark subsumes those of lower marks.

The mark awarded therefore, need not be supported by direct evidence of achievement of lower marks in each area.

It is assumed that in order to access higher marks, projects will involve a more sophisticated approach and/or a more complex treatment.

Teacher-assessors are required to award marks in each of the four areas of the assessment criteria.

Marks in these four areas should be totalled to give a mark for the project out of 40.

This mark should be recorded on the *Student Record Form*. A copy should be kept at the centre and a copy sent to the moderator if that student is being sampled.

Internal standardisation

Teachers must show clearly how the marks have been awarded in relation to the assessment criteria. If more than one teacher in a centre is marking students' work, there must be a process of internal standardisation to ensure that there is consistent application of the assessment criteria.

Authentication

All students must sign an authentication statement. Statements relating to work not sampled should be held securely in the centre. Those which relate to sampled students must be attached to the work and sent to the moderator. In accordance with a revision to the current Code of Practice, any student unable to provide an authentication statement will receive zero credit for the component. Where credit has been awarded by a centre-assessor to sampled work without an accompanying authentication statement, the moderator will inform Edexcel and the mark adjusted to zero.

Further information

For more information on annotation, authentication, mark submission and moderation procedures, please refer to the *Edexcel GCSE in Statistics: Instructions and administrative documentation for internal assessment* document, which is available on our website (www.edexcel.com).

For up-to-date advice on teacher involvement, please refer to the Joint Council for Qualifications (JCQ) Instructions for conducting coursework/ portfolio document on the JCQ website: www.jcq.org.uk.

For up-to-date advice on malpractice and plagiarism, please refer to the Joint Council for Qualifications (JCQ) *Suspected Malpractice in Examinations: Policies and Procedures and Instructions for conducting coursework/portfolio* documents on the JCQ website (www.jcq.org.uk).

Assessing your students

The first assessment opportunity for Unit 1 will take place in the June 2011 series and in each following June series for the lifetime of the specification.

The first assessment opportunity for Unit 2 will take place in the June 2010 series and in each following June series for the lifetime of the specification.

Your student assessment opportunities

Assessment	June 2010	June 2011	June 2012	June 2013	June 2014
Unit 1	×	✓	✓	✓	✓
Unit 2	✓	✓	✓	✓	✓

Awarding and reporting

The grading, awarding and certification of this qualification will comply with the requirements of the current GCSE/GCE Code of Practice for courses starting in September 2008, which is published by the Qualifications and Curriculum Authority (QCA). The GCSE qualification will be graded and certificated on an eight-grade scale from A* to G.

The first certification opportunity for the Edexcel GCSE in Statistics will be 2011.

Students whose level of achievement is below the minimum judged by Edexcel to be of sufficient standard to be recorded on a certificate will receive an unclassified U result.

Unit results

The minimum uniform marks required for each grade for each unit:

Unit 1

Unit grade	*A	A	B	C	D	E	F	G
Maximum uniform mark = 300	**270**	**240**	**210**	**180**	**150**	**120**	**90**	**60**

Students who do not achieve the standard required for a grade G will receive a uniform mark in the range 0–59.

Unit 2

Unit grade	*A	A	B	C	D	E	F	G
Maximum uniform mark = 100	**90**	**80**	**70**	**60**	**50**	**40**	**30**	**20**

Students who do not achieve the standard required for a grade G will receive a uniform mark in the range 0–19.

Qualification results

GCSE in Statistics cash-in code: 2ST01

Qualification grade	*A	A	B	C	D	E	F	G
Maximum uniform mark = 400	**360**	**320**	**280**	**240**	**200**	**160**	**120**	**80**

Students who do not achieve the standard required for a grade G will receive a uniform mark in the range 0–79.

Resitting of units

Students can resit the assessment requirements for an internal and external unit once before claiming certification for the qualification. The best available result for each contributing unit will count towards the final grade.

Unit 1 has to be taken at the end of the course, as students studying this unitised qualification are required to complete at least 40% of the overall assessment requirement as terminal assessment.

For internally assessed units students will need to retake the entire assessment requirements for that unit.

Results of units will be held in Edexcel's unit bank for as many years as this specification remains available. Once the qualification has been certificated, all unit results are deemed to be used up at that level. These results cannot be used again towards a further award of the same qualification at the same.

Language of assessment

Assessment of this specification will be available in English only. Assessment materials will be published in English only and all work submitted for examination and moderation must be produced in English.

Quality of written communication

Students will be assessed on their ability to:

- write legibly, with accurate use of spelling, grammar and punctuation in order to make the meaning clear
- select and use a form and style of writing appropriate to purpose and complex subject matter
- organise relevant information clearly and coherently, using specialist vocabulary when appropriate.

Stretch and challenge

Students can be stretched and challenged in all assessments through the use of different assessment strategies, for example:

- using a variety of stems in questions — for example analyse, evaluate, discuss, compare
- ensuring connectivity between sections of questions
- a requirement for extended writing.

Malpractice and plagiarism

For up-to-date advice on malpractice and plagiarism, please refer to the Joint Council for Qualifications *Suspected Malpractice in Examinations: Policies and Procedures* document on the JCQ website www.jcq.org.uk.

Student recruitment

Edexcel's access policy concerning recruitment to our qualifications is that:

- they must be available to anyone who is capable of reaching the required standard
- they must be free from barriers that restrict access and progression
- equal opportunities exist for all students.

Progression

This specification gives students a grounding in statistics, which can enable them to progress to Level 3 qualifications such as:

- GCE in Mathematics and GCE in Further Mathematics

This specification also provides support for and progression to Level 3 qualifications, such as GCE or BTEC, in:

- biology
- psychology
- geography
- business
- sociology
- economics

and training and employment where quantitative research methods are used.

Previous knowledge

This specification builds on the knowledge, understanding and skills set out in the National Curriculum for England Key Stage 3 programme of study for Data Handling (Ma4).

It is expected that students entering for this GCSE will have the mathematical and numerical skills associated with the National Curriculum Key Stage 3 programme of study.

Students entering for the Foundation Tier will also be expected to be familiar with the following mathematics:

a accuracy of data

b significant figures and decimal places

c fractions, percentages and decimals

d fractional or percentage change

e proportion and factors

f manipulation of fractions

g efficient use of a calculator, including redundant figures, accuracy and rounding

h the selection of scales for graphical representation of variables

i reading graphs, including obtaining interpolated and extrapolated values.

In addition, students entering for the Higher Tier will be expected to be familiar with the following:

j the equation of a straight line in the form $y = mx + c$, with the meaning of m and c

Questions can be set that involve the material listed above, but these topics will always appear in context and will not be examined separately.

This qualification complements Edexcel GCSE in Mathematics whilst also providing a basis in statistics for students who wish to progress to further study of the subject at Level 3 or within related disciplines.

Grade descriptions

A	Candidates analyse statistical problems and use appropriate strategies to conduct a statistical investigation. They identify and specify research questions and hypotheses which are appropriate to the context. They plan and execute a statistical investigation, working through the statistical problem-solving process, accurately and rigorously, justifying their chosen approaches. Candidates use data collection methods appropriate to the context and recognise their limitations. They understand different types of data, the concepts of a population and different methods of sampling. They understand bias and how it might arise. They use probability to model real life situations. Candidates select from a range of different methods, to process and analyse data accurately and effectively. They recognise that some methods are more appropriate than others and can rationalise their choices. They understand and can illustrate how different representations and statistics may distort outcomes. They review their work, identify their errors and correct them. They are able to overcome minor difficulties in their investigations. Candidates apply statistical reasoning using evidence to draw sensible inferences, make deductions and communicate complex conclusions in an understandable way using an appropriate mixture of writing and suitable tabular and graphical methods. They read and interpret published tables of secondary data and identify the major features. They use interpolation and extrapolation sensibly. They compare actual with expected frequencies and draw appropriate conclusions. Their accurate conclusions are securely based on data and relevant to the original question or hypothesis.

C	Candidates work through the statistical problem-solving process, selecting appropriate statistical methods and drawing conclusions that are relevant to their original question or hypothesis. Candidates plan for and use different methods for collecting data. They understand the problem of bias and can use different methods of sampling. Candidates process and analyse data accurately using different methods. They recognise the advantages and disadvantages of different methods. They can identify how different representations can distort outcomes. They understand that different outcomes may result from repeating an experiment. They can use probability to model simple real life situations. Candidates draw inferences and communicate conclusions in writing, tabular and graphical forms. They read and interpret tables of secondary data, including tables involving percentages. They recognise that the reliability of results can be affected by the size of a sample or data. Their conclusions are usually correct.

F	Candidates work through the statistical problem-solving process, using suitable statistical methods and drawing conclusions that are relevant to their original question. Candidates use suitable methods for collecting data. They understand the importance of using a suitably large sample when the entire population cannot be investigated. They have some knowledge of probability. Candidates use some methods for analysing and processing data accurately. They select methods to present straightforward simple data. They may need some support to complete their investigations. They understand that different outcomes may result from repeating an experiment. Candidates use evidence to draw simple conclusions which they communicate in writing and by using tabular and graphical presentation. They read frequency tables, bar charts, pie charts, line graphs and scatter diagrams.

C Resources, support and training

Edexcel resources

Edexcel aims to provide the most comprehensive support for our qualifications.

Teacher and student support

The new resources from Edexcel will provide you and your students with comprehensive support for our new GCSE 2008 Statistics qualification. This dedicated suite of resources will be written by subject experts and ensure that you and your department have everything needed to deliver the specification from Edexcel.

The resources will include engaging student books and interactive teacher support which will save you time implementing the new specification and help you get better results for your students!

Assessment support

ExamWizard gives instant access to thousands of GCSE and A Level Statistics questions set by Edexcel in recent years and will be updated in spring 09 for use with the new GCSE specification. To learn more about how you can create customised mock exams, topic test and receive your FREE trial visit **www.edexcel.com/examwizard**.

Edexcel publications

You can order further copies of the specification and sample assessment materials (SAMs) and teacher's guide documents from:

Edexcel Publications
Adamsway
Mansfield
Nottinghamshire NG18 4FN

Telephone: 01623 467467
Fax: 01623 450481
Email: publications@linneydirect.com
Website: www.edexcel.com

Endorsed resources

Edexcel also endorses additional materials written to support this qualification. Any resources bearing the Edexcel logo have been through a quality assurance process to ensure complete and accurate support for the specification. For up-to-date information about endorsed resources, please visit www.edexcel.com/endorsed.

Please note that while resources are checked at the time of publication, materials may be withdrawn from circulation and website locations may change.

Edexcel support services

Edexcel has a wide range of support services to help you implement this qualification successfully.

ResultsPlus — ResultsPlus is an application launched by Edexcel to help subject teachers, senior management teams, and students by providing detailed analysis of examination performance. Reports that compare performance between subjects, classes, your centre and similar centres can be generated in 'one-click'. Skills maps that show performance according to the specification topic being tested are available for some subjects. For further information about which subjects will be analysed through ResultsPlus, and for information on how to access and use the service, please visit www.edexcel.com/resultsplus.

Ask the Expert — Ask the Expert is a new service, launched in 2007, that provides direct email access to senior subject specialists who will be able to answer any questions you might have about this or any other specification. All of our specialists are senior examiners, moderators or verifiers and they will answer your email personally. You can read a biography for all of them and learn more about this unique service on our website at www.edexcel.com/asktheexpert.

Ask Edexcel — Ask Edexcel is Edexcel's online question and answer service. You can access it at www.edexcel.com/ask or by going to the main website and selecting the Ask Edexcel menu item on the left.

The service allows you to search through a database of thousands of questions and answers on everything Edexcel offers. If you don't find an answer to your question, you can choose to submit it straight to us. One of our customer services team will log your query, find an answer and send it to you. They'll also consider adding it to the database if appropriate. This way the volume of helpful information that can be accessed via the service is growing all the time.

Examzone — The Examzone site is aimed at students sitting external examinations and gives information on revision, advice from examiners and guidance on results, including re-marking, re-sitting and progression opportunities. Further services for students — many of which will also be of interest to parents — will be available in the near future. Links to this site can be found on the main homepage at www.examzone.co.uk.

Training

A programme of professional development and training courses, covering various aspects of the specification and examination, will be arranged by Edexcel each year on a regional basis. Full details can be obtained from:

Training from Edexcel
Edexcel Head Office
One90 High Holborn
London WC1V 7BH

Telephone: 0844 576 0027
Email: trainingbookings@edexcel.com
Website: www.edexcel.com

D Appendices

Appendix 1 Key skills

Signposting

Key skills (Level 2)	Unit 1	Unit 2
Application of number		
N2.1	✓	✓
N2.2	✓	✓
N2.3	✓	✓
Communication		
C2.1a		✓
C2.1b		✓
C2.2		✓
C2.3		✓
Information and communication technology		
ICT2.1		✓
ICT2.2		✓
ICT2.3		✓
Improving own learning and performance		
LP2.1		✓
LP2.2		✓
LP2.3		✓
Problem solving		
PS2.1	✓	✓
PS2.2	✓	✓
PS2.3	✓	✓
Working with others		
WO2.1		✓
WO2.2		✓
WO2.3		✓

Development suggestions

Please refer to the Edexcel website for the key skills development suggestions.

Appendix 2 Wider curriculum

Signposting

Issue	Unit 2
Spiritual	✓
Moral	✓
Ethical	✓
Social	✓
Cultural	✓
Citizenship	✓
Environmental	✓
European initiatives	✓
Health and safety	✓

Development suggestions

Issue	Opportunities for development
Spiritual	This specification provides centres with a courses in statistics which will allow students to discriminate between truth and falsehood. As students explore statistical models of the real world there will be many naturally arising moral and cultural issues, environmental and safety considerations and aspects of European and world issues for discussion.
Moral	
Ethical	
Social	
Cultural	
Environmental	
European initiatives	
Health and safety	
Citizenship	This specification gives students the opportunity to develop their skills of enquiry and communication in relation to citizenship. In particular, they will develop their ability to analyse information from different sources, including ICT-based sources, and explore the use and abuse of statistics. They will also have the opportunity to develop their knowledge and understanding of citizenship. In particular, through their work in handling data, students will have the opportunity to explore the use of statistical information in the media and its role in providing information and affecting opinion. Students can explore the practical applications of their work in the fields of business and financial services.

Further skills development

The study of statistics can, and should, provide opportunities to promote:

- **general thinking skills:** through developing problem solving, communication and deductive reasoning skills, ie why 'lines of best fit' are limited on a modelling of used car prices, or why 'a football team is at its most vulnerable shortly after it scores a goal' is nonsense
- **economic skills**: through using and applying statistics in problems set in economic disciplines, for example the relationship between the Retail Price Index and house prices
- **entrepreneurial and enterprise skills**: developing students' abilities to apply statistical techniques in business, technology, science, economics, etc. For example, what are the implications of a drop in share prices or the causality of smoking and heart disease
- **work-based skills**: by developing students' abilities to appreciate and apply statistical techniques in a range of 'workplace' situations and analyse related real-life problems, for example, the minimum hourly wage as related to production, share prices, profits and potential growth or closure of the company.

Appendix 3 Codes

Type of code	Use of code	Code number
National classification codes	Every qualification is assigned to a national classification code indicating the subject area to which it belongs. Centres should be aware that students 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 achievement and attainment tables.	2510
National Qualifications Framework (NQF) codes	Each qualification title is allocated a QCA National Qualifications Framework (NQF) code. The QCA National Qualifications Framework (NQF) code is known as a Qualification Accreditation Number (QAN). This is the code that features in the DfES Funding Schedule, Sections 96 and 97, and is to be used for all qualification funding purposes. The QCA QAN is the number that will appear on the student's final certification documentation.	The QAN for the qualification in this publication is: GCSE — 500/4456/4
Unit code	Each unit is assigned a unit code. This unit code is used as an entry code to indicate that a student wishes to take the assessment for that unit. Centres will need to use the entry codes only when entering students for their examination.	Unit 1 — 5ST1F/5ST1H Unit 2 — 5ST02
Cash-in codes	The cash-in code is used as an entry code to aggregate the student's unit scores to obtain the overall grade for the qualification. Centres will need to use the entry codes only when entering students for their qualification.	GCSE — 2ST01
Entry codes	The entry codes are used to: • enter a student for the assessment of a component of a linear course • aggregate the student's component scores to obtain the overall grade for the qualification.	Please refer to the Edexcel *Information Manual*, available on the Edexcel website.

Appendix 4 Formulae sheets

The following formulae sheets will be given in each examination paper and controlled assessment task.

Edexcel GCSE in Statistics

Formulae Sheet

Foundation Tier

Mean of a frequency distribution $= \dfrac{\sum fx}{\sum f}$

Mean of a grouped frequency distribution $= \dfrac{\sum fx}{\sum f}$, where x is the mid-interval value.

Edexcel GCSE in Statistics

Formulae Sheet

Higher Tier

Mean of a frequency distribution

$$= \frac{\sum fx}{\sum f}$$

Mean of a grouped frequency distribution

$= \frac{\sum fx}{\sum f}$, where x is the mid-interval value.

Variance

$$= \frac{\sum (x - \bar{x})^2}{n}$$

Standard deviation (set of numbers)

$$\sqrt{\left[\frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2\right]}$$

or

$$\sqrt{\left[\frac{\sum (x - \bar{x})^2}{n}\right]}$$

where $\bar{x}$ is the mean set of values.

Standard deviation (discrete frequency distribution)

$$\sqrt{\left[\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2\right]}$$

or

$$\sqrt{\left[\frac{\sum f(x - \bar{x})^2}{\sum f}\right]}$$

Spearman's rank correlation coefficient

$$1 - \frac{6\sum d^2}{n(n^2 - 1)}$$

Appendix 5 Controlled assessment

Nature of controlled assessment

Controlled assessment will consist of one major project.

The task chosen and data collected should give students opportunities to satisfy all of the controlled assessment objectives.

Setting, administering and supervising controlled assessment

The controlled assessment component contributes 25% to the final assessment. The time devoted to the controlled assessment and associated skills should reflect the weighting of the component.

Students may choose any line of enquiry for their project, within the task set by Edexcel. Centres should adapt the task to suit their own circumstances and access to resources. The project may reflect personal interests of the student or local interests but should be chosen to ensure that the full range of statistical techniques open to the student can be demonstrated.

Data collected for the project may come from primary or secondary sources chosen by the student. Specific data should not be given to students since this would be restrictive in one of the areas of assessment. Qualitative data can also be restricting.

Whilst providing the basis for an extended piece of work, the project should also involve opportunities for designing the overall strategy, the identification of aims and hypotheses, the identification of appropriate data to be collected and the following parameters or variables to be considered:

- the selection and collection of appropriate data, the use of primary or secondary sources, methods of collection and/or selection and a very clear description of the sampling method and technique to be used
- the recording and tabulation of data, sorting and re-sorting to fit various categories, control of variables, the use of an appropriately wide range of graphical methods of representation to describe, compare or relate the data
- the selection and computation of appropriate measures or summary statistics to describe, compare or relate the variables in order to make as full as possible analysis of the data
- the interpretation of tables, graphs, summary statistics and other measures in the context of the line of enquiry, to show a clear and full understanding of the work undertaken or to confirm or refute hypotheses and draw accurate conclusions.

ICT

The use of ICT should be both encouraged and promoted in the project. Students should be encouraged to create and interrogate databases, use the internet as a source of data and use computer simulations and packages. The use of computers to carry out graphical work and calculation should also be encouraged. However it should be recognised that for the controlled assessment the selection of appropriate graphs or computations is the real emphasis of the assessment, particularly when this is accompanied by the reasoning behind the selection.

The use of computer-based statistical packages should be encouraged at all times since this is very much at the heart of what today's statistician does in real-life situations.

The use of ICT for stages where formal supervision is required should ensure that students have access to only stored data or information, in order to ensure controlled conditions are maintained.

Cross-curricular projects

There are many applications of statistics in areas such as science, geography, business studies, economics and psychology. For this reason, lines of enquiry which cut across subject boundaries, where appropriate to the requirements of the controlled assessment task, could be welcomed. The data collected for 'another subject' can often be subjected to a deeper analysis of a statistical nature and be the basis for GCSE in Statistics controlled assessment, appropriate to the task requirements.

It must be recognised that a project submitted for assessment both in statistics and another area of study will need to satisfy the assessment objectives of both areas of study and be assessed according to the assessment criteria for each subject.

Group work

Statisticians rarely work in isolation so group work in the controlled assessment is allowed. Students may work together for the collection of data, which can readily be shared and this can add to the overall efficiency — especially with the collection of a large sample. When group work is undertaken it is important that teachers can recognise the contribution of each individual in order to make reliable assessments for the collection of data stage.

Students are not allowed to work together for any other stage of the project.

Controlled assessment advice

We will advise on the controlled assessment by providing:

- tasks
- a programme of professional development and training provision
- endorsed textbooks.

Administering the controlled assessment

The controlled assessment component can be undertaken at any time during the period of study.

The controlled assessment tasks provided by Edexcel must be valid for the period of study.

We will give centres information about the closing date for sending controlled assessment marks to Edexcel. This date will be a few weeks before the written examinations start.

Centres will be provided with:

- full administrative details in booklet form, including details of how to proceed in special cases such as lost or missing work
- photocopiable controlled assessment record forms
- details of their moderator.

Supervision of controlled assessment

Centres are required to ensure that the general principles governing the supervision of controlled assessment are applied. These include the integrity of the work from each student.

The definition of **formal supervision**:

The student must be in direct sight of the supervisor at all times. Use of resources and interaction is tightly prescribed.

The definition of **informal supervision**:

Questions or tasks are outlined, the use of resources is not tightly prescribed and assessable outcomes can be informed by group work. Supervision is confined to: (i) ensuring that the contributions of individual students are recorded accurately, and (ii) ensuring that plagiarism does not take place. The supervisor can provide limited guidance to students.

Teachers will be asked to comment on any 'extra guidance' given to individual students and informed of what to do in the case of any malpractice.

Both the teacher and student will be required to sign a declaration confirming that the controlled assessment submitted is the work of the student.

Each stage should be carried out within the suggested time allowances, with the appropriate level of supervision.

Supporting evidence

Student submissions must be annotated to show where the crucial evidence behind the awarding of a mark in each strand can be found.

When the assessments are complete, the marks awarded under each of the strands and an overall mark out of 40 must be entered on the *Student Record Form* with, where appropriate, any supporting information in the spaces provided.

Standardisation

Internal standardisation

Each centre is required to standardise across teachers marking the controlled assessment component and teaching groups entering the examination. In cases where more than one teacher has been involved in the marking of the controlled assessment, one teacher must be designated as being responsible for the final mark, signing the *Student Record Form* and for the standardisation of student work.

Centres are advised to hold training sessions for internal markers.

Moderation

The sample for moderation

Centres will be informed before the examination of the sample they should send for moderation. This sample will be chosen, at random. However, it should always contain both the highest and lowest mark awarded by the centre, so if these are not included in the selected random sample the centre will be asked to add them to the sample.

The moderator

We will assign a moderator to each centre. The sample for moderation should be sent directly to the moderator by the centre.

Feedback

The centre will receive brief feedback notes from the moderator; which will highlight any problem areas in the marking of the controlled assessment.

Appendix 6 Controlled assessment marking criteria

Introduction

Controlled assessment is marked on a common mark scale across both tiers of entry. The maximum mark is 40, which we then convert to a mark out of 25 by a direct scaling factor for each tier of entry.

Each piece of work must be assessed under the following strand headings with the mark for each strand recorded on the *Student Record Form* (see *Appendix 7*).

The assessment criteria are sub-divided into four strands, these being:

1: Planning

2a Data collection

2b: Processing, analysing and representing data

3: Interpretation and discussion of results.

Strands 1 and 3 will be on a 10-mark scale, Strand 2a will be on an 8-mark scale and Strand 2b will be on a 12-mark scale.

The mark awarded in each strand must reflect the degree of difficulty and sophistication of the line of enquiry.

Quality of Written Communication (QWC)

Controlled assessments for the Edexcel GCSE in Statistics provide opportunities across ability ranges to assess Quality of Written Communication (QWC).

Each stage of the controlled assessment offers opportunities where:

i) student ensures text is legible
spelling, punctuation and grammar are accurate
that meaning is clear

ii) students select and use a form and style of writing appropriate to purpose and to complex subject matter

iii) students organise information clearly and coherently, using specialist vocabulary when appropriate.

Throughout the controlled assessment there are opportunties to assess strand (i) of QWC, and to ensure students are using clear and legible writing and checking their punctuation, grammar and spelling through their work.

Strand (ii) of QWC can be assessed differently through the stages. In Stages 2 and 3, for example, the student may find it is more appropriate to use diagrammatic or tabular representations of information, with short sentances linking the different observations and findings. In stages 1 and 4 a more extended writing structure would be appropriate.

Strand (iii) of QWC can be assessed throughout the stages of the controlled assessment, where students can be expected to express themselves logically and clearly, using appropriate technical language and notation, and the overall investigation should be organised clearly and coherently.

Areas where students are required to provide clear aims, strategies, lines of enquiries, explanations, justifications or reasons for their work are all opportunities where QWC (ii) and QWC (iii) could be assessed.

In the assessment criteria, specific indicators where QWC (ii) and QWC (iii) can be assessed have been included. QWC (i) can be assessed throughout the controlled assessment.

1: Planning (10 marks)

Mark	Performance descriptor
0	The student provides no evidence of an implicit plan to process or display some data.
1	The student provides evidence of an implicit plan to process or display some data.
2 **QWC (iii)**	The student gives a clear aim to process or display some data.
3	The student gives a simple aim and provides a strategy to use a simple statistical technique to process or display data.
4 **QWC (ii)**	The student chooses a simple aim and provides a strategy to use a simple statistical technique (diagram **or** calculation) to make a comparison.
5	The student chooses a simple aim and provides a strategy to use simple statistical techniques (diagrams **and** calculations) to make a comparison.
6 **QWC (ii) and QWC (iii)**	The student chooses a **more complex line of enquiry** to use statistical techniques to make a comparison. They give a clear aim and sensible **reasons** for the diagrams and calculations they will use.
7	The student chooses a more complex line of enquiry to use statistical techniques to make a comparison. They give a clear aim and justify which diagrams and calculations they use. They **identify** potential problems with the data (eg anomalies, different sized populations, scales etc).
8 **QWC (ii) and QWC (iii)**	The student plans to test hypotheses, which have been carefully specified in clear statistical terms. They give a clear aim and justify all of the diagrams and calculations they use, ensuring that diagrams are drawn so that **comparisons** can be made. They **plan** how they will deal with any potential problems with the data.
9 **QWC (ii) and QWC (iii)**	The student plans to test hypotheses, which have been carefully specified in clear statistical terms. They should consider a **number of interrelated variables** and justify their plan to use a number of different techniques. They must **plan and justify** how they will deal with any potential problems with the data.
10 **QWC (ii) and QWC (iii)**	The student plans to test a hypothesis, which has been carefully specified in clear statistical terms. They must **foresee possible problems**, which might arise and **justify their methods** for dealing with these. They should consider a number of interrelated variables and plan to use a number of different advanced techniques.

2a: Collecting data (8 marks)

Mark	Performance descriptor
0	The student does not use any data.
1	The student uses some data.
2	The student **collects** some data (at least 10 items).
3 **QWC (ii)**	The student collects some data, **indicates its source and how it was collected**. The data should be shown in some way. They may use the whole population but should indicate that they are doing so. (The word census is not required at this level.)
4	The student uses a recognised sampling method and gives a brief account of how the data was collected and its source. The student collects sufficient data in two or more data sets to make comparisons. If a census is used reasons for this must be given.
5 **QWC (iii)**	The student uses a recognised sampling method and gives a detailed account of how they collected their data. They discuss the type(s) of data which may be discrete, continuous, qualitative or quantitative. Any anomalies in the data collected should be identified as they occur.
6	The student gives a detailed account of the **sampling mechanism** for their data collection and justifies the size of the sample. Any anomalies should be identified as they occur and a decision made, with **reasons**, as to whether they should be included or omitted.
7	The student justifies their choice of a particular sampling technique. Limits for outliers, set at the planning stage, should have been used. Problems in data collection which were identified at the planning stage (for example, different sized populations or samples, missing data) have been acted upon.
8 **QWC (ii) and QWC (iii)**	Reliability of the data source should be discussed with reference to source, collection, strategy and the proportion of anomalies found. Bias, how it may arise and what is being done to avoid it should be discussed. All of the techniques used for sampling and dealing with problems must be justified.

2b: Processing, analysing and representing data (12 marks)

Mark	Performance descriptor
0	The student does not attempt to draw a simple diagram or perform a calculation.
1	The student attempts to draw a simple diagram or perform a calculation.
2	The student produces a simple diagram (correct labels and scales) or calculation successfully.
3	The student produces a simple correct statistical diagram or calculation.
4	The student produces simple correct statistical diagrams and calculations. These may be simply to display or summarise the data.
5 **QWC (iii)**	The student provides a diagram **or** calculation to make a simple comparison following on from their planning.
6	The student uses diagrams **and** calculations to make simple comparisons following on from their planning. At least one of the statistical techniques should be more complex than the techniques used for mark 4. The diagrams must be correct with scales and labels.
7	The student uses diagrams and calculations to make a comparison, at least one of which must be more complex.
8	The student use both diagrams and calculations which must be more complex to make comparisons.
9 **QWC (ii)**	The student justifies their use of diagrams and calculations, having ensured that diagrams enable comparisons to be made. They draw a series of diagrams and perform calculations to explore one or more variables without making connections between the variables.
10 **QWC (ii) and QWC (iii)**	The student uses diagrams and calculations to test a complex hypothesis. They draw a series of diagrams and perform calculations to explore one or more variables without making connections between the variables. The work is accurate with few errors. There is little irrelevant work present and outliers are considered if they occur.
11	The student should consider a number of interrelated variables and use a number of different techniques to explore possible connections or effects. They draw a series of diagrams and perform calculations to explore one or more variables making connections between **all** the variables. At least one of the techniques they use must be complex.
12 **QWC (ii) and QWC (iii)**	The student should consider a number of inter-related variables and plan to use a number of different techniques beyond those associated with mark 11. They link diagrams and calculations to explore possible connections, distributions or effects. The student must deal with the problems they foresaw in their plan and justify their approach.

3: Interpreting and evaluating data (10 marks)

Marks	Performance indicator
0	The student makes no comments about the data.
1	The student makes a comment about the data. For example: I collected 10 pieces of data.
2	The student makes a comment to draw a conclusion about the data. For example: The largest is...
3	The student makes a simple statistical comment about the diagram or calculation. For example: The mode is...
4	The student interprets a diagram or calculation using a simple techniques, to make a simple statistical comparison. For example: The bar charts show that the most popular drink is X. Drink Y is the least popular.
5 **QWC (iii)**	The student interprets a diagram **and** calculation to make a simple statistical comparison. In the case of multiple conclusions at least one but not all need to be correct.
6 **QWC (ii)**	The student **summarises their results** and comment upon their work. They make some simple written comparisons.
7	The student summarises and makes detailed explanations of their results with correct interpretations of statistical techniques. They correctly interpret their data and make comparisons.
8 **QWC (ii) and QWC (iii)**	The student summarises and makes detailed explanations of their results with correct interpretations of statistical techniques. They correctly interpret their data making in-depth comparisons and commenting on the effect of anomalies in their data. They evaluate their sampling or strategy.
9 **QWC (ii) and QWC (iii)**	The student summarises their strategy, discussing the interrelationships between the variables, interpreting their results and evaluating their planning. They relate summary statistics to confirm or refute their hypothesis. All techniques, some of which must be complex, must be used and commented upon.
10 **QWC (ii) and QWC (iii)**	The student summarises and evaluates as above to use a number of different techniques, at least one of which must be at more complex than those for mark 9. All commentaries should be correct and concise. Any limitations are discussed and quantified.

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Appendix 7 Student Record Form

Candidate name: _____

Candidate number: _____

Centre name: _____

Centre number: _____

Total mark out of 40:

Planning (10 marks)	**Date completed**	

Teacher's advice to student

Student's changes to initial plan

Please record marks and additional comments on the next page.

For the teacher-examiner's, and moderator's use

Assessment Objective	Centre mark	Moderator mark	Comments (Additional comments to justify mark)
Planning (10 marks)			
Data collection (8 marks)			
Processing, analysing and representing data (12 marks)			
Interpreting and discussing data (10 marks)			

Other comments:

