

GCSE



CCEA GCSE Specification in Statistics

Version 3: 17 September 2019

For first teaching from September 2017
For first assessment in Summer 2018
For first award in Summer 2019
Subject Code: 2260



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1 Introduction

This specification sets out the content and assessment details for our GCSE course in Statistics. We have designed this specification to meet the requirements of:

- Northern Ireland GCSE Design Principles; and
- Northern Ireland GCE and GCSE Qualifications Criteria.

First teaching is from September 2017. We will make the first award based on this specification in Summer 2019.

This specification is a unitised course. The guided learning hours, as for all GCSEs, are 120 hours.

This specification supports the aim of the Northern Ireland Curriculum to empower young people to achieve their potential and to make informed and responsible decisions throughout their lives, as well as its objectives:

- to develop the young person as an individual;
- to develop the young person as a contributor to society; and
- to develop the young person as a contributor to the economy and environment.

If there are any major changes to this specification, we will notify centres in writing. The online version of the specification will always be the most up to date; to view and download this please go to www.ccea.org.uk

1.1 Aims

This specification aims to encourage students to:

- develop understanding of the basic concepts of statistical problem solving in a way that encourages confidence and enjoyment of the subject in everyday and real-life situations;
- develop and apply their knowledge, skills and understanding in planning a statistical enquiry;
- develop knowledge of methods that are commonly used to collect statistical data and understanding of difficulties they may encounter when collecting data;
- develop skills of processing, analysing and representing data and understand which techniques are appropriate in particular situations;
- develop their ability to interpret and evaluate the outcomes of a statistical enquiry, thinking critically and communicating their conclusions clearly;
- develop their ability to use appropriate technology to work with data;
- develop understanding of the importance of statistical information to individual citizens and to society as a whole as well as its limitations, including recognising misleading representations and uses of statistics; and
- develop understanding of how technology enables the collection, visualisation and analysis of large quantities of data to inform decision-making in a variety of organisations including public, commercial, charitable and academic sectors.

1.2 Key features

The following are important features of this specification.

- It offers opportunities to build on the skills and capabilities developed through the delivery of the Northern Ireland Curriculum at Key Stage 3.
- It helps students to develop appropriate statistical skills, knowledge and understanding to support their GCSE studies and enable them to progress to further academic and vocational study and to employment.
- It has two tiers: Foundation and Higher.
- The assessment model gives students the opportunity to apply the complete statistical problem-solving process.

1.3 Prior attainment

This specification builds on the knowledge, understanding and skills developed through the statutory requirements for Mathematics (including Financial Capability) in the Northern Ireland Curriculum at Key Stage 3. Students do not need to have reached a particular level of attainment before beginning to study this specification.

1.4 Classification codes and subject combinations

Every specification has a national classification code that indicates its subject area. The classification code for this qualification is 2260.

Please note that if a student takes two qualifications with the same classification code, schools and colleges and universities that they apply to may take the view that they have achieved only one of the two GCSEs. The same may occur with any two GCSE qualifications that have a significant overlap in content, even if the classification codes are different. Because of this, students who have any doubts about their subject combinations should check with the schools, colleges and universities that they would like to attend before beginning their studies.

2 Specification at a Glance

The table below summarises the structure of this GCSE course. Students must take Unit 1 and Unit 2 at either Foundation or Higher tier for an award in GCSE Statistics.

Content	Assessment	Weightings	Availability
Unit 1	External written examination Foundation Tier: 1 hour 30 minutes 80 marks OR Higher Tier: 2 hours 100 marks All questions are compulsory.	50%	Summer from 2018
Unit 2	External written examination Foundation Tier: 1 hour 30 mins 80 marks OR Higher Tier: 2 hours 100 marks Some questions are set on the information in the pre-release case study. All questions are compulsory.	50%	Summer from 2019

Students must take at least 40 percent of the assessment (based on unit weightings) at the end of the course as terminal assessment.

3 Subject Content

We have divided this course into two units. The content of each unit is the same and the respective learning outcomes appear below.

The examination for Unit 2 has some questions on information in a pre-release case study focusing on Northern Ireland data.

Content for Higher Tier only is in **bold**. Questions in Higher Tier papers may be set on any content in the specification.

Content for Foundation Tier is in normal type.

Questions in Foundation Tier papers will only be set on this content.

Content	Learning Outcomes
Planning and data collection	Students should be able to: <ul style="list-style-type: none"> • understand and use the statistical problem-solving process by: <ul style="list-style-type: none"> – planning; – collecting data; – processing, representing and analysing data; – discussing and interpreting results; and – communicating in a variety of forms such as written, tabular or diagrammatic; • formulate a question or hypothesis to investigate using statistical methods; • identify suitable data to investigate a question or hypothesis; • demonstrate understanding of the terms population, sampling frame and sample; • demonstrate understanding of the term variable; • use a sampling frame to choose a random or systematic sample; and • use techniques such as names drawn from a hat, dice, cards, random number lists or random numbers from a calculator or spreadsheet to select a random sample.

Content	Learning Outcomes
Processing, representing and analysing data (cont.)	<p>Students should be able to:</p> <ul style="list-style-type: none"> • choose appropriate graphs and calculations to represent and analyse data and justify their choice of techniques; • draw and interpret pictograms, pie charts and bar charts for categorical data and for grouped discrete data; • draw and interpret compound (stacked) and multiple (grouped) bar charts, including compound percentage bar charts; • draw and interpret stem and leaf diagrams for ungrouped quantitative data; • draw and interpret histograms for grouped data with equal width class intervals and unequal width class intervals; • draw and interpret frequency polygons; • construct and interpret cumulative frequency tables; • draw and interpret cumulative frequency diagrams for grouped quantitative data and stepped cumulative frequency diagrams for ungrouped discrete data; • estimate median, quartiles, deciles and percentiles from a cumulative frequency diagram and interpret these measures; • draw and interpret box plots for quantitative data; and • recognise positive and negative skewness in graphical representations such as histograms, frequency polygons and box plots.

Content	Learning Outcomes
<p>Processing, representing and analysing data (cont.)</p>	<p>Students should be able to:</p> <ul style="list-style-type: none"> • draw and interpret graphs for time series, including the calculation of appropriate moving averages to draw trend lines that can be used to make predictions; • calculate and interpret simple, chain base and weighted index numbers; • calculate and interpret mode, median, arithmetic mean and geometric mean for ungrouped data; • identify and interpret modal class for grouped data; • identify and interpret median class for grouped data; • calculate an estimate of and interpret mean for grouped data; • demonstrate understanding of a sample mean as an estimate of the population mean; • recognise when it is appropriate to use different averages; • calculate and interpret a weighted mean; • calculate and interpret measures of spread, including range and interquartile range; • calculate an estimate of and interpret median for grouped data; and • calculate standard deviation using a given formula or calculator functions for a small set of ungrouped data or large set of grouped data and interpret standard deviation as a measure of spread.

Content	Learning Outcomes
<p>Processing, representing and analysing data (cont.)</p> <p>Reasoning, interpreting and discussing results</p>	<p>Students should be able to:</p> <ul style="list-style-type: none"> • demonstrate understanding of the effect of addition or removal of data and linear transformations on the mean, mode, median range and standard deviation; • demonstrate understanding of the effect of skewed data or outliers on measures of average and spread; • interpret population pyramids, choropleth maps and comparative pie charts; • interpret a range of different types of diagram, with sufficient guidance; • demonstrate understanding that correlation does not necessarily imply causation ; and that there are multiple factors that may interact; • recognise graphical misrepresentation, including but not limited to: <ul style="list-style-type: none"> – incorrect scales; – effects of change of scale; – truncated axis; – selection of data; – distorted sizing; and – inappropriate 3D diagrams; • identify trends in data by inspection and by calculation; • understand the terminology of control charts and plot sample means or medians on a control chart with given action and warning lines in quality assurance sampling applications and interpret the resulting graph; • use and interpret a given line of best fit for a scatter diagram, including outputs from software; • use interpolation in a scatter diagram and recognise that extrapolation may not be warranted; • interpret a product moment correlation coefficient in context; and • interpret a Spearman’s rank correlation coefficient in context.

Content	Learning Outcomes
	<p>Students should be able to:</p> <ul style="list-style-type: none"> • compare experimental data with theoretical predictions to identify possible bias with experimental design; • recognise that experimental probability will tend towards theoretical probability as the number of trials increases when all variables are random; • construct and interpret a frequency tree that represents the outcomes of a probability experiment; and • use two-way tables, Venn diagrams with two or three sets and tree diagrams to calculate estimates of probability and interpret them in context, including for conditional probabilities.
<p>The normal distribution as a model</p>	<p>Students should be able to:</p> <ul style="list-style-type: none"> • demonstrate understanding that the normal distribution is a commonly used model for many naturally occurring phenomena and recognise the shape of a normal distribution and relate it to the shape of a histogram; • demonstrate knowledge that for a normal distribution: <ul style="list-style-type: none"> – values more than three standard deviations from the mean are very unusual; – approximately 95% of the data lies within two standard deviations of the mean; and – 68% of the data (just over two thirds) lie within one standard deviation of the mean; • calculate a standardised score (z-score) for data values and use this to interpret data; • use standardised scores to make comparisons;

Content	Learning Outcomes
The binomial distribution as a model	Students should be able to: <ul style="list-style-type: none">• demonstrate understanding of the binomial distribution as a commonly used model for experiments; and• use binomial expansions to calculate probabilities.
Statistics in real-life	<ul style="list-style-type: none">• appreciate the use of descriptive and inferential statistics in different areas, for example industry, research or the economy.

4 Scheme of Assessment

4.1 Assessment opportunities

For the availability of examinations, see Section 2.

This is a unitised specification; candidates must complete at least 40 percent of the overall assessment requirements at the end of the course, in the examination series in which they request a final subject grade. This is the terminal rule.

Candidates may resit individual assessment units once before cash-in. The better of the two results will count towards their final GCSE grade unless a unit is required to meet the 40 percent terminal rule. If it is, the more recent mark will count (whether or not it is the better result). Results for individual assessment units remain available to count towards a GCSE qualification until we withdraw the specification.

4.2 Assessment objectives

There are three assessment objectives for this specification. Candidates must:

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

4.3 Assessment objective weightings

The table below sets out the assessment objective weightings for each assessment component and the overall GCSE qualification.

Assessment Objective	Unit Weighting (%)		Overall Weighting (%)
	Unit 1 (Foundation and Higher)	Unit 2 (Foundation and Higher)	
AO1	60	50	55
AO2	25	25	25
AO3	15	25	20
Total Weighting	100	100	100
Weightings have a tolerance of +/- 3%			

4.4 Reporting and grading

We report the results of individual assessment units on a uniform mark scale that reflects the assessment weighting of each unit.

In units offered at Foundation and Higher Tiers, candidates entering for Foundation Tier can achieve notional grades C* – G. For Higher Tier units, candidates can achieve notional grades A* – D (with allowable grade E).

Candidates may choose to enter individual units at different tiers.

We determine the grades awarded by aggregating the uniform marks that candidates obtain in individual assessment units. We award GCSE qualifications on a grade scale from A* to G, with A* being the highest. The nine grades available are as follows:

Grade	A*	A	B	C*	C	D	E	F	G
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If candidates fail to attain a grade G or above, we report their result as unclassified (U).

5 Grade Descriptions

Grade descriptions are provided to give a general indication of the standards of achievement likely to have been shown by candidates awarded particular grades. The descriptions must be interpreted in relation to the content in the specification; they are not designed to define that content. The grade awarded depends in practice upon the extent to which the candidate has met the assessment objectives overall. Shortcomings in some aspects of candidates' performance in the assessment may be balanced by better performances in others.

Grade	Description
A	<p>Candidates characteristically:</p> <ul style="list-style-type: none"> • analyse statistical problems and use appropriate strategies to conduct a statistical investigation; • identify and specify research questions and hypotheses that are appropriate to the context; • plan and execute a statistical investigation, working through the statistical problem-solving process accurately and rigorously, justifying their chosen approaches; • use data collection methods appropriate to the context and recognise their limitations; • understand different types of data, the concepts of a population and different methods of sampling; • understand bias and how it might arise; • use probability to model real-life situations; • select from a range of different methods to process and analyse data accurately and effectively; • recognise that some methods are more appropriate than others and rationalise their choices; • understand and illustrate how different representations and statistics may distort outcomes; • review their work, identify their errors and correct them; • suggest improvements to statistical investigations; • 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; • read and interpret published tables of secondary data and identify the major features; • use interpolation and extrapolation sensibly; and • compare actual with expected frequencies and draw appropriate conclusions that are accurate, securely based on data and relevant to the original question or hypothesis.

Grade	Description
C	<p>Candidates characteristically:</p> <ul style="list-style-type: none"> • work through the statistical problem-solving process, selecting appropriate statistical methods and drawing conclusions that are relevant to their original question or hypothesis; • plan for and use different methods for collecting data; • understand the problem of bias and use different methods of sampling; • understand that different outcomes may result from repeating an experiment; • use probability to model simple, real-life situations; • process and analyse data accurately using different methods; • recognise the advantages and disadvantages of different methods; • identify how different representations can distort outcomes; • draw inferences and communicate conclusions in writing, tabular and graphical forms; • read and interpret tables of secondary data, including tables involving percentages; • recognise that the reliability of results can be affected by the size of a sample or data; and • reach conclusions that are usually correct.
F	<p>Candidates characteristically:</p> <ul style="list-style-type: none"> • work through the statistical problem-solving process using suitable statistical methods and drawing simple conclusions that are relevant to their original question; • use suitable methods for collecting data; • understand the importance of using a suitably large sample when the entire population cannot be investigated; • understand that different outcomes may result from repeating an experiment; • have some knowledge of probability; • use some methods for analysing and processing data accurately; • select methods to present straightforward, simple data; • may need some support to complete their investigations; • use evidence to draw simple conclusions, which they communicate in writing and by using tabular and graphical presentation; and • read frequency tables, bar charts, pie charts, line graphs and scatter diagrams.

6 Guidance on the Pre-Release Case Study

The pre-release case study materials encourages candidates to apply techniques within the framework of the statistical enquiry cycle, using real data taken from authentic contexts.

6.1 Statistical enquiry review

We will replace our pre-release case study materials for each examination series. The case study materials will be available on our GCSE Statistics microsite.

6.2 Skills assessed by statistical enquiry cycle

The statistical enquiry cycle is assessed by a written examination, focusing on the following skills:

- understanding and using the whole statistical problem-solving process to address problems by:
 - planning;
 - collecting data;
 - processing, representing and analysing data;
 - discussing and interpreting results; and
 - communicating in a variety of forms;
- formulating hypotheses to investigate using statistical methods;
- identifying and collecting suitable data to investigate a question or hypothesis; and
- evaluating solutions and suggesting improvements.

We will send the pre-release case study materials for Unit 2 to centres each September. This enables teachers to prepare candidates for Unit 2.

7 Curriculum Objectives

This specification builds on the learning experiences from Key Stage 3 as required for the statutory Northern Ireland Curriculum. It also offers opportunities for students to contribute to the aim and objectives of the Curriculum at Key Stage 4, and to continue to develop the Cross-Curricular Skills and the Thinking Skills and Personal Capabilities. The extent of the development of these skills and capabilities will be dependent on the teaching and learning methodology used.

7.1 Cross-Curricular Skills at Key Stage 4

Communication

Students should be able to:

- communicate meaning, feelings and viewpoints in a logical and coherent manner, *for example using statistical evidence to back up or to challenge viewpoints that have been presented to them;*
- make oral and written summaries, reports and presentations, taking account of audience and purpose, *for example writing conclusions from statistical evidence in non-technical language related to the original context;*
- participate in discussions, debates and interviews, *for example through sharing ideas, investigating misconceptions, exploring alternative strategies, justifying choice of strategy, negotiating decisions and listening to others;*
- interpret, analyse and present information in oral, written and ICT formats, *for example investigating a statistical hypothesis or supporting a viewpoint through the use of data;* and
- explore and respond, both imaginatively and critically, to a variety of texts, *for example analysing the presentation of data and statistical graphs in the media.*

Using Mathematics

Students should be able to:

- use mathematical language and notation with confidence, *for example using statistical terminology to summarise the results of an online survey about shopping habits;*
- use mental computation to calculate, estimate and make predictions in a range of simulated and real-life contexts, *for example using a line of best fit drawn on a scatter graph that shows the results of an investigation about the sales of iced drinks and temperature to estimate other values from the graph;*
- select and apply mathematical concepts and problem-solving strategies in a range of simulated and real-life contexts, *for example use the results of a sample survey about people's attitudes towards reality TV to judge the opinion of everyone in the population;*
- interpret and analyse a wide range of mathematical data, *for example as part of a statistical enquiry analyse and interpret data that has been collected to test the hypothesis 'voting preferences are influenced by income levels';*
- assess probability and risk in a range of simulated and real-life contexts, *for example using weather data to decide when an outdoor event should take place;* and
- present mathematical data in a variety of formats which take account of audience and purpose, *for example use a dual bar chart to compare the number of missed appointments with a GP or nurse at a local medical centre on a monthly basis over the course of a year.*

Using ICT

Students should be able to make effective use of information and communications technology in a wide range of contexts to access, manage, select and present information, including mathematical information, *for example accessing suitable sources of secondary data online and using a spreadsheet or other suitable software to draw statistical graphs.*

7.2 Thinking Skills and Personal Capabilities at Key Stage 4

Self-Management

Students should be able to:

- plan work, *for example by identifying appropriate strategies, working systematically and persisting with open-ended tasks and problems;*
- set personal learning goals and targets to meet deadlines, *for example when designing a line of enquiry or investigation;*
- monitor, review and evaluate their progress and improve their learning, *for example by self-evaluating their own performance, identifying strengths and areas for improvement and seeking support where required;* and
- effectively manage their time, *for example when undertaking a statistical investigation.*

Working with Others

Students should be able to:

- learn with and from others through co-operation, *for example by discussing their conjectures, explaining their ideas and supporting them with data and listening to the ideas of others;*
- participate in effective teams and accept responsibility for achieving collective goals, *for example through working together on small group tasks in order to produce a joint solution;* and
- listen actively to others and influence group thinking and decision-making, taking account of others' opinions, *for example by using statistical evidence when putting their own ideas forward.*

Problem Solving

Students should be able to:

- identify and analyse relationships and patterns, *for example by making use of statistical methods to investigate them;*
- propose justified explanations, *for example through the appropriate use of statistical evidence presented in a way that is relevant to context and audience;*
- reason, form opinions and justify their views, *for example by collecting and analysing suitable data in order to do so;*
- analyse critically and assess evidence to understand how information or evidence can be used to serve different purposes or agendas, *for example understanding how statistical graphs can be used to present data in a misleading way;*
- analyse and evaluate multiple perspectives, *for example understanding that different possible conclusions can arise from the same data;*
- explore unfamiliar views without prejudice, *for example making use of statistical evidence to do so;*
- weigh up options and justify decisions, *for example by using and analysing appropriate data;* and
- apply and evaluate a range of approaches to solve problems in familiar and novel contexts, *for example using real data taken from local contexts.*

Although not referred to separately as a statutory requirement at Key Stage 4 in the Northern Ireland Curriculum, **Managing Information** and **Being Creative** may also remain relevant to learning.

8 Links and Support

8.1 Support

The following resources are available to support this specification:

- our Statistics microsite at www.ccea.org.uk and
- specimen assessment materials.

We also intend to provide:

- past papers;
- mark schemes;
- Chief Examiner's reports;
- guidance on progression from Key Stage 3;
- planning frameworks;
- centre support visits;
- support days for teachers;
- pre-release material;
- a resource list; and
- exemplification of examination performance.

8.2 Examination entries

Entry codes for this subject and details on how to make entries are available on our Qualifications Administration Handbook microsite, which you can access at www.ccea.org.uk

Alternatively, you can telephone our Examination Entries, Results and Certification team using the contact details provided.

8.3 Equality and inclusion

We have considered the requirements of equality legislation in developing this specification and designed it to be as free as possible from ethnic, gender, religious, political and other forms of bias.

GCSE qualifications often require the assessment of a broad range of competences. This is because they are general qualifications that prepare students for a wide range of occupations and higher level courses.

During the development process, an external equality panel reviewed the specification to identify any potential barriers to equality and inclusion. Where appropriate, we have considered measures to support access and mitigate barriers.

We can make reasonable adjustments for students with disabilities to reduce barriers to accessing assessments. For this reason, very few students will have a complete barrier to any part of the assessment.

It is important to note that where access arrangements are permitted, they must not be used in any way that undermines the integrity of the assessment. You can find information on reasonable adjustments in the Joint Council for Qualifications document *Access Arrangements and Reasonable Adjustments*, available at www.jcq.org.uk

8.4 Contact details

If you have any queries about this specification, please contact the relevant CCEA staff member or department:

- Specification Support Officer: Nuala Tierney
(telephone: (028) 9026 1200, extension 2292, email: ntierney@ccea.org.uk)
- Subject Officer: Gavin Graham
(telephone: (028) 9026 1200, extension 2658, email: ggraham@ccea.org.uk)
- Examination Entries, Results and Certification
(telephone: (028) 9026 1262, email: entriesandresults@ccea.org.uk)
- Examiner Recruitment
(telephone: (028) 9026 1243, email: appointments@ccea.org.uk)
- Distribution
(telephone: (028) 9026 1242, email: cceadistribution@ccea.org.uk)
- Support Events Administration
(telephone: (028) 9026 1401, email: events@ccea.org.uk)
- Moderation
(telephone: (028) 9026 1200, extension 2236, email: moderationteam@ccea.org.uk)
- Business Assurance (Complaints and Appeals)
(telephone: (028) 9026 1244, email: complaints@ccea.org.uk or appealsmanager@ccea.org.uk).

Summary of Changes since First Issue

(Most recent changes are indicated in red on the latest version)

Revision History Number	Date of Change	Page Number	Change Made
Version 1	N/A	N/A	First issue
Version 2	3 August 2017	15	New numbers in table
Version 3	26 April 2018	7, 8, 9, 10, 11, 12, 13, 14 & 15 25	Insertion and deletion of text Amendment to Subject Officer contact details
Version 3	16 October 2018	8, 10, 12, 13 & 17	Insertion and deletion of text
Version 3	17 September 2019	25	Contact details updated