London Chamber of Commerce & Industry

Member of the IAB Group

Qualification Specification

LCCI Level 3 Certificate in Business Statistics

LCCI qualifications

LCCI qualifications are awarded by the IAB, the UK's largest awarding body offering academic and vocational qualifications that are globally recognised and benchmarked. For further information, please visit our qualifications website at https://www.iab.org.uk/iab-qualifications/

About IAB

LCCI qualifications have been offered internationally for over 120 years and were started by the London Chamber of Commerce and Industry to meet the need for reliable, high-quality standards across international workforces.

As the way we do business evolves and becomes more fluid on a global scale the demand for internationally recognised standards has never been greater and is a sentiment that is echoed by the IAB who have been supporting financial professionals globally for 50 years.

Based on these shared values from September 2023, the IAB and LCCI will join to continue to offer and develop high-quality, professional qualifications for the finance sector and a range of other professions.

Acknowledgements

This specification has been produced based on the consultation with teachers, examiners, consultants and other interested parties. IAB would like to thank all those who contributed their time and expertise to the specification's development.

References to third party material made in this specification are made in good faith. IAB does not endorse, approve or accept responsibility for the content of materials, which may be subject to change, or any opinions expressed therein. (Material may include textbooks, journals, magazines and other publications and websites.)

All information in this specification is correct at time of publication.

Introduction
LCCI qualifications

LCCI qualifications are widely regarded by employers as preparing students for key functions of modern international business. Employers, universities and professional bodies such as the Association of Chartered Certified Accountants (ACCA), the Chartered Institute of Management Accountants (CIMA) and the Institute of Chartered Accountants of England and Wales (ICAEW) recognise them across the world.

This new and engaging range of qualifications has been developed in collaboration with professional bodies, employers and customers. To ensure that the qualifications develop the breadth and depth of knowledge, skills and understanding that students need to be effective employees and that they support progression pathways, we have carried out in-depth, independent consultation.

IAB LCCI offers a wide range of qualifications; they are available at Levels 1 to 4 across the following subject areas:

- Business
- Financial and Quantitative
- Marketing.

Purpose of the specification

This specification sets out:

- the objectives of the qualification
- any other qualification(s) that a student must have completed before taking the qualification
- any prior knowledge and skills that the student is required to have before taking the qualification
- any other requirements that a student must have satisfy before they will be assessed or before the qualification will be awarded
- the knowledge, understanding and skills that will be assessed as part of the qualification
- the method of assessment and any associated requirements relating to it
- the criteria against which a student's level of attainment will be measured (such as assessment criteria).

Rationale

The IAB LCCI Level 3 Certificate in Business Statistics meets the following purpose:

This qualification is for students who work in or want to work in business and research environments. This qualification is appropriate for students aiming for a career in business and finance where they will be sourcing and analysing business related data.

A review of the qualification requirements at this level identified the main content areas. This

qualification therefore includes content on basic concepts of statistical problem solving in real-life situations, statistical methods and concepts, probability, and an awareness of the potential and limitations of data and methods.

Qualification aim

The IAB LCCI Level 3 Certificate in Business Statistics qualification is for students who work in, or who want to work in, business and research environments. Students will be aiming for a career in business and finance where they will be sourcing and analysing business related data. Students should have a level of English sufficient to evaluate and explain the appropriateness of methods and outcomes.

This qualification will enable students to apply statistical techniques to business data in order to plan and control business operations, evaluate and manage risk and support the decision-making process.

Students will gain an understanding of the basic concepts of statistical problem solving in business situations, develop knowledge, understanding and skills of statistical methods and concepts and in probability, including an awareness of the potential and limitations of data and methods.

Students will develop a critical perspective on statistics, including recognition of collection errors, misleading forms of presentation, improper analysis and invalid inferences and conclusions. Students will be encouraged to actively engage in the process of enquiry, communicate clearly using standard statistical conventions and notations and develop as effective and independent students.

The IAB LCCI Level 3 Certificate in Business Statistics qualification and legacy qualification are established and valued by employers worldwide and recognised by professional bodies. This qualification will enhance student's statistical knowledge and abilities, a requirement of employers, enabling them to handle, understand, analyse, and interpret business data and question statistical method and models.

Together with other IAB LCCI Level 3 business, accounting and finance qualifications, the IAB LCCI Level 3 Certificate in Business Statistics qualification allows progression to more advanced administrative, business and management qualifications and supports progression into the job market in areas such as forecasting, data collection and analysis, finance and accountancy.

This qualification will give students a suitable foundation for first year undergraduate programmes in business, finance and related fields.

It will give students an appreciation and understanding of data analysis, including its limitations, in a business and finance environment.

Contents

Specification at a glance

The IAB LCCI Level 3 Certificate in Business Statistics consists of one online examination.

Title: IAB LCCI Level 3 Certificate in Business Statistics	
• Externally assessed	100% of the total qualification

Overview of content

1 Management Information: The External and Internal Business Environment

1.1 Data collection

1.2 Descriptive statistics

2 Business Planning Models

2.1 Correlation and regression

2.2 Time-based data

3 Risk Management and Business Decision Making

3.1 Probability, including the normal distribution

3.2 Estimation and confidence intervals

3.3 Significance testing

4.4 Chi squared test

4 Quality Assurance and Control

4.1 Quality control

Overview of assessment

- One online, externally set and marked examination, contributing to 100% of the overall grade of the qualification.
- Assessment construction – examination consisting of five or six questions. The questions comprise short open response, calculations, chart/diagram construction/drawing and chart/diagram interpretation questions
- The examination will be 3 hours

Knowledge, skills and understanding

Content

To prepare students for the final assessment of this qualification, the following content must be covered.

1. Management Information: The External and Internal Business Environment

Subject content	What students need to learn
Students will need to apply their knowledge and understanding of the following content and interpret and analyse their findings and results in a business context	
1.1 Data collection	a) Planning for data collection
	b) The difference between primary and secondary sources of business data
	c) The difference between a census and a survey and their relative advantages and disadvantages
	d) The need for a pilot survey before conducting a large scale survey
	e) The sample frames
	f) The determinants of sample size
	g) The different methods of sampling: • random • systematic • multistage • quota
	h) Advantages and disadvantages of the various sampling methods
	i) The role of stratification in sample design
	j) Advantages and disadvantages of the different methods of data collection including: • observation • telephone • interview • postal questionnaire

Subject content	What students need to learn
	• email survey • internet survey
	k) Statistical bias
	l) Principles of questionnaire design
	m) Non-response and the methods of attempting to overcome this problem when dealing with business data
1.2 Descriptive statistics	a) Calculations: • the mean, mode and standard deviation for grouped data • coefficient of variation
	b) Diagrams, charts and graphs: • histogram, dealing with unequal class intervals
	c) Interpretation of the measures of location and dispersion including the coefficient of variation
	d) Skewness by calculation or graphically

2. Business Planning Models

Subject content	What students need to learn
Students will need to apply their knowledge and understanding of the following content and interpret and analyse their findings and results in a business context	
1.1 Correlation and regression	a) Response and explanatory variables
	b) Scatter diagram, interpreting the relationship shown including the possible presence of outliers
	c) Calculations • regression equation • the product moment correlation coefficient • the coefficient of determination • Spearman's rank correlation coefficient
	d) Plot a least squares regression line
	e) Forecasting and forecast accuracy
	f) Testing for significance of a correlation coefficient

Subject content	What students need to learn
	g) Meaning and interpretation of regression and correlation coefficients
2.2 Time-based data	a) Components of a time series
	b) Calculations: • suitable moving average to identify the trend • the seasonal factors using either the additive or multiplicative model • weighted index number for price, quantity, cost and value • Laspeyres and Paasche index numbers including their advantages and disadvantages
	c) Diagrams, charts and graphs: • time series graph • the trend on the time series graph
	d) Choice of additive or multiplicative model
	e) Seasonally adjusted values and their uses
	f) Forecasting future values and their accuracy
	g) A national index of retail prices
	h) Change of base year and its effects
	i) Index linking for comparative purposes

3. Risk Management and Business Decision Making

Subject content	What students need to learn
Students will need to apply their knowledge and understanding of the following content and interpret and analyse their findings and results in a business context	
3.1 Probability, including the normal distribution	a) Uses of probability and its application within a business environment
	b) Probability concepts including mutually exclusive and independent events
	c) The addition and multiplication rules of probability
	d) Presentation of business outcomes including the use of tabulation and Venn and tree diagrams
	e) Problems involving conditional probability
	f) Problems involving mathematical expectation
	g) Characteristics of normally distributed data
	h) Conversion of a general normal distribution to a standard normal distribution
	i) Use of normal distribution tables
	j) Combinations of two or more independent normal distributions and including applications in a business context
3.2 Estimation and confidence intervals	a) Concept of a sampling distribution and a confidence interval
	b) Confidence interval for a mean using the normal distribution for large samples
	c) Confidence interval for a mean using the t distribution for small samples
	d) Confidence interval for a proportion
	e) Sample number required to obtain a confidence interval of a given size for a stated probability
3.3 Statistical test	a) Stages for carrying out statistical tests
	b) Use of a confidence interval in a statistical test
	c) Type I and Type II errors and which of these might arise because of a statistical test

	d) One tailed and two tailed statistical tests
Subject content	What students need to learn
	e) Choice of an appropriate statistical test: • single mean test for large samples using the normal distribution • single mean test for small samples using the t distribution • single proportion test • two means test for large samples using the normal distribution • two means test for small samples using the t distribution • paired comparison test using the t distribution • two proportion tests
3.4 Chi-squared test	a) The appropriate use of a chi-squared test
	b) Chi-squared test for association using contingency tables
	c) Test for goodness of fit when percentages are given
	d) Differences between observed and expected values
	e) Interpretation of the outcome of a Chi-squared test

4. Quality Assurance and Control

Subject content	What students need to learn
Students will need to apply their knowledge and understanding of the following content and interpret and analyse their findings and results in a business context	
4.1 Quality control	a) Advantages to management of setting up quality control charts
	b) The use of control charts for mean
	c) Diagrams, charts and graphs: • a mean chart using the normal distribution 0.025 point for the warning line and 0.001 point for the action line and interpreting the results • interpretation of results

The following skills should be developed throughout the course of study.

Skills	Students should:
	a) Use and apply statistical techniques in a range of business contexts, including market research, financial data, manufacturing, business forecasting and economic indicators
	b) Select and justify appropriate statistical methods and tests as an aid in solving business problems and business decisions
	c) Collect, analyse and interpret results of diagrams, charts and graphs and information in the context of business situations

Delivery guidance

In delivering this qualification, teachers are encouraged to use a variety of examples and scenarios drawn from the business environment.

Business scenarios and short case studies can be useful when used in small-group work as they give students the opportunity to work with their peers to identify key issues and how they can be addressed. This is particularly useful in developing the skills required when analysing different approaches to specific business contexts. Examinations for this qualification will use the dollar ($) as standard currency.

Assessment

Assessment summary

IAB LCCI Level 3 Certificate in Business Statistics
First teaching: September 2019 First assessment: June 2020 Number of series: 2
Overview of content **1** Management Information: The External and Internal Business Environment 1.1 Data collection 1.2 Descriptive statistics **2** Business Planning Models 2.1 Correlation and regression 2.2 Time-based data **3** Risk Management and Business Decision Making 3.1 Probability, including the normal distribution 3.2 Estimation and confidence intervals 3.3 Significance testing 4.4 Chi squared test **4** Quality Assurance and Control 4.1 Quality control

Overview of assessment

- One online, externally set and marked examination, contributing to 100% of the overall grade of the qualification.
- The examination will be 3 hours
- The examination will consist of 100 marks
- Candidates will be graded Pass/Merit/Distinction. A result of Fail will be recorded where candidates do not achieve the required marks for a Pass
- The examination contains five or six questions
- Candidates answer all questions

- The questions comprise short open response, calculations, chart/diagram construction/drawing and chart/diagram interpretation questions
- Candidates are expected to have available a calculator with at least the following keys: +, –, ×, ÷, □, x^2, □x, $\frac{1}{x}$, x^y, ln x, e^x, x!, sine, cosine and tangent and their inverses in degrees and decimals of a degree, and in radians; memory. Calculators with a facility for symbolic algebra, differentiation and/or integration are not permitted
- A formulae sheet will be provided
- Bilingual dictionaries are permitted for use in the exam.

Assessment Objectives

Students must:		% of qualification
AO1	Memorise Recall statistical procedures used in a business context Recall statistical terms and definitions Recall statistical processes and formulae	5
AO2	Perform procedures Select and use calculations using descriptive statistics Select and use statistical calculations involving correlation, regression and time-based data Select and use calculations involving probability Select and use calculations involving estimation, confidence intervals and statistical tests Present business data using suitable tables, charts, graphs and diagrams	50
AO3	Communicate understanding Demonstrate understanding of statistical concepts and conclusions Demonstrate understanding of the use of appropriate scales, axes and labels on graphs and charts Draw out the main points from tables, charts, graphs and diagrams Identify correlations/associations/trends	35
AO4	Analyse Analyse data collected from primary and secondary sources Recognise patterns, make inferences and forecast outcomes Distinguish different forms of statistical distributions Interpret results to establish acceptance or otherwise of a given hypothesis	10
	Total	100

Performance descriptors

Grade	Descriptor
Pass	Candidates can recall statistical procedures, terms, definitions, processes and formulae in a business context, showing an understanding of statistical concepts. Candidates can select appropriate statistical calculations most of the time and apply them to a business context. Candidates can carry out computations using statistical methods with some numerical errors, presenting solutions and data using tables, graphs, charts and diagrams with occasional errors. Candidates can analyse data and use further information provided, recognising patterns. They can sometimes make inferences and draw on evidence to interpret results.
Distinction	Candidates can recall and communicate thorough understanding of statistical procedures, terms, definitions, processes and formulae in a business context, and explain statistical concepts. Candidates can consistently select appropriate statistical techniques and interpret outcomes accurately most of the time, applying these in a business context. Candidates carry out both computations using statistical methods and present tables, graphs, charts and diagrams appropriately and accurately. Candidates can analyse complex data to make reasoned interpretations and judgements most of the time.

Performance descriptors may be revised following the first award.

Entry and assessment information

Student entry

Details on how to enter candidates for the examination for this qualification can be found at awarding team at ao@iab.org.uk or the website https://www.iab.org.uk/lcci/

The closing date for entries is approximately six weeks before the start of each examination series. Centres should refer to the published examination timetable for examination dates.

Combinations of entry

There are no forbidden combinations of entry for this qualification.

Age

Students must be a minimum of 16 years old to be entered for this qualification.

Resitting the qualification

Candidates must leave one series between the previous examination and the next planned examination entry.

Awarding and reporting

The IAB LCCI Level 3 Certificate in Business Statistics qualification is graded and certificated on a three-grade scale: Pass/Merit/Distinction. Pass and Distinction are awarded, Merit is arithmetically calculated.

Access arrangements, reasonable adjustments and special consideration

Access arrangements

Access arrangements are agreed before an assessment. They allow students with special educational needs, disabilities, or temporary injuries to:

- access the assessment
- show what they know and can do, without changing the demands of the assessment.

The intention behind an access arrangement is to meet the particular needs of an individual student with a disability, without affecting the integrity of the assessment. Access arrangements are the principal way in which awarding bodies comply with the duty under the Equality Act 2010 to make 'reasonable adjustments'.

Access arrangements should always be processed at the start of the course. Students will then know what is available and have the access arrangement(s) in place for assessment.

Reasonable adjustments

The Equality Act 2010 requires an awarding organisation to make reasonable adjustments where a person with a disability would be at a substantial disadvantage in undertaking an assessment. The awarding organisation is required to take reasonable steps to overcome that disadvantage.

A reasonable adjustment for a particular person may be unique to that individual and therefore might not be in the list of available access arrangements.

Whether an adjustment will be considered reasonable will depend on a number of factors, which will include:

- the needs of the student with the disability
- the effectiveness of the adjustment
- the cost of the adjustment; and
- the likely impact of the adjustment on the student with the disability and other students.

An adjustment will not be approved if it involves unreasonable costs to the awarding organisation, has untenable timeframes or affects the security or integrity of the assessment. This is because the adjustment is not 'reasonable'.

Special consideration

Special consideration is a post-examination adjustment to a student's mark or grade to reflect temporary injury, illness or other indisposition at the time of the examination or assessment, which has had, or is reasonably likely to have had, a material effect on a candidate's ability to take an assessment or demonstrate their level of attainment in an assessment.

Further information

Please see the website for further information about how to apply for access arrangements and special consideration.

For further information about access arrangements, reasonable adjustments and special consideration please refer to the JCQ website: www.jcq.org.uk.

Equality Act 2010 and IAB equality policy

Equality and fairness are central to our work. Our equality policy requires all students to have equal opportunity to access our qualifications and assessments, and our qualifications to be awarded in a way that is fair to every student.

We are committed to making sure that:

- Students with a protected characteristic (as defined by the Equality Act 2010) are not, when they are undertaking one of our qualifications, disadvantaged in comparison to students who do not share that characteristic
- All students achieve the recognition they deserve for undertaking a qualification and that this

achievement can be compared fairly to the achievement of their peers.

You can find details of how to make adjustments for students with protected characteristics in the policy document *Access Arrangements, Reasonable Adjustments and Special Considerations*, which is on our website awarding team at ao@iab.org.uk or the website https://www.iab.org.uk/lcci/

Candidate malpractice

Candidate malpractice refers to any act by a candidate that compromises or seeks to compromise the process of assessment or which undermines the integrity of the qualifications or the validity of results/certificates.

Candidate malpractice in examinations must be reported to IAB awarding team by email ao@iab.org.uk clearly identifying the title or posted to the registered office 110 Bishopsgate, London, EC2N 4AY. Please provide as much information and supporting documentation as possible. Note that the final decision regarding appropriate sanctions lies with IAB.

Failure to report malpractice constitutes staff or centre malpractice.

Staff/centre malpractice

Staff and centre malpractice includes both deliberate malpractice and maladministration of our qualifications. As with candidate malpractice, staff and centre malpractice is any act that compromises or seeks to compromise the process of assessment, or which undermines the integrity of the qualifications or the validity of results/certificates.

All cases of suspected staff malpractice and maladministration must be reported immediately, before any investigation is undertaken by the centre, to IAB awarding team by email ao@iab.org.uk clearly marked malpractice or posted to the registered office 110 Bishopsgate, London, EC2N 4AY. Please provide as much information and supporting documentation as possible. Note that the final decision regarding appropriate sanctions lies with IAB.

Failure to report malpractice itself constitutes malpractice.

More detailed guidance on malpractice can be found in the latest version of the document *General and Vocational Qualifications Suspected Malpractice in Examinations and Assessments Policies and Procedures,* available at:
www.jcq.org.uk/exams-office/malpractice.

Language of assessment

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

Other information

Total Qualification Time (TQT) and Guided Learning Hours (GLH)

For all regulated qualifications, we specify a total number of hours that students are expected to undertake to complete and show achievement for the qualification – this is the Total Qualification Time (TQT). The TQT value indicates the size of a qualification.

Within the TQT, we identify the number of Guided Learning Hours (GLH) that a centre delivering the qualification needs to provide. Guided learning means activities that directly or immediately involve tutors and assessors in teaching, supervising, and invigilating students, for example lectures, tutorials, online instruction, and supervised study.

As well as guided learning, there may be other required learning that is directed by tutors or assessors. This includes, for example, private study, preparation for assessment and undertaking assessment when not under supervision, such as preparatory reading, revision, and independent research.

TQT and guided learning hours are assigned after consultation with users of the qualifications.

This qualification has a TQT value of 160 and a GLH of 135

Student recruitment

I A B follows the JCQ policy concerning recruitment to our qualifications in 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.

Prior learning and other requirements

Students may be studying in a local language, but the assessment will be in English. IAB recommends students have B1 level of English on the Common European Framework of Reference (CEFR). This will support access to the assessment materials and be able to communicate responses effectively.
IAB's *Recognition of prior learning policy and process* document can be found at ao@iab.org.uk or the website https://www.iab.org.uk/lcci/

Progression

LCCI qualifications are designed to allow students to pursue different routes as outlined below.

Enter a chosen field of work, pursue a promotion, or change their field of work

The IAB LCCI Level 3 Certificate in Business Statistics qualification supports progression to employment. It is designed to support student knowledge and understanding of statistics relevant to their portfolio of learning in business, finance and accounting. Together with other IABLCCI Level 3 qualifications, this qualification will allow progression to more advanced administrative, business and management qualifications and supports progression into the job market in areas such as

forecasting, data collection and analysis, finance and accountancy.

Using appropriate internal processes, centres must ensure they choose the most appropriate qualification level for their learners' needs.

Progress to further study, such as the next LCCI level or externally with a professional body or education provider

This qualification allows progression to LCCI Level 4 accounting qualifications, as well as qualifications across the LCCI suites. Completing different LCCI qualifications could potentially lead to gaining an LCCI Diploma. Please refer to the 'Exemptions' section of this specification for information on recognition from external providers, or the latest LCCI Information Manual for more information about Diplomas.

Exemptions

We are continuously gaining new and updated exemptions for our LCCI qualifications from professional bodies and organisations. For the latest list of agreements, and to check this specific qualification, please visit the IAB LCCI website: ao@iab.org.uk or the website https://www.iab.org.uk/lcci/

Codes

This qualification is approved by Ofqual and meets the Ofqual General Conditions for inclusion on the Register of Regulated Qualifications. The Qualification Number (QN) is: **********.

The subject code for IAB LCCI Level 3 Certificate in Business Statistics is: **********. The subject code is used by centres to enter students for a qualification. Centres will need to use the entry codes only when claiming students' qualifications.

Support, training and resources

Training

I A B offers support and training to teachers on standard of delivery and preparing students to meet the assessment requirements.

Specifications, Sample Assessment Materials and Teacher Support Materials

The IAB LCCI Level 3 Certificate in Business Statistics Sample Assessment Materials document (ISBN 9781446961209) can be downloaded from **********

To find a list of all the support documents available please visit **********

Appendix 1: IAB LCCI Level 3 Certificate in Business Statistics – formulae sheet

Median for grouped data $l_m + c_m \left(\frac{\frac{n}{2} - F_{m-1}}{f_m} \right)$

Where l_m, c_m and f_m are the lower boundary, width and frequency respectively of the median class, n is the total number of observations and F_{m-1} is the cumulative frequency corresponding to l_m.

Mean for ungrouped data $\bar{x} = \frac{\sum x}{n}$

Mean for grouped data $\bar{x} = \frac{\sum fx}{\sum f}$

Standard deviation for ungrouped data $s = \sqrt{\frac{\sum x^2}{n} - (\bar{x})^2}$

Standard deviation for grouped data $s = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f} \right)^2}$

IAB measure of skewness $\frac{3(\bar{x} - \text{Median})}{s}$

Coefficient of variation $\frac{s}{\bar{x}} \times 100$

Multiplication rule of probability if A and B independent

$P(A \cap B) = P(A) \times P(B)$

Addition rule of probability $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

	Price	Quantity
Laspeyres index	$\frac{\sum p_1 q_0}{\sum p_0 q_0} \times 100$	$\frac{\sum p_0 q_1}{\sum p_0 q_0} \times 100$
Paasche index	$\frac{\sum p_1 q_1}{\sum p_0 q_1} \times 100$	$\frac{\sum p_1 q_1}{\sum p_1 q_0} \times 100$

Weighted index $\frac{\sum WI}{\sum W}$

Product moment correlation coefficient $r = \frac{n\sum xy - \sum x \sum y}{\sqrt{\left(n\sum x^2 - \left(\sum x\right)^2\right)\left(n\sum y^2 - \left(\sum y\right)^2\right)}}$

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

Least Squares regression line $\hat{y} = a + bx$

$$b = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - \left(\sum x\right)^2}$$

$$a = \frac{\sum y}{n} - \frac{b\sum x}{n}$$

One sample z test

Mean $z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$ Proportion $z = \frac{p - \pi}{\sqrt{\frac{\pi(1-\pi)}{n}}}$

Two sample z test

Mean $z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$ Proportion $z = \frac{p_1 - p_2}{\sqrt{p(1-p)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$

where $p = \frac{n_1 p_1 + n_2 p_2}{n_1 + n_2}$

One sample t test

$t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$ where $s = \sqrt{\frac{\sum(x - \bar{x})^2}{n-1}}$

Independent samples t test

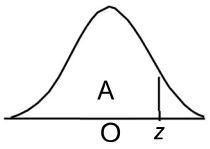
$t = \frac{\bar{x} - \bar{y}}{s\sqrt{\frac{1}{n} + \frac{1}{m}}}$ where $s = \sqrt{\frac{\sum(x - \bar{x})^2 + \sum(y - \bar{y})^2}{n + m - 2}}$

Chi squared test $\chi^2 = \sum \frac{(O-E)^2}{E}$

Test for $\rho = 0$ $t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$

Table 1: The Normal Distribution

A is the area to the left of the given value of z

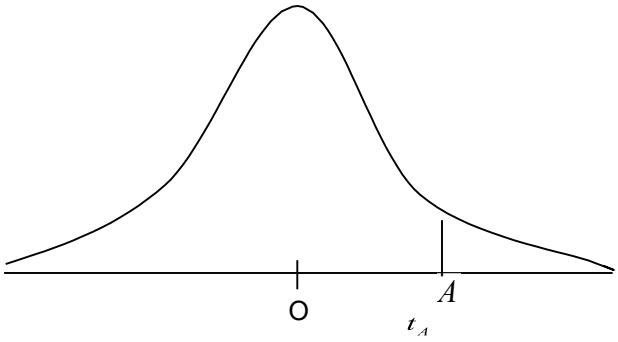


z	A	z	A	z	A	z	A	z	A
0.00	0.5000	0.50	0.6915	1.00	0.8413	1.50	0.9332	2.00	0.9772
0.01	0.5040	0.51	0.6950	1.01	0.8438	1.51	0.9345	2.02	0.9783
0.02	0.5080	0.52	0.6985	1.02	0.8461	1.52	0.9357	2.04	0.9793
0.03	0.5120	0.53	0.7019	1.03	0.8485	1.53	0.9370	2.06	0.9803
0.04	0.5160	0.54	0.7054	1.04	0.8508	1.54	0.9382	2.08	0.9812
0.05	0.5199	0.55	0.7088	1.05	0.8531	1.55	0.9394	2.10	0.9821
0.06	0.5239	0.56	0.7123	1.06	0.8554	1.56	0.9406	2.12	0.9830
0.07	0.5279	0.57	0.7157	1.07	0.8577	1.57	0.9418	2.14	0.9838
0.08	0.5319	0.58	0.7190	1.08	0.8599	1.58	0.9429	2.16	0.9846
0.09	0.5359	0.59	0.7224	1.09	0.8621	1.59	0.9441	2.18	0.9854
0.10	0.5398	0.60	0.7257	1.10	0.8643	1.60	0.9452	2.20	0.9861
0.11	0.5438	0.61	0.7291	1.11	0.8665	1.61	0.9463	2.22	0.9868
0.12	0.5478	0.62	0.7324	1.12	0.8686	1.62	0.9474	2.24	0.9875
0.13	0.5517	0.63	0.7357	1.13	0.8708	1.63	0.9484	2.26	0.9881
0.14	0.5557	0.64	0.7389	1.14	0.8729	1.64	0.9495	2.28	0.9887
0.15	0.5596	0.65	0.7422	1.15	0.8749	1.65	0.9505	2.30	0.9893
0.16	0.5636	0.66	0.7454	1.16	0.8770	1.66	0.9515	2.32	0.9898
0.17	0.5675	0.67	0.7486	1.17	0.8790	1.67	0.9525	2.34	0.9904
0.18	0.5714	0.68	0.7517	1.18	0.8810	1.68	0.9535	2.36	0.9909
0.19	0.5753	0.69	0.7549	1.19	0.8830	1.69	0.9545	2.38	0.9913
0.20	0.5793	0.70	0.7580	1.20	0.8849	1.70	0.9554	2.40	0.9918
0.21	0.5832	0.71	0.7611	1.21	0.8869	1.71	0.9564	2.42	0.9922
0.22	0.5871	0.72	0.7642	1.22	0.8888	1.72	0.9573	2.44	0.9927
0.23	0.5910	0.73	0.7673	1.23	0.8907	1.73	0.9582	2.46	0.9931

0.24	0.5948	0.74	0.7704	1.24	0.8925	1.74	0.9591	2.48	0.9934
z	A	*z*	A	*z*	A	*z*	A	*z*	A
0.25	0.5987	0.75	0.7734	1.25	0.8944	1.75	0.9599	2.50	0.9938
0.26	0.6026	0.76	0.7764	1.26	0.8962	1.76	0.9608	2.55	0.9946
0.27	0.6064	0.77	0.7794	1.27	0.8980	1.77	0.9616	2.60	0.9953
0.28	0.6103	0.78	0.7823	1.28	0.8997	1.78	0.9625	2.65	0.9960
0.29	0.6141	0.79	0.7852	1.29	0.9015	1.79	0.9633	2.70	0.9965
0.30	0.6179	0.80	0.7881	1.30	0.9032	1.80	0.9641	2.75	0.9970
0.31	0.6217	0.81	0.7910	1.31	0.9049	1.81	0.9649	2.80	0.9974
0.32	0.6255	0.82	0.7939	1.32	0.9066	1.82	0.9656	2.85	0.9978
0.33	0.6293	0.83	0.7967	1.33	0.9082	1.83	0.9664	2.90	0.9981
0.34	0.6331	0.84	0.7995	1.34	0.9099	1.84	0.9671	2.95	0.9984
0.35	0.6368	0.85	0.8023	1.35	0.9115	1.85	0.9678	3.00	0.9987
0.36	0.6406	0.86	0.8051	1.36	0.9131	1.86	0.9686	3.05	0.9989
0.37	0.6443	0.87	0.8078	1.37	0.9147	1.87	0.9693	3.10	0.9990
0.38	0.6480	0.88	0.8106	1.38	0.9162	1.88	0.9699	3.15	0.9992
0.39	0.6517	0.89	0.8133	1.39	0.9177	1.89	0.9706	3.20	0.9993
0.40	0.6554	0.90	0.8159	1.40	0.9192	1.90	0.9713	3.25	0.9994
0.41	0.6591	0.91	0.8186	1.41	0.9207	1.91	0.9719	3.30	0.9995
0.42	0.6628	0.92	0.8212	1.42	0.9222	1.92	0.9726	3.35	0.9996
0.43	0.6664	0.93	0.8238	1.43	0.9236	1.93	0.9732	3.40	0.9997
0.44	0.6700	0.94	0.8264	1.44	0.9251	1.94	0.9738	3.50	0.9998
0.45	0.6736	0.95	0.8289	1.45	0.9265	1.95	0.9744	3.60	0.9998
0.46	0.6772	0.96	0.8315	1.46	0.9279	1.96	0.9750	3.70	0.9999
0.47	0.6808	0.97	0.8340	1.47	0.9292	1.97	0.9756	3.80	0.9999
0.48	0.6844	0.98	0.8365	1.48	0.9306	1.98	0.9761	3.90	1.0000
0.49	0.6879	0.99	0.8389	1.49	0.9319	1.99	0.9767	4.00	1.0000
0.50	0.6915	1.00	0.8413	1.50	0.9332	2.00	0.9772		

Table 2: t Distribution

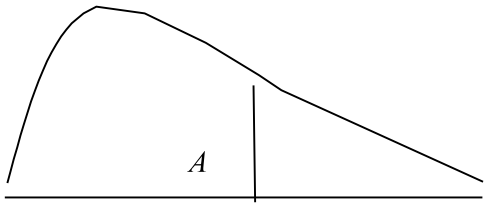
t_A is the value of the t statistic with ν degrees of freedom with area A to the right of it



ν	1	2	3	4	5	6	7	8
$t_{0.05}$	6.31	2.92	2.35	2.13	2.02	1.94	1.90	1.86
$t_{0.025}$	12.71	4.30	3.18	2.78	2.57	2.45	2.37	2.31
$t_{0.01}$	31.82	6.97	4.54	3.75	3.37	3.14	3.00	2.90
$t_{0.005}$	63.66	9.93	5.84	4.60	4.03	3.71	3.50	3.36
ν	9	10	11	12	13	14	15	16
$t_{0.05}$	1.83	1.81	1.80	1.78	1.77	1.76	1.75	1.75
$t_{0.025}$	2.26	2.23	2.20	2.18	2.16	2.15	2.13	2.12
$t_{0.01}$	2.82	2.76	2.72	2.68	2.65	2.62	2.60	2.58
$t_{0.005}$	3.25	3.17	3.11	3.05	3.01	2.98	2.95	2.92
ν	17	18	19	20	21	22	23	24
$t_{0.05}$	1.74	1.73	1.73	1.73	1.73	1.72	1.71	1.71
$t_{0.025}$	2.11	2.10	2.09	2.09	2.09	2.08	2.07	2.06
$t_{0.01}$	2.57	2.55	2.54	2.54	2.53	2.52	2.50	2.49
$t_{0.005}$	2.90	2.88	2.86	2.86	2.85	2.83	2.81	2.80

Table 3: Chi squared Distribution Table

χ_A^2 is the value of the χ^2 statistic with ν degrees of freedom with area A to the right of it



ν	1	2	3	4	5	6
$\chi^2_{0.05}$	3.84	5.99	7.81	9.49	11.07	12.59
$\chi^2_{0.01}$	6.63	9.21	11.34	13.28	15.09	16.81
ν	7	8	9	10	11	12
$\chi^2_{0.05}$	14.07	15.51	16.92	18.31	19.68	21.03
$\chi^2_{0.01}$	18.48	2.09	21.67	23.21	24.73	26.22

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