

## Higher National Unit Specification

### General information for centres

**Unit title:** Statistics for Science 2

**Unit code:** DV08 35

**Unit purpose:** This Unit is designed to enable candidates to develop their knowledge of the application of statistics to science. Candidates should develop an appreciation of the need for statistical analysis. They will also interpret the findings in the context of a scientific problem.

On completion of the Unit the candidate should be able to:

- 1 Explain and demonstrate an understanding of appropriate sampling techniques.
- 2 Determine confidence interval and test hypothesis.
- 3 Interpret and apply non parametric tests.

**Credit points and level:** 1 HN Credit at SCQF level 8: (8 SCQF credit points at SCQF level 8\*).

*\*SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

**Recommended prior knowledge and skills:** Entry to this unit is at the discretion of the centre however, it is advisable that candidates have prior knowledge of statistics and possess good numerical skills. This may be evidenced by possession of the unit Statistics for Science 1 (DN8C 34). A working knowledge of a computerised spreadsheet system, such as Excel, is also recommended.

**Core Skills:** There are opportunities to develop the Core Skill(s) of Numeracy at Higher level in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

**Context for delivery:** If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

**Assessment:** This Unit will be assessed by means of a combination of written/oral responses and/or computer printouts. Assessments will be closed-book and under controlled conditions. However some formulae can be supplied to the students for use in the assessment. Assessment could be done on an outcome by outcome basis however it is suggested that assessment for Outcomes 1-3 is integrated into one assessment event.

## **Higher National Unit specification: statement of standards**

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The sections of the Unit stating the Outcomes, knowledge and/or skills, and evidence requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

### **Outcome 1**

Explain and demonstrate an understanding of appropriate sampling techniques

#### **Knowledge and/or skills**

- ◆ Random sampling
- ◆ Systematic sampling
- ◆ Stratified sampling
- ◆ Multi-stage sampling

### **Outcome 2**

Determine confidence interval and test hypothesis

#### **Knowledge and/or skills**

- ◆ Confidence limits and intervals
- ◆ Hypothesis testing: z-test, f-test and t-test

### **Outcome 3**

Interpret and apply non parametric tests

#### **Knowledge and/or skills**

- ◆ Wilcoxon test
- ◆ Mann-Whitney test
- ◆ Chi-squared test

### **Evidence Requirements for the Unit**

The assessment for this Unit consists of a closed-book assessment of approximately two hours duration sampling each Outcome as directed.

## Higher National Unit specification: statement of standards (cont)

**Unit title:** Statistics for Science 2

Outcome 1 — Two out of four knowledge and skills are assessed

Outcome 2 — Both knowledge and skills are assessed:  
One question must be on confidence intervals.  
Two out of the three topics in the hypothesis testing, which must include stating the null and alternative hypothesis

Outcome 3 — Two out of the three knowledge and skills are assessed.

This Unit will be assessed by means of a combination of written/oral responses and/or computer printouts.

Assessments will be closed book and under controlled conditions. However relevant formulae can be supplied to the students for use in the assessment: z test, f-test and t-test equations for Outcome 2 and Mann — Whitney and Chi-squared test formulae for Outcome 3.

### Assessment guidelines for the Unit

If computers are utilised it is suggested that data for the assessment could be set up for students in a computer file so that assessment time is not spent by them time entering in data.

Assessment will be closed book and under controlled conditions.

Assessment could be done on an outcome by outcome basis using three separate assessment events. However, it is anticipated that assessment will be by a single assessment event lasting approximately two hours.

## **Administrative Information**

<b>Unit code:</b>	DV08 35
<b>Unit title:</b>	Statistics for Science 2
<b>Superclass category:</b>	RB
<b>Date of publication:</b>	August 2005
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## Higher National Unit specification: support notes

### Unit title: Statistics for Science 2

This part of the Unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

### Guidance on the content and context for this Unit

Although some tests can be done quickly manually, candidates should make use of computer spreadsheet statistical functions, or calculators with statistical functions to carry out calculations when appropriate and sensible. This unit could be integrated with a number of units in Science related HNs such as Information Technology: Applications Software 1 (D75X 34).

**Outcome 1** considers the concepts of randomness and sampling. The difference between a population parameter and a sample statistic should be clearly explained. The concept of bias should be explained and the need for unbiased estimators of parameters. The various sampling techniques should be defined with appropriate examples from science used as illustrations.

**Outcome 2** introduces confidence limits and intervals. The main levels of confidence, 90%, 95%, 97.5% and 99% should be used. Understand the concept of confidence intervals and calculate confidence limits and intervals for various confidence levels. Interpret the confidence interval in context of the problem. Following on is hypothesis testing. Integral to this is stating both the null and the alternative hypothesis before carrying out the appropriate test. Select and use an appropriate test, and interpret the results in context. Computer statistical functions can be used for some of this Outcome but the output from these may differ from the manual procedure. Therefore interpreting the output/results is important.

**Outcome 3** covers three non parametric tests. As in previous outcomes computer statistical functions can be used for some of this Outcome. The interpretation of output/results is important. Select and use an appropriate test, and interpret the results in context.

### Guidance on the delivery and assessment of this Unit

The Unit should be delivered in a way that enables the candidates to appreciate its relevance to the branch of science concerned.

This Unit will be assessed by means of a combination of detailed responses and/or computer printouts.

Assessments will be closed book and under controlled conditions. However some formulae can be supplied to the students for use in the assessment: z test, F-test and t-test equations for Outcome 2 and Mann Whitney and Ch-squared test formulae for Outcome 3. Appropriate tables will also be provided.

The basis of the Unit is that students learn when to use the appropriate statistics and to interpret their results, so it is expected that computers or calculator with statistical functions are used in the assessment to perform the calculations, especially in questions for Outcome 1.

## **Higher National Unit specification: support notes (cont)**

**Unit title:** Statistics for Science 2

### **Open learning**

This Unit could be delivered by distance learning. However, it would require planning by the centre to ensure the sufficiency and authenticity of candidate evidence. Arrangements would have to be made to ensure that the assessments for each outcome are delivered in a supervised environment under controlled conditions.

For further information and advice, please see *Assessment and Quality Assurance for Open and Distance Learning* (SQA, February 2001 — publication code A1030).

### **Candidates with additional support needs**

This Unit specification is intended to ensure that there are no artificial barriers to learning or assessment. The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative Outcomes for Units. For information on these, please refer to the SQA document *Guidance on Alternative Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs*, which is available on the SQA website **[www.sqa.org.uk](http://www.sqa.org.uk)**.

## General information for candidates

### Unit title: Statistics for Science 2

This Unit is designed to

On completion of the Unit the candidate should be able to:

- 1 Explain and demonstrate an understanding of appropriate sampling techniques.
- 2 Determine confidence interval and test hypothesis.
- 3 Interpret and apply non parametric tests.

**Outcome 1** is about using appropriate sampling techniques and considers the concepts of randomness and sampling

**Outcome 2** is about Confidence Intervals and Hypothesis testing. Firstly you will learn about confidence intervals. Then you will discover what a hypothesis is and how to state these for a problem. Then you will be shown ways in which these hypothesis can be tested.

**Outcome 3** introduces you to some useful statistical tests. and covers three non parametric tests

This Unit will be assessed by means of a combination of written/oral responses and/or computer printouts.

Assessments will be closed book and under controlled conditions. However some formulae will be supplied to you for use in the assessment.