

SQA Advanced Unit specification: general information

Unit title: Databases: An Introduction

Unit code: HR89 47

Superclass: CD

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Unit purpose

This Unit is designed to introduce candidates to the range of databases and their uses in computing. They will be taught about the evolution of databases from flat and hierarchical models through to the prominence of relational models and later object models. Candidates will also be introduced to common data storage terms and the difference between data and information.

Candidates will have the opportunity to investigate some of the technology used to support online databases such as server side scripting, SQL and xml. They will also have the opportunity to develop skills both in manipulating data within databases and in developing a simple database using a pre-defined data model.

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

- 1 Describe the purpose and types of databases.
- 2 Describe the use of databases on the internet.
- 3 Develop and test a simple database using a pre-defined data model.

Recommended prior knowledge and skills

Access to this Unit will be at the discretion of the Centre, however it would be beneficial if the candidate already possessed good written communication, information technology, critical thinking and analytical skills, either through workplace experience or training at an appropriate level.

This could be exemplified by possession of the Core Skills in *Numeracy* (SCQF level 5), *Working with Others* (SCQF level 4), *Communication* (SCQF level 5), *Information and Communication Technology (ICT)* (SCQF level 6) and *Problem Solving* (SCQF level 4).

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Credit points and level

1 SQA Credit at SCQF level 7: (8 SCQF credit points at SCQF level 7*)

**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 National 1 to Doctorates.*

Core Skills

Opportunities to develop aspects of Core Skills are highlighted in the Support Notes of this Unit specification.

There is no automatic certification of Core Skills or Core Skill components in this Unit.

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.

Unit specification: statement of standards

Unit title: Databases: An Introduction

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The sections of the Unit stating the Outcomes, Knowledge and/or Skills, and Evidence Requirements are mandatory.

Please refer to the Knowledge and/or Skills for the Unit and the Evidence Requirements for the Unit after the Outcomes.

Outcome 1

Describe the purpose and types of databases.

Knowledge and/or Skills

- ◆ Database data models.
- ◆ Database storage terms.
- ◆ Data and information.
- ◆ Common database business models.
- ◆ Geographical information systems.

Outcome 2

Describe the use of databases on the Internet.

Knowledge and/or Skills

- ◆ Hypertext
- ◆ Server side scripting
- ◆ SQL
- ◆ XML
- ◆ Distributed databases

Outcome 3

Develop and test a simple database using a pre-defined data model.

Knowledge and/or Skills

- ◆ Select appropriate fields.
- ◆ Develop forms for entering data.
- ◆ Develop reports for displaying data.
- ◆ Develop forms for editing data.
- ◆ Develop forms for deleting data.

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Evidence Requirements for the Unit

As an alternative to traditional assessment methods (eg paper-based), candidates can provide a digital record of evidence to demonstrate Knowledge and/or Skills. Suggested approaches are outlined in the Support Notes, Guidance on the assessment of this Unit.

Assessment 1: Closed-book Assessment

Candidates will need to provide evidence to demonstrate their knowledge by showing that they can describe:

- ◆ Database data models including flat, hierarchical, relational and object oriented.
- ◆ Common database storage terms including files, tables, records and fields.
- ◆ The difference between data and information.
- ◆ The use of common database business models.
- ◆ The use of geographical information systems.
- ◆ The use of hypertext to link to both text documents and objects.
- ◆ The use of server side scripting to communicate to databases securely.
- ◆ The use of SQL to communicate to relational databases.
- ◆ The use of self describing data for sharing data.
- ◆ The purpose of distributed databases.

This assessment should be conducted under supervised closed-book conditions and the questions presented must change on each assessment occasion.

Assessment 2: Open-book Assessment

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

Develop and populate a simple database using a pre-defined data model. The database produced should be tested to ensure that the user can successfully enter, update, delete and search for data.

Unit specification: support notes

Unit title: Databases: An Introduction

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

This Unit is designed to introduce candidates to the range and purposes of databases used in computing. The first two Outcomes concentrate on the concepts behind databases and the technologies used to support the use of databases on the internet.

The first Outcome looks at the purposes and types of databases. Candidates will be introduced to some of the common data models used by databases including flat, hierarchical, relational and object oriented models. They should be able to recognise the benefits and limitations of each model and be able to describe common data base storage terms including files, tables, records and fields. The final part of the Outcome allows the candidates to investigate some common database business models (eg customer relational management systems, sales systems and payroll systems) and some geographical information systems (eg Google Earth and Satellite Navigational Systems).

The second Outcome looks at the use of databases on the internet and starts by looking at how hypertext can be used to link both text documents and objects. The use of server side scripting (eg PHP and ASP.net) should then be introduced to illustrate how this technology allows web pages to communicate to databases securely. The use of SQL to query databases should be introduced to allow candidates to appreciate how SQL can be used to select and update data. candidates should be aware of how the increasing use of self describing data (XML) to return the results of queries helps to both simplify and standardise data transport in a meaningful manner. The use of distributed databases should be limited to an awareness of how data can be distributed across networks.

In the final Outcome, candidates will have the opportunity to build and populate a simple database using a pre-defined data model such as that provided in a CMS or Active Directory. This means that the Unit can be geared towards candidates progressing onto each of the SQA Advanced Diploma awards (Computing, Technical Support, Software Development and Networking) following on from the SQA Advanced Certificate in Computing. The database produced should be tested to ensure that users can successfully manipulate data.

This Unit addresses a range of skills at both foundation and intermediate level that are described in the National Occupational Standards for IT Users v3. The main areas covered are DB: Database Software and DMS: Data Management Software. There is also scope to cover some of the skills described in IT Software Fundamentals, Using the Internet, Bespoke or specialist software and Website Software.

Guidance on the delivery of this Unit

Although the first two Outcomes of this Unit are more theoretical in nature, the teaching approach adopted could make extensive use of practical activities to help engage the learners.

A possible approach would be to introduce data storage terms and the common models used to store data. This could then be reinforced by providing candidates with a series of exercises where they search for information using a range of databases that adopt different data models.

The differences between flat file, hierarchical and relational models could be illustrated by getting the students to create a simple address book using a flat file (eg table in a Word processor or using a spreadsheet). You could then discuss how a business might want to group the data such as by company name and how this could be achieved using a hierarchical folder structure where the entries are organised by companies. This could then be followed by looking at how the data could be stored using a relational model and illustrate how the latter greatly reduces the amount of data that needs to be stored. This is also an opportunity to illustrate how the binary data needs to be queried and presented in a meaningful way in order to be viewed as information.

The use of objects could then be introduced by suggesting that an image is also required to be stored along with the contact information — illustrate how this uses a link to a file that is usually stored in a hierarchical folder structure. Geographical information systems could be introduced by looking at satellite navigational systems or Google Earth — both of these allow you to illustrate how these systems make use of cartographic data, databases and data processing software.

The business models could be introduced by allowing the candidates to research the increasing use of content management systems such as customer relational management systems, sales systems and payroll systems. This could be enhanced by allowing them to use a content management system to a limited extent — this would also help prepare the candidates for the practical activity in Outcome 3.

Outcome 2 provides an opportunity to allow the students to investigate the technology used by the Web. You might want to start by looking at some typical well used online databases such as YouTube (<http://www.youtube.com/>) to illustrate how the search results use hypertext to link to the video objects.

The use of hypertext could then be explained by allowing the candidates to create web pages that include links to both text documents and objects. This can easily be created using design views in a range of development tools. The underlying html tags could then be explained by switching to code view. You could also illustrate how websites are generally organised using hierarchical folder structures.

The use of ASP and/or PHP could be illustrated by using web development environments where the student can use a design view to create dynamic web pages, The database connection wizards could then be used to link to data in a relational database. These wizards would also allow the students to see SQL at work without having to directly write the code. The express edition of Microsoft's Visual Web Developer is an example of a 'free' resource that could be used to illustrate this.

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At the time of writing the use of self describing data (xml) is becoming more and more extensive in computing. This section lets you explain the basic structure (root and child hierarchy) of an xml document and illustrate how this removes the problems with different binary data formats used by different RDMS. It might make sense to stick to a relatively simple xml definition such as RSS to illustrate this. This area also allows you to reinforce the idea of a flat file database.

The final section on distributed databases allows you to illustrate how a particular database could be distributed across different servers and how this approach can help reduce network bottlenecks.

The final Outcome is practical in nature and allows the candidate to use a pre-defined data model and wizards to create, populate and test a database. There are numerous content management applications that could be used to illustrate this. A possible alternative would be to use the database creation wizards supplied in RDMS software applications such as Microsoft Access or to use a directory system such as Active Directory. If a CMS is used, it is important that the candidates are made aware of how this sits on top of a relational database hidden from the user.

Guidance on the assessment of this Unit

Both of the assessments for this Unit could be undertaken using e-assessment. The closed-book assessment lends itself to a standard online objective assessment. The open-book assessment could be undertaken using an e-portfolio with links to the completed database and links to videos demonstrating that the candidate has appropriately tested the completed database.

Assessment Guidelines

Closed-book Assessment

The closed-book assessment covers the concepts studied in Outcomes 1 and 2 and should be conducted using a knowledge based assessment such as a closed-book objective test consisting of 20 multiple-choice questions. The assessment should include at least one question from each of the knowledge points as detailed below:

- ◆ Database data models including flat, hierarchical, relational and object oriented.
- ◆ Common database storage terms including files, tables, records and fields.
- ◆ The difference between data and information.
- ◆ The use of common database business models.
- ◆ The use of geographical information systems.
- ◆ The use of hypertext to link to both text documents and objects.
- ◆ The use of server side scripting to communicate to databases securely.
- ◆ The use of SQL to communicate to relational databases.
- ◆ The use of self describing data for sharing data.
- ◆ The purpose of distributed databases.

The questions presented should change on each assessment occasion.

The assessment should be undertaken in supervised conditions and is closed-book. A candidate should complete this assessment within one hour. Candidates may not bring to the assessment event any notes, textbooks, hand-outs or other material.

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Candidates should answer at least 60% of the questions correctly.

Open-book Assessment

Outcome 3 should be assessed using a project based assessment where candidates are given a scenario and a suitable database model. They should then develop and test a database that meets the requirements given in the scenario. The database produced should be populated with a minimum of five records to allow for appropriate testing. The candidate will need to provide documentary and/or video evidence that they have developed and tested a database that meets the given requirements.

The environment used for this assessment should allow the candidate to make extensive use of wizards in developing their solution. The scenario selected should enable the candidate to recognise and implement some data grouping within their solution.

Online and Distance Learning

It would be perfectly feasible to develop a range of blended learning material to support distance learners. Online technology such as e-learning objects and links from virtual learning environments could be used support this type of delivery. Support for distance learners could be provided by both synchronous and asynchronous communication technologies such as the use of virtual classrooms and forums.

The closed-book assessment could be delivered using an online objective assessment and the open-book assessment could make use of an E-portfolio. Care would need to be taken to ensure the authenticity of assessments undertaken by distance learners.

Opportunities for developing Core Skills

Although there is no automatic certification of Core Skills or Core Skill components in this Unit, there are opportunities for developing the ICT operations skills, processing information using ICT skills and accessing information using ICT skills required for the *Information and Communication Technology* Core Skill at SCQF level 6. Further information on the requirements for assessing the *Information and Communication Technology* Core Skill at SCQF level 6 can be found at http://www.sqa.org.uk/sqa/files_ccc/F3GC_12_ASP.pdf.

Equality and inclusion

This unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website www.sqa.org.uk/assessmentarrangements.

History of changes to Unit

Version	Description of change	Date

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SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of SQA Advanced Qualifications.

FURTHER INFORMATION: Call SQA's Customer Contact Centre on 44 (0) 141 500 5030 or 0345 279 1000. Alternatively, complete our [Centre Feedback Form](#).

General information for candidates

Unit title: Databases: An Introduction

Databases are at the core of the information society. They are used to store data about just about every aspect of modern life ranging from health and government records to the vast majority of all our business transactions. When you store or retrieve contact details from a mobile, you are using a simple database. This Unit is designed to allow you to explore the purposes and types of databases used.

In the first Outcome you will be introduced to the evolution of database storage models from flat files and hierarchical models through to relational and object models. In addition you will see how many business models have now become so well established that it is possible to use content management systems to quickly build powerful databases with little or no programming skills.

The use of online databases and the technology used to support them will be looked at in Outcome 2. You will have the opportunity to learn how hypertext can be used to link to objects and how server side scripts can be used to securely link web pages to remote databases. You will also be introduced to the role of self describing data (xml) in transporting meaningful data across networks.

In the final Outcome you will have the opportunity to use a modern development environment, such as a Content Management System (CMS) to quickly build a working database.