Group Award Specification for:

HND Computing: Software Development

Group Award Code: GG7E 16

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Contents

1 Introduction

This document was previously known as the Arrangements document. The purpose of this document is to:

- assist centres to implement, deliver and manage the qualification.
- provide a guide for new staff involved in offering the qualification.
- inform Course managers, teaching staff, assessors, learners, employers and HEIs of the aims and purpose of the qualification.
- provide details of the range of learners the qualification is suitable for and progression opportunities.

1.1 Background

The current development began in June 2010 with a public consultation meeting, attended by 58 representatives, spanning 32 colleges.

The initial review phase commenced in June 2010 and involved extensive consultation and discussion with the sector.

One major finding during this phase was the sector's preference for a single development that encompassed Computing and Networking. HN *Computing* has previously been a family of awards consisting of: HNC *Computing*, HND *Computing: Software Development*, and HND *Computing: Technical Support*. The QDT, supported by Heads of Computing, wanted the review of these awards to embrace the review of HN *Computer Networking*, which was also due to commence (as a separate development). As a result, the 'HN Review', as it was known, encompassed five awards:

1 HNC *Computing*
2 HND *Computing: Technical Support*
3 HND *Computing: Software Development*
4 HNC *Computer Networking*
5 HND *Computer Networking & Internetworking Technology*

At this stage, it was agreed to combine the HNCs into a single award, and introduce a new HND award (HND Computing). The HN Review, therefore, sought to develop the following awards:

1 HNC *Computing* (based on HNC *Computing* and HNC *Computer Networking*)
2 HND *Computer Science* (new award)
3 HND *Computing: Technical Support* (based on existing award)
4 HND *Computing: Software Development* (based on existing award)
5 HND *Computing: Networking* (based on HND *Computer Internetworking*)

This document relates (only) to HND Computing: Software Development. The HNC Computing award was validated in December 2012. The rationales for the other HNDs will be presented separately and, as such, are out with the scope of this document.

1.2 Rationale for Group Award

This qualification has been designed to update the current HND *Computing: Software Development* (G7TT 16) and provide a distinctive route within the suite of HN *Computing* awards. The title of the award reflects the core aim of preparing candidates for employment in the field of software development. The mandatory Units of the award reflect the underlying importance of the object oriented paradigm in modern software development. This key skill was highlighted in the consultations undertaken with stakeholders from employers, higher education and tertiary education.

Technology Insights 2012 (e-skills UK) clearly highlights the demand for the skill sets embodied within this award. The new development Units have been designed to allow flexibility in both the development environments chosen and in the target platforms. This should provide learners with the opportunity to develop their programming and design skills using 'in vogue' technologies such as mobile applications.

The Information and Communication Technologies: Sector Skills Assessment 2012 (UK Commission for Employment and skills) emphasises the continuing need for software professionals within the sector.

'Software Professionals are the largest occupational group with nearly one in five (19 per cent or 141,000) in the sector workforce employed in these occupations.'

The report also highlights the increasing need for software professionals outside of the sector

'Software Professionals' is the fifteenth largest occupational group in the UK with employment of 327,000 people across the economy (141,000 of whom are employed within the Information and communication technologies sector itself).'

Technology Insights 2012 (e-skills UK) predicts that the demand for software professionals will continue to dominate the occupational area.

'When asked to speculate on the likely nature of future IT & Telecoms related recruitment difficulties, employers responding to the National Academy survey most often thought that problems would be most apparent when seeking to fill positions for: Programmers and Software Development professionals followed by Web design and development professionals and, to a lesser extent, IT User Support Technicians.'

The reports mentioned above reinforce the findings of the lead developer's consultations with representatives of major vendors (Microsoft, Apple and Oracle) and with a range of software professionals. These findings highlighted the need for a range of generic skills including:

- problem solving
- inter-personal skills
- innovative thinking

Along with specific technical skills — the most commonly required being:

- SQL
- C
- C#
- .NET
- Java
- SQL
- SVR
- ASP
- JavaScript
- Agile
- HTML

The majority of these technical skills are dependent on a thorough understanding of the object oriented paradigm which is at the core of the new award. The generic nature of the majority of the Units allows the incorporation of a wide range of the technical skills currently in demand.

The award has been designed so that it can be geared towards the technical skills required to undertake a number of professional vendor qualifications. For example, if Java is adopted as the main development language, the core Units of the award encompass the skill sets in Oracle's Java SE 7 Programmer 1certification. The vendor options in the award currently include Units that could be used towards both the MCSD: Windows Store Apps and MCSD: Web Applications certification.

Despite the increased demands from both learners and employers for the skill sets encompassed in the HND *Computing: Software Development*, there has been a decline in the number of centres offering the award. The design of the new award has tried to address some of the underlying causes by updating the focus of the award, embracing new technologies and by incorporating appropriate SCQF level 7 feeder Units within the new validated HNC *Computing*.

1.3 Title of Group Award

The title of the Group Award is HND *Computing: Software Development*, one of five related but distinct HN *Computing* awards in the proposed new HN *Computing* framework.

In the SQA online survey carried out in 2010 (detailed in 'Evidence to Support the Validation of HND *Computing: Software Development'*) 96% of respondents agreed with the title of the award. The reasons for the appropriateness of the award are listed below:

- It provides continuity with the existing award of the same title.
- It accurately describes the essential content of the award.
- It distinguishes the award from the other related HN Computing awards.
- Surveys have shown that the title of the award is popular with stakeholders.
- It provides prospective learners with accurate information about prospective job roles and employment opportunities which may be provided by achieving the award.

1.4 Target Client Groups

This HND *Computing: Software Development* award is suitable for a range of learners including:

- School leavers or apprentices who wish to embark on a course which will lead to either higher education or IT industry employment.
- Employed or unemployed adults with appropriate NQGAs (NCs) or vocational skills wishing to train for a career as a software professional.
- Learners completing the HNC Computing award vocational qualification with a view to progressing to university or employment as a software professional.

1.5 Employment Opportunities

Traditionally many of the employment opportunities for learners undertaking this award have required graduate entry. However there are an increasing number of areas where successful learners could find direct employment. For example many small businesses are looking for developers with the skill sets to customize common business applications, develop and support e-commerce sites and develop and support mobile apps. Many are now directly targeting HND students as potential employees to fill these posts.

Technology Insights 2012 (e-skills UK) highlighted the predicted difficulties in filling positions for programmers and Software Development professionals. This has already manifested itself in the uptake of Modern Apprenticeships within the sector. The core Units within HND *Computing: Software Development* are already being used to provide specific training in both object oriented programming and design and in database design and development. The generic nature of the updated Units allows centers to gear the skill development to the particular training requirements of employees.

The award continues to support the indirect route to employment via articulation into HE programs as detailed in the next section.

1.6 Articulation into HE programs

The HND *Computing: Software Development* has been designed to update the previous award to reflect current software development methodologies, tackle known issues with the previous award and to ensure that the award still has the potential to articulate to a wide range of degree programmes.

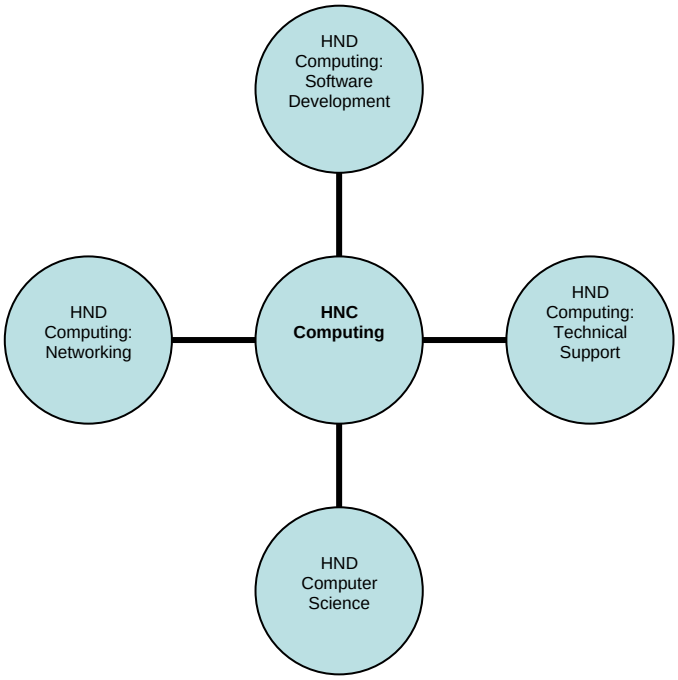
The award now adopts the object oriented paradigm as its key focus reflecting current and anticipated demands from both degree programmes and employment opportunities.

The new framework has incorporated a number of new SCQF level 7 Units to address the known issues with learning programming. Learners can now spend time learning the basics of this fundamental skill prior to undertaking the mandatory Object Oriented SCQF level 8 Units. The *Developing Small Scale Standalone Applications* (H17W 34) Unit has been specifically designed as a feeder Unit for the mandatory SCQF level 8 Units in the hope that this will help learners develop and consolidate the fundamental skills required to undertake these Units. This should help to improve the overall achievement rate for the award.

The knowledge and skills covered in the mandatory SCQF level 8 Units map into knowledge and skills taught within the first two years of all computer science related degree programmes in Scotland. The range of optional HND *Computing: Software Development* Units should allow centers to forge articulation routes to the 2nd and/or 3rd year of a wide range of degrees offered by Scottish universities. Some possible articulation routes are outlined in Section 6.2.1.

1.7 Relationship with other awards

This award is part of a suite of new or revised HNDs awards, as explained in Section 1.1. The relationship between the awards is illustrated in the diagram below.



The HNC award is embedded within all of the HNDs, and (largely) constitutes the first year of each programme. Each HND offers a particular specialism that reflects recognized vocational or academic progression paths (see Sections 1.5, 1.6 and 6.2 for further information on vocational or academic progression). The awards have similar structures and equivalent demands (in terms of practical or cognitive competencies) but each seeks to provide different skills sets and underpinning knowledge.

2 Qualification structure

This Group Award is made up of 30 SQA Unit credits. It comprises of 240 SCQF credit points of which 64 are at SCQF level 8 in the mandatory section including a HNC *Computing* Graded Unit 1 of 8 SCQF credit points at SCQF level 7 and a HND *Computing: Software Development* Graded Unit 2 of 16 SCQF credit points at SCQF level 8. A mapping of Core Skills development opportunities is available in Section 5.3.

2.1 Structure

In order to achieve the HND *Computing: Software Development* Group Award the candidate must achieve 14 mandatory credits and 16 optional credits from Groups 1, 2 and 3.

Please note if choosing Units from Group 2 only a maximum of 9 credits can be taken. If choosing from Group 3 only a maximum of 7 credits can be taken.

The mandatory section of this Group Award incorporates 64 SCQF credit points at SCQF level 8 which satisfies the design principles.

Mandatory Units — Total of 14 credits

Candidates must pass all of the following Units.

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Developing Software: Introduction	H173 34	8	7	1
Professionalism and Ethics in Computing	H1F7 34	8	7	1
Computer Systems Fundamentals	H175 34	8	7	1
Troubleshooting Computer Problems	H177 34	8	7	1
Team Working in Computing	H178 34	8	7	1
Computing: Graded Unit 1 (Exam)	H1J8 34	8	7	1
Software Development: Object Oriented Programming	H171 35	16	8	2
Systems Development: Object Oriented Analysis and Design	H172 35	16	8	2
Software Development: Data Structures	H16Y 35	16	8	2
Computing: Software Development: Graded Unit 2 (Project)	H48W 35	16	8	2

Optional Units — Total of 16 credits

Learners must select at least 16 credits selected from one or more of the following groups of optional Units.

Group 1: Specialist options (up to 16 credits)
Group 2: General options (up to 9 credits)
Group 3: Vendor Units (up to 7 credits)

These rules of combination ensure that the aims and objectives of the award are achieved, irrespective of the route through the award. For example, by limiting the general options to 9 credits, all candidates are required to complete at least 21 credits directly related to the subject area.

Group 1 specialist options should be seen as the non-mandatory credits which are fundamental to giving the Group Award its distinctive emphasis on software development. Group 2 general options give centres a degree of flexibility in course design, eg options to include mathematics, networking and hardware. Group 3 Units are dedicated vendor qualifications. See the following section for further information on vendor provision.

Note that a local option is included in Group 2 (general options). Up to four credits can be selected from any area, subject to the design rules and rules of combination defined above. This is consistent with the current awards and reflects the preferences of centres so that they can customize the awards to their local circumstances.

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Group 1 — Specialist Options (Up to 16 credits)				
Artificial Intelligence for Computer Games	HH3D 35	16	8	2
Database Design Fundamentals	DV6E 34	8	7	1
Databases: Introduction	H17H 34	8	7	1
Developing Mobile Web Based Applications: An Introduction	HF4Y34*	16	7	2
Human Computer Interaction	H17L 34	8	7	1
Relational Database Management Systems	H16W 35	16	8	2
Scripting for Interactivity	DE32 35	8	8	2
Self-Describing Data (XML)	FM97 35	8	8	1
Software Development: Applications Development	D76N 34	16	7	2
Software Development: Developing Small Scale Standalone Applications	H17W 34	16	7	2
Software Development: Developing Websites for Multiplatform Use	H1J9 35	16	8	2
Software Development: Programming Foundations	H17X 34	8	7	1
Software Development: Programming in PL/SQL	F4TJ 35	16	8	2
Software Development: Rapid Applications Development and Prototyping	DM3F 35	16	8	2
Software Development: Systems Foundations	H17Y 34	16	7	2
SQL: Introduction	DH3J 34	8	7	1
Systems Development: Introduction	H180 34	8	7	1
Systems Development: Testing Software	H181 34	8	7	1
Systems Development: User Centred Design	H182 34	8	7	1
Team Development	H3LM 35	8	8	1
User Interface Design	HF55 34*	8	7	1
Web Development: Dynamically Generated Content	HF57 35*	16	8	2
Web Development: Producing a Data Driven Website	HF56 35*	8	8	1
Web Development Fundamentals	F203 34	8	7	1
Web Development: Essential Content	HF58 34*	8	7	1
Routing Technology*	FR22 35	16	8	2

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Networking Technology*	FR24 35	16	8	2
Professional Career Development in the IT Industry	HG1K 34	8	7	1
Data Security	J0H9 34*	8	7	1
Data Flow	J27L 34*	8	7	1
Unit title	**Code**	**SCQF credit points**	**SCQF level**	**SQA credit value**
Group 2 — General Options (Up to 9 credits)				
Building an e-Business	F6JJ 34	8	7	1
Client Operating Systems	H1EM 34	16	7	2
Cloud Computing	H179 34	8	7	1
Computer Forensics Fundamentals	H1EN 34	8	7	1
Computer Hardware: Hardware Installation and Maintenance	H1FY 34	16	7	2
Computer Networking: Fundamentals	H17A 34	8	7	1
Computer Networking: Practical	H17B 34	8	7	1
Computer Networks: Building Local Area Networks	H17C 34	16	7	2
Computing: Introduction to Project Management	H17D 34	8	7	1
Computing: PC Hardware and Operating System Essentials	H17E 34	8	7	1
Computing: PC Hardware and Operating System Support	H17F 34	8	7	1
Configuring a Desktop Operating System	FK89 34	16	7	2
Convergence Technologies	H17G 35	16	8	2
Digital Culture: Online Collaboration	F86V 35	8	8	1
Digital Culture: Online Communications	F86P 34	8	7	1
Digital Culture: Web 2.0 Applications	F86T 33	8	6	1
E-Commerce: Publishing Web Sites	DV6G 34	16	7	2
Entrepreneurship in the Creative Industries	DR0T 35	8	8	1
Ethical Hacking Fundamentals	H1EP 34	8	7	1
*Preparing to Start a Business	H7V4 34	8	7	1
Handling Information as a Resource	H17K 34	8	7	1
Intrusion Prevention Systems	H17M 34	8	7	1
Information Technology: Information Systems and Services	H1G0 34	8	7	1
Mail Server Management	H17N 34	8	7	1
Mathematics for Computing	A5P0 35	8	8	1
Mathematics for Computing 1	D76E 34	8	7	1
Mathematics for Computing 2	D76F 35	8	8	1
Mathematics for Interactive Computing: Essential Techniques	F20B 34	8	8	1
Mathematics: Calculus and Matrices for Computing	DP8F 34	8	7	1

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Managing a Web Server	H17P 34	8	7	1
Mobile Technology	H17R 35	8	8	1
Multi User Operating Systems	DH3A 34	8	7	1
Multimedia: Developing Multimedia Applications	DH2R 34	16	7	2
Network Concepts	H17S 34	16	7	2
Personal Development Planning	DE3R 34	8	7	1
Project Management for IT	F1W0 34	8	7	1
Providing Support to Users	H17T 34	8	7	1
Network Security Concepts	HT9G 34*	16	7	2
Technical Support: Supporting Users – Hardware	H183 34	8	7	1
Technical Support: Supporting Users - Software	H184 34	8	7	1
Troubleshooting a Desktop Operating System	FK8A 34	16	7	2
Work Role Effectiveness	DG6E 34	24	7	3
Work Role Effectiveness	DG6G 35	24	8	3
Working in IT	H185 35	16	8	2
Workplace Communication in English	H8T2 33*	8	6	1
Bring Your Device (BYOD): Introduction	H6D0 34*	8	7	1
Using Software Applications Packages*	D85F 34	8	7	1
Information Technology: Applications Software 1*	D75X 34	8	7	1
Computing: Planning*	DH35 34	8	7	1
Digital Skills	H9DE 34*	8	7	1
Data Science	H8W9 35*	16	8	2
Group 3 — 'Vendor' Options (Up to 7 credits)				
Technical Specialist: Web Applications Development with Microsoft.NET Framework 4	H1HP 35	30	8	3.5
Technical Specialist: Windows 7: Configuring	H1HR 35	24	8	3
Technical Specialist: Windows Communication Foundation Development with Microsoft.NET Framework 4	H1HS 36	9	9	1
Technical Specialist: Windows Applications Development with Microsoft.NET Framework 4	H1HT 36	15	9	1.5
Technical Specialist: Accessing Data with Microsoft.NET Framework 4	H1HV 35	15	8	1.5
Technical Specialist: Microsoft SharePoint 2010, Application Development	H1HW 36	15	9	1.5

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Database Design and Programming in SQL	H4KJ 34*	15	7	1.5
Database Programming with PL/SQL	H4KP 35*	15	8	1.5
Group 4 — Local Option (Up to 4 credits permitted)				

*Refer to History of Changes for revision changes.
The SCQF level Descriptors have five characteristics which provide a reference point for determining the level of a qualification, learning programme, module or Unit of learning or for the recognition of prior learning. They are not intended to give precise or comprehensive statements of required learning for individual qualifications.

Each level is described in terms of its characteristic general Outcomes under five broad headings. These are:

- Knowledge and understanding — mainly subject-based
- Practice (applied knowledge and understanding)
- Generic cognitive skills — eg evaluation, critical analysis
- Communication, numeracy and IT skills
- Autonomy, accountability and working with others

There are a range of SCQF level 7 Units that have been designed as feeder Units for the HND *Computing: Software Development*. These will help learners develop the underlying programming and development skills required for the mandatory SCQF level 8 Units. These Units include:

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Developing Software: Introduction	H173 34	8	7	1
Software Development: Developing Small Scale Standalone Applications	H17W 34	16	7	2
Software Development: Programming Foundations	H17X 34	8	7	1
Software Development: Systems Foundations	H17Y 34	16	7	2
Systems Development: Introduction	H180 34	8	7	1
Systems Development: Testing Software	H181 34	8	7	1
Systems Development: User Centred Design	H182 34	8	7	1

All of the mandatory SCQF level 8 Units encompass a wide range of the knowledge and understanding characteristics required for a SCQF level 8 qualification. Learners will also apply this knowledge and understanding in designing and implementing software solutions to given problems. The project allows the learners to manage resources in undertaking the project and then critically evaluate both their own effectiveness in undertaking an autonomous development as well as the software solution produced. Learners will need to use a range of standard and specialised applications throughout their studies. This will include using some advanced and specialised skills associated with software development. The Software Development: Data Structures mandatory Unit also allows them to use and evaluate numerical and graphical data to understand and trace searching and sorting algorithms. The Team Development optional Unit can be used to develop working with others skills such as taking continuing account of own and others' roles, responsibilities and contributions in carrying out and evaluating tasks.

2.2 Inclusion of vendor qualifications within HND Computing: Software Development

SQA has agreed to participate in a pilot project to evaluate the feasibility of directly accrediting vendor qualifications within this award. This pilot has the approval of SQA's Qualification Committee, chaired by the Director for Qualifications.

Previously, vendor qualifications were accredited through credit transfer, whereby shadow Units were created, based on vendor curricula, and candidates were awarded these [SQA] Units on the basis of their vendor achievements. However, this system placed the onus on SQA to revise these shadow Units whenever vendors changed their certifications.

The pilot programme places the responsibility for recognition on to the vendors. Vendors are required to credit and level their qualifications using SCQF, and then propose these awards for inclusion in this framework. Their inclusion, or otherwise, will be decided by the appropriate Qualifications Support Team.[1] Figure 2 illustrates the process of vendor accreditation.

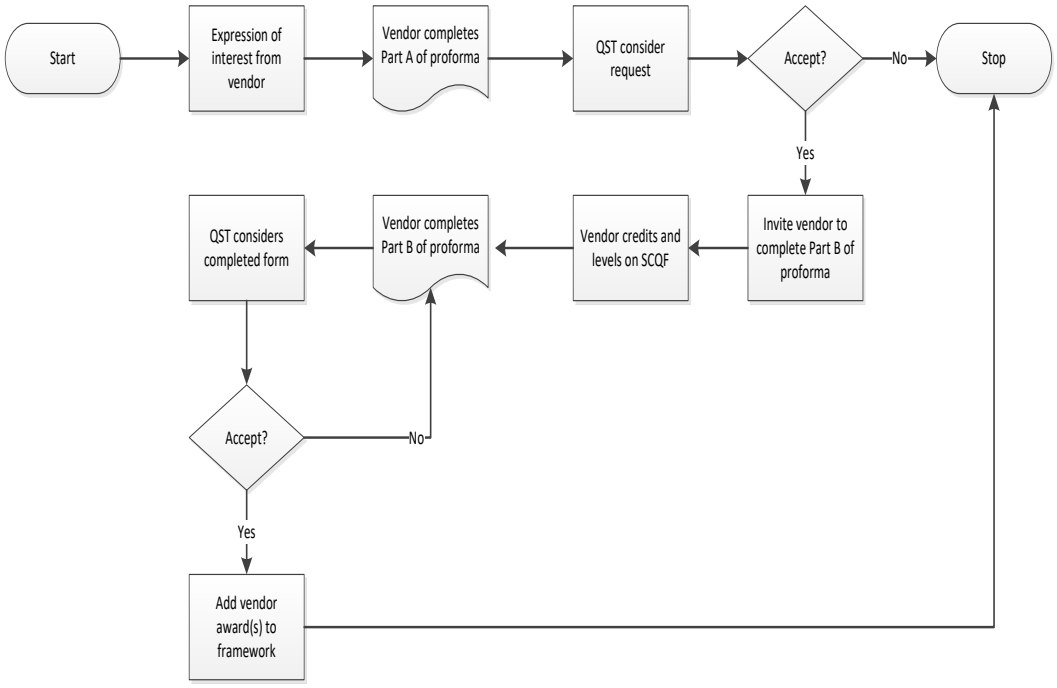


Figure 1: Vendor accreditation process

The Qualifications Committee imposed a cap on the contribution of vendor awards to national qualifications. The cap is 25% (7 credits for an HND). This limit applies to all vocational qualifications with direct recognition of third party awards, based on SCQF. This rule will be reviewed when the pilot is evaluated.

It is the responsibility of each vendor to accredit their awards on SCQF. This may be done by any one of the SCQF-accreditation bodies in Scotland.

[1] During the development phase, the QDT will decide on the inclusion of specific vendor qualifications. This task will be taken over by the QST once the award is operationalised.

Grouping 3 within the qualification structure shows the accredited vendor qualifications at the time of writing this document. It is anticipated that more vendor awards will be added as and when they are accredited through this process. When a specific vendor award is accredited but found to be similar to an existing (generic) HN Unit, these Units (the vendor Unit and the HN Unit) will be grouped into an excluded combination to ensure that candidates cannot double count their knowledge or skills.

All decisions regarding the accreditation of vendor Units (for inclusion in this framework) and excluded combinations will be made by the Qualifications Support Team for HN awards.

This pilot programme will be evaluated in summer 2013, when final decisions will be made regarding its continuation.

3 Aims of the qualification

The principal aim is to prepare candidates for employment in the field of Software Development. This qualification has been designed to update the current HND *Computing: Software Development* (G7TT 16) and provide a distinctive route within the suite of HN Computing awards. The award now adopts the object oriented paradigm as its key focus reflecting current and anticipated demands from both degree programmes and employment opportunities.

3.1 General aims of the qualification

The general aims of this award are:

1 To develop candidates' knowledge and skills in planning, developing and evaluating.
2 To develop employment skills and enhance candidates' employment prospects, particularly relating to the IT industry.
3 To enable progression within the Scottish Credit and Qualifications Framework
4 To develop study and research skills.
5 To develop transferable skills including Core Skills.
6 To provide academic stimulus and challenge, and foster an enjoyment of the subject.
7 To support learners' continuing professional development.

3.2 Specific aims of the qualification

The specific aims of this award are:

8 To prepare students for employment in an IT/Computing-related post at technician or professional level in a software development role.
9 To develop a range of specialist technical software development skills and knowledge in programming and systems development.
10 To prepare students for progression to further study in Computing, Software Development, Software Engineering or a related discipline.
11 To develop an awareness of professional IT issues such as legal and ethical considerations.

3.3 Graded Unit

The QDT selected an examination as the SCQF level 7 Graded Unit for the HNC Computing combined with a project as the SCQF level 8 Graded Unit for each of the HND Computing awards. This option was chosen for several reasons, including:

- Continuity: HND frameworks have used a project since the inception of Graded Units in 2003.
- QDT preference: The QDT supported the use of project for the HND awards.
- Stakeholder support: Heads of Computing supported the use of a project for the HND awards.
- HE articulation: a project facilitates progression to degree courses as it supports both scholarly activities and independent learning. It was also supported by HE in our consultations. The examination used for the HNC Computing helps to prepare candidates for a style of assessment commonly used in degree programmes.
- Employer preference: employers expressed a preference for a project as it allows the learner to gain familiarity with scenarios simulating real-life experiences.

The Graded Units for this award are designed to provide evidence that the candidate has achieved the following aims of HND *Computing: Software Development:*

- To develop candidates' knowledge and skills in planning, developing and evaluating.
- To develop study and research skills.
- To develop transferable skills including Core Skills.
- To provide academic stimulus and challenge, and foster an enjoyment of the subject.
- To prepare students for employment in an IT/Computing-related post at technician or professional level in a software development role.
- To develop a range of specialist technical software development skills and knowledge in programming and systems development.
- To prepare students for progression to further study in Computing, Software Development, Software Engineering or a related discipline.
- To develop an awareness of professional IT issues such as legal and ethical considerations.

4 Recommended entry to the qualification

Entry to this qualification is at the discretion of the centre. The following information on prior knowledge, skills, experience or qualifications that provide suitable preparation for this qualification has been provided by the Qualification Design Team as guidance only.

Learners would benefit from having attained the skills, knowledge and understanding required by one or more of the following qualifications and/or experience.

- Passes in two relevant National Courses at SCQF level 6 (Higher) together with three relevant subjects at National 5.
- A related National Certificate at SCQF level 6.
- A relevant combination of vocational awards at appropriate levels.
- A mix of the above.

For example, a school leaver may be expected to possess two Higher level passes, (such as Computer Science and English) together with three passes at National 5 (such as Mathematics, Business Administration and History).

A college entrant would be expected to have completed a relevant National Certificate programme such as *Digital Media Computing* at SCQF level 6 or *Computer Games Development* at SCQF level 6. A combination of level 6 and Level 5 National Units would also be appropriate. For example, a college entrant may possess a National Certificate in *Mobile Technology* at SCQF level 5 together with individual Unit passes at SCQF level 6.

Given the range of vocational awards available to learners, applicants who possess a range of smaller vocational qualifications should also be considered. For example, possession of relevant National Progression Awards (such as PC Passport and *Computer Games Development* at SCQF level 6) may be considered appropriate for entry to this award.

Applicants with a mixture of the above should also be considered for entry. For example, a candidate who possessed a pass in Computing Science at SCQF level 6 (Higher) together with one or more relevant NPA awards at SCQF levels 5 or 6 would, most likely, have the necessary knowledge and skills to benefit from undertaking this award.

Equivalent qualifications from other awarding bodies may also be acceptable as would suitable vendor certifications.

Mature candidates with suitable work experience should also be considered subject to the Core Skill entry profile detailed in Section 4.1.

Entry onto the second year of this award is at the discretion of the centre. For direct entry into Year 2 of the HND *Computing: Software Development* award candidates should have successfully passed the revised HNC *Computing* award (GF3E 15) or qualify for credit transfer using the recognised SQA quality procedures to ensure that the learner is credited with the appropriate SCQF Units. As the HNC *Computing* is a 12 credit award it is recommended that candidates top up their qualifications with an additional relevant 3 SQA credits prior to articulating to the second year of the award. It is highly recommended that candidates have demonstrated practical skills in developing simple applications. This could be demonstrated by successful completion of the 2 credit level 7 feeder Unit *Software Development: Developing Small Scale Standalone Applications* (H17W 34).

4.1 Core Skills entry and exit profile

The Core Skill entry profile provides a summary of the associated assessment activities that exemplify why a particular level has been recommended for this qualification. The information should be used to identify if additional learning support needs to be put in place for learners whose Core Skills profile is below the recommended entry level or whether learners should be encouraged to do an alternative level or learning programme.

Core Skill	Recommended SCQF entry level	Associated assessment activities	SCQF exit level
Communication	Intermediate 2 (SCQF 5)	The Core Skill of 'Communications' at SCQF level 6 can be developed comfortably and naturally within the mandatory Units Team Working in Computing and Professionalism and Ethics in Computing but have been signposted rather than embedded.	Higher (SCQF 6)
Numeracy	Intermediate 2 (SCQF 5)	The Qualification Design Team have embedded the Core Skill of 'Numeracy' at SCQF level 5 within the mandatory Unit Computer Systems Fundamentals. A selection of 'Mathematics' Units which have Numeracy embedded at SCQF level 6 are also included in the framework as optional Units for centres wishing to offer a higher Core Skill exit level (refer to end of section 4.1 for more information).	Intermediate 2 (SCQF 5)
Information and Communication Technology (ICT)	Intermediate 2 (SCQF 5)	The Core Skill of 'ICT' at SCQF level 6 is embedded in the mandatory Unit Team Working in Computing.	Higher (SCQF 6)
Problem Solving	Intermediate 2 (SCQF 5)	The Core Skill component of 'Critical Thinking' which is part of the Problem Solving Core Skill is embedded within the mandatory Unit of Developing Software: Introduction. The Core Skill of 'Problem Solving' at SCQF level 6 is embedded in the mandatory Unit Troubleshooting Computing Problems.	Higher (SCQF 6)
Working with Others	Intermediate 2 (SCQF 5)	The Core Skill of 'Working with Others' at SCQF level 6 is embedded in the mandatory Unit Team Working in Computing.	Higher (SCQF 6)

Core Skills can be embedded or signposted within Units**.** Embedded are where the development of a Core Skill is incorporated into the Unit and where the Unit assessment also covers the requirements of Core Skill assessment at a particular level. Units that have embedded Core Skill(s) will be automatically certificated upon successful completion of the Unit assessments.

Signposted means identifying opportunities within the Unit for developing Core Skills other than those that can be summatively assessed and certificated. This allows the development of the Core Skills through teaching and learning to be utilised and these opportunities are highlighted within the Unit support notes to those delivering and managing the Units.

Additional opportunities to attain the Core Skill of Numeracy at a higher SCQF level exist in the following Units:

DP8F 34 *Mathematics: Calculus and Matrices for Computing* (embedded — SCQF level 6)
D76E 34 *Mathematics for Computing 1* (Using Number embedded — SCQF level 6, Using Graphical Information embedded — SCQF level 5)
F20B 34 *Mathematics for Interactive Computing: Essential Techniques* (signposted — SCQF level 6)

4.2 Relationship with Curriculum for Excellence

The award was developed during the *Curriculum for Excellence (CfE)* programme, which is on-going at the time of writing. The development was able to encompass the principles of CfE, particularly the principles relating to breadth, progression, choice and relevance.

The award naturally encompasses the technology curriculum responsibilities and some of the language, mathematics and science curriculum responsibilities outlined in the CfE factfile. The underlying development of programming skills also helps to develop an understanding of the syntax and semantics of languages. The development of problem solving skills alongside the programming skills also helps to tackle some of the issues raised in the STEM initiative.

The award also meets some of the major aims of CfE for responsibilities across all practitioners as detailed below:

- To develop health and well being — specifically social well being in the team working activities and in the study of computer ethics.
- To develop literacy skills (listening and talking, reading and writing) — the development of academic study skills and Core Skills are embodied in the general aims of the award.
- To develop numeracy across learning — The award embeds the level 5 Numeracy Core Skill and encourages the uptake of a range of Mathematics Units which would allow learners to obtain the level 6 Numeracy Core Skill.

A member of the QDT was given special responsibility for ensuring the QDT's work was compatible with CfE. The SQA manager with special responsibility for the new Computing Science arrangements was consulted throughout this development.

5 Additional benefits of the qualification in meeting employer needs

This qualification was designed to meet a specific purpose and what follows are details on how that purpose has been met through mapping of the Units to the aims of the qualification. Through meeting the aims, additional value has been achieved by linking the Unit standards with those defined in National Occupational Standards and/or trade/professional body requirements. In addition, significant opportunities exist for learners to develop the more generic skills, known as Core Skills through doing this qualification.

5.1 Mapping of qualification aims to Units

To ensure that the aims of the national qualification are met, the QDT have ensured that all specific aims are covered by the core Units defined in the award. Optional Units will however play pivotal roles in the extending the learner's depth of understanding with reference to specific aims.

1 To develop candidates' knowledge and skills in planning, developing and evaluating.
2 To develop employment skills and enhance candidates' employment prospects, particularly relating to the IT industry.
3 To enable progression within the Scottish Credit and Qualifications Framework.
4 To develop study and research skills.
5 To develop transferable skills including Core Skills.
6 To provide academic stimulus and challenge, and foster an enjoyment of the subject.
7 To support learners' continuing professional development.
8 To prepare students for employment in an IT/Computing-related post at technician or professional level in a software development role.
9 To develop a range of specialist technical software development skills and knowledge in programming and systems development.
10 To prepare students for progression to further study in Computing, Software Development, Software Engineering or a related discipline.
11 To develop an awareness of professional IT issues such as legal and ethical considerations.

Unit title and code	**Aims**										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Developing Software: Introduction (H173 34)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Professionalism and Ethics in Computing (H1F7 34)	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Computer Systems Fundamentals (H175 34)	✓	✓	✓	✓	✓	✓	✓	✓		✓	
Troubleshooting Computer Problems (H177 34)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Team Working in Computing (H178 34)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Computing: Graded Unit 1: Exam (H1J8 34)		✓	✓	✓	✓	✓	✓	✓	✓	✓	
Software Development: Object Oriented Programming (H171 35)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Systems Development: Object Oriented Analysis and Design (H172 35)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Software Development: Data Structures (H16Y 35)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Computing: Software Development: Graded Unit 2: Project (H48W 35)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

5.2 Mapping of National Occupational Standards (NOS) and/or trade body standards

IT and Telecoms Professional National Occupational Standards (NOS) have been developed in parallel with and as part of the IT Professional Competency Model — e-skills Procom. E-skills Procom is being established as the industry recognised, internationally relevant training framework for organising courses and qualifications. It defines knowledge, understanding, and competencies for seven broad disciplines. The disciplines are:

1 Sales and marketing
2 Business change
3 Programme and project management
4 Solutions architecture
5 Solution development and implementation
6 Information management and security
7 IT service management and delivery

The content of disciplines 1–3, while important to the IT&T sectors, do not fall within the scope of e-skills UK for NOS. Consequently these will not formally be recognised as NOS as is the case for disciplines 4–7. To maintain the relationship these NOS have been numbered to reflect the relationship to e-skills Procom. Within each discipline there exist a number of sub-disciplines. Within each sub-discipline the competences relating to a particular role have been defined.

This is an example of a structure and as there are many more optional Units available then this is not an exhaustive list.

4.1 Systems Architecture
4.2 Data Analysis
4.3 Human Needs Analysis
4.4 Systems Analysis
4.5 Data Design
4.6 Human Computer Interaction/ Interface design
4.7 Systems Design
4.8 IT/Technology Infrastructure Design and Planning

5.1 Systems Development
5.2 Software Development
5.3 IT/Technology Solution testing
5.4 Systems Integration
5.5 IT/Technology systems installation, implementation and handover
6.1 Information management
6.2 IT Security management
6.3 IT Disaster Recovery

Unit title and code	National Occupational Standards															
	4.1	**4.2**	**4.3**	**4.4**	**4.5**	**4.6**	**4.7**	**4.8**	**5.1**	**5.2**	**5.3**	**5.4**	**5.5**	**6.1**	**6.2**	**6.3**
Developing Software: Introduction (H173 34)		✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	
Professionalism and Ethics in Computing (H1F7 34)														✓	✓	
Computer Systems Fundamentals (H175 34)	✓					✓			✓		✓		✓			
Troubleshooting Computer Problems (H177 34)	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Team Working in Computing (H178 34)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Computing: Graded Unit 1 (H1J8 34)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Software Development: Object Oriented Programming (H171 35)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					
Systems Development: Object Oriented Analysis and Design (H172 35)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Software Development: Data Structures (H16Y 35)		✓			✓		✓		✓	✓	✓					
Computing: Software Development: Graded Unit 2: Project (H48W 35)		✓	✓	✓	✓	✓	✓		✓	✓	✓			✓		

5.3 Mapping of Core Skills development opportunities across the qualification

Unit code	Unit title	Communication		Numeracy		Information Communication Technology (ICT)		Problem Solving			Working with Others	
		Written	Oral	Using Number	Using Graphical Information	Accessing Information	Providing/ Creating information	Critical Thinking	Planning and Organising	Reviewing and Evaluating	Working Co-operatively with Others	Reviewing Co-operative Contribution
H173 34	Developing Software: Introduction							Embedded (SCQF 6)				
H178 34	Team Working in Computing	Signposted (SCQF 6)	Signposted (SCQF 6)			Embedded (SCQF 6)	Embedded (SCQF 6)				Embedded (SCQF 6)	Embedded (SCQF 6)
H177 34	Troubleshooting Computing Problems							Embedded (SCQF 6)	Embedded (SCQF 6)	Embedded (SCQF 6)		
H175 34	Computer Systems Fundamentals			Embedded (SCQF 5)	Embedded (SCQF 5)							
H1F7 34	Professionalism and Ethics in Computing	Signposted (SCQF 6)	Signposted (SCQF 6)			Signposted (SCQF 6)	Signposted (SCQF 6)					
H171 35	Software Development: Object Oriented Programming							Signposted (SCQF 6)	Signposted (SCQF 6)	Signposted (SCQF 6)		
H172 35	Systems Development: Object Oriented Analysis and Design							Signposted (SCQF 6)	Signposted (SCQF 6)	Signposted (SCQF 6)		
H16Y 35	Software Development: Data Structures							Signposted (SCQF 6)	Signposted (SCQF 6)	Signposted (SCQF 6)		
H48W 35	HND Computing: Software Development: Graded Unit 2 (Project)							Embedded (SCQF 6)	Embedded (SCQF 6)	Embedded (SCQF 6)		

5.4 Assessment strategy for the qualification

The Units listed below are the mandatory Units which when added to the mandatory HNC *Computing* Units form the 14 mandatory credits for the HND *Computing: Software Development* award.

<table>
<tr><th rowspan="2">Unit</th><th colspan="4">Assessment</th></tr>
<tr><th>Outcome 1</th><th>Outcome 2</th><th>Outcome 3</th><th>Outcome 4</th></tr>
<tr><td>Software Development: Developing Small Scale Standalone Applications (H17W 34)</td><td>30 Question closed-book Multiple-Choice test</td><td colspan="3">Open-book assessment with candidates providing evidence to demonstrate their Knowledge and Skills by showing that they can develop test and deploy a sufficiently complex small scale standalone application</td></tr>
<tr><td>Software Development: Object Oriented Programming (H171 35)</td><td colspan="3">Open-book assessment where candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can investigate object oriented programming techniques and apply them appropriately to implement and test a given Object Oriented Design.</td><td></td></tr>
<tr><td rowspan="2">Systems Development: Object Oriented Analysis and Design (H172 35)</td><td colspan="3">Closed-book Assessment
Candidates will need to provide evidence to demonstrate their knowledge by showing that they can identify and critically analyse object oriented concepts, models, techniques and life cycle stages of object oriented design.</td><td rowspan="2"></td></tr>
<tr><td colspan="3">Open-book Assessment
Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can analyse a given problem and produce a static and dynamic model for the scenario.</td></tr>
<tr><td rowspan="2">Software Development: Data Structures (H16Y 35)</td><td rowspan="2">Closed-book knowledge based assessment such as an objective test</td><td>Supervised open-book algorithm tracing exercises</td><td></td><td></td></tr>
<tr><td colspan="3">Open-book assessment that may well consist of a series of implementation completion exercises conducted during the delivery of the Unit. Candidates should be given the designs and partial classes to allow them to concentrate on implementing the associations and corresponding methods.</td></tr>
<tr><td>HND Computing: Software Development: Graded Unit 2: Project (H48W 35)</td><td colspan="3">All Outcomes: Practical Assignment. The candidate will be required to provide documentation which supports evidence of the candidate’s ability to plan, develop, implement and evaluate technical skills gained throughout their course.
The project is a complex task which consists of three stages: planning; developing; and evaluating</td><td></td></tr>
</table>

6 Guidance on approaches to delivery and assessment

During the past decade all degree programmes, related to software development, offered in Scotland have incorporated the object oriented paradigm as the prime objective within the first two years of study. This reflects the importance of this paradigm to modern software development. Integrated development environments offered by both vendors and open source organisations continue to use this paradigm as the fundamental technology in developing software applications and middleware libraries. This update to the HND *Computing: Software Development* Group Award has tried to reflect this in the belief that this will continue to be the case over the next decade.

There is a wealth of evidence that many learners find learning programming difficult. This update has tried to tackle this issue by providing a range of SCQF level 7 Units that are designed to help build learners' skills in this fundamental software development skill. The SCQF level 7 feeder Unit *Software Development: Developing Small Scale Standalone Applications* has been specifically designed to allow learners to see how using object libraries can allow them to build interactive applications quickly and efficiently. The Unit also allows them to learn about and 'hopefully' understand a range of fundamental programming concepts including the primary constructs (sequence, selection and repetition) and modularity (functions and procedures). In addition the Unit introduces the learner to user centred design principles.

All of the recent e-skills UK reports clearly indicate that there is a highly significant demand for the skill sets incorporated into this award. This increase in focus on software development has been recognised by a variety of government pushed educational initiatives including STEM and Curriculum for Excellence. A number of Units within this new framework have tried to incorporate some entrepreneurial avenues in the hope that this might provide the impetus for successful candidates to set up or find direct employment in small businesses. The update also tries to ensure that the more traditional route to employment via degree programmes is available for successful candidates.

6.1 Sequencing/integration of Units

Providing the mandatory Units of the award are covered, centres are free to devise their own sequence for delivery of Units. It is recommended however that SCQF level 7 Units are concentrated in Year 1 with SCQF level 8 Units concentrated in Year 2.

Where possible, learners should complete a SCQF level 7 feeder Unit before undertaking associated SCQF level 8 Unit(s). For Example;

The level 7 feeder Unit *Software Development: Developing Small Standalone Applications* should be undertaken before tackling the mandatory Units *Software Development: Object Oriented Programming* (H171 35) and *Systems Development: Object Oriented Analysis and Design* (H172 35)

Given the fundamental importance of databases, mobile technology and web based technology in our everyday lives, it would make sense to try to ensure that learners are exposed to all of these technologies. The framework includes a wide range of Units that can allow centres to introduce learners to developing for and using each of these technologies.

It is recommended that where possible assessments should be integrated to reduce the assessment load.

In selecting combinations of optional Units centres are also likely to consider issues such as:

- Articulation arrangements with universities
- Needs of employers
- Resources available to the centre

An example course schedule plan is suggested below, based upon a two year course with each year comprising of three blocks. Note that centres are free to devise their own alternative course plans:

Year 1

Block 1	Block 2	Block 3
Developing Software: Introduction (H173 34) 1 credit level 7	Professionalism and Ethics in Computing (H1F7 34) 1 credit level 7	HNC Computing: Graded Unit 1: Exam (H1J8 34) 1 credit level 7
Computer Systems Fundamentals (H175 34) 1 credit level 7	Troubleshooting Computer Problems (H177 34) 1 credit level 7	Team Working in Computing (H178 34) 1 credit level 7
Systems Development: User Centred Design (H182 34) 1 credit level 7	Software Development: Developing Small Standalone Applications (H17W 34) 2 credits level 7	
Databases: Introduction (H17H 34) 1 credit level 7	Systems Development: Testing Software (H181 34) 1 credit level 7	Mathematics for Computing 1 (D76E 34) 1 credit level 7
Web Development Fundamentals (F203 34) 1 credit level 7	Developing Mobile Web Based Applications: An Introduction (H17J 34) 2 credits level 7	

Year 2

Block 1	Block 2	Block 3
Software Development: Object Oriented Programming (H171 35) 2 credits level 8		Mathematics for Computing 2 (D76F 35)1 credit level 8
Systems Development: Object Oriented Analysis and Design (H172 35) 2 credits level 8		Self-Describing Data (XML) FM97 35 1 credit level 8
Software Development: Data Structures (H16Y 35) 2 credits level 8		Web Development: Producing a Data Driven Website (F6C4 35) 1 credit level 8
Computing: Introduction to Project Management (H17D 34) 1 credit level 7	HND Computing: Software Development: Graded Unit 2 2 credits level 8	
SQL: Introduction (DH3J 34) 1 credit level 7	Relational Database Management Systems (H16W 35) 2 credits level 8	

	Mandatory Units
	Recommended Feeder Unit

There are a number of Units within the framework that could be combined to both help reduce the assessment burden on candidates and provide a more holistic learning experience. Care should be taken, if this approach is adopted, to ensure that candidates have the opportunity to pass each of the grouped Units individually. One approach is to use re-assessments that target individual Units rather than the grouped Units.

Some examples where this approach might be appropriate include:

- The *Systems Development: User Centred Design* (H182 34) Unit could be combined with the *Software Development: Developing Small Scale Standalone Applications* (H17W 34) Unit. The open-book assessment for the S*ystems Development: User Centred Design* Unit could cover some of the requirements for the *Developing Small Scale Standalone Applications* Unit.
- The delivery of the mandatory *Software Development: Object Oriented Programming* (H171 35) Unit should be co-ordinated with the delivery of the mandatory *Software Development: Object Oriented Analysis and Design* (H172 35) Unit to help ensure that learners can fully understand the object oriented paradigm. The assessments for the two Units should be separated to avoid the pitfall of failing both Units.
- Aspects of the mandatory *Software Development: Data Structures* (H16Y 35) Unit could be integrated with aspects of the mandatory *Software Development: Object Oriented Programming* (H171 35) Unit illustrating how a Class can encapsulate an ADT. The final Outcome of the *Software Development: Data Structures* Unit illustrates how one too many associations in class diagrams can be implemented using standard generic collection classes. The assessments for the two Units should be separated to avoid the pitfall of failing both Units.
- The Unit *Systems Development: Testing Software* (H181 34) could be combined with any of the development Units. This would allow learners to conceptualise the importance of testing. Care would need to be taken that candidates can still pass the testing elements of the development Unit even if they fail to meet the requirements of the *Systems Development: Testing Software* Unit.
- The requirements for the Units *SQL: Introduction* (DH3J 34) and *Relational Database Management Systems* (H16W 35) could be achieved by undertaking the Oracle Academy vendor award.

6.2 Recognition of Prior Learning

SQA recognises that learners gain knowledge and skills acquired through formal, non-formal and informal learning contexts.

In some instances, a full Group Award may be achieved through the recognition of prior learning. However, it is unlikely that a learner would have the appropriate prior learning and experience to meet all the requirements of a full Group Award.

The recognition of prior learning may **not** be used as a method of assessing in the following types of Units and assessments:

- HN Graded Units
- Course and/or external assessments
- Other integrative assessment Units (which may or not be graded)
- Certain types of assessment instruments where the standard may be compromised by not using the same assessment method outlined in the Unit
- Where there is an existing requirement for a licence to practice
- Where there are specific Health and Safety requirements
- Where there are regulatory, professional or other statutory requirements
- Where otherwise specified in an assessment strategy

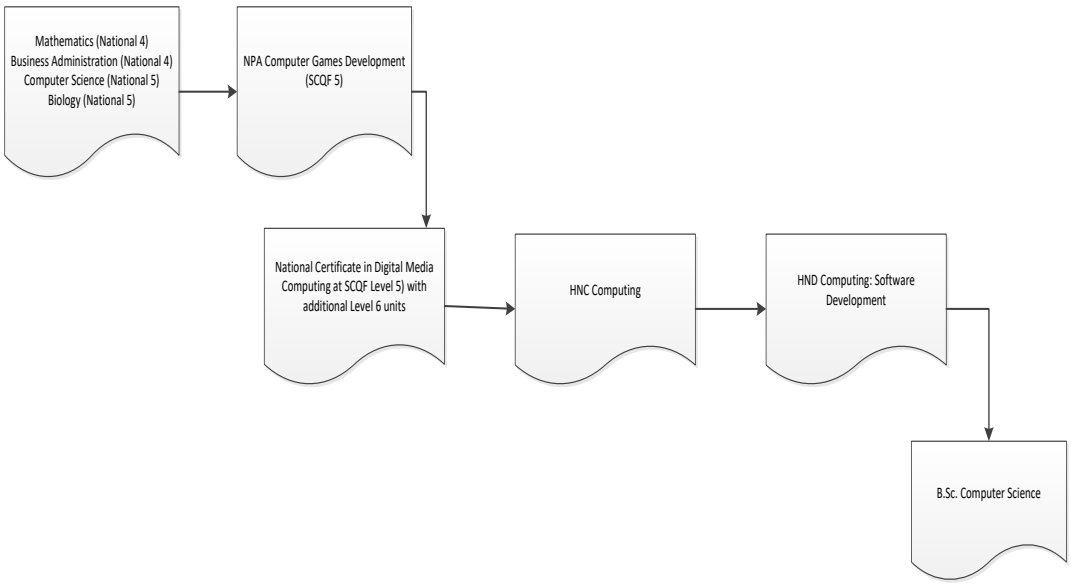
More information and guidance on the *Recognition of Prior Learning* (RPL) may be found on our website **www.sqa.org.uk**

The following sub-sections outline how existing SQA Unit(s) may contribute to this Group Award. Additionally, they also outline how this Group Award may be recognised for professional and articulation purposes.

6.2.1 Articulation and/or progression

This award has been designed to allow centres to forge a range of articulation routes to a wide range of degree courses at universities throughout Scotland. Some articulation routes are likely to require centres to select specific Units from the optional lists. For example, articulation to the 2nd year of the more traditional Universities such as the University of Strathclyde and the University of Glasgow might well require candidates to have achieved a certain level of Mathematics. In a similar vein direct entry to some third year courses might require some exposure to database development which could be achieved by adopting the Relational Database Management Systems Unit.

The following diagram illustrates one particular progression path for this award.



This learning journey illustrates progression from school to university. The learner leaves school with a number of National Courses and an NPA, before progressing to college where s/he undertakes a full-time NC programme. Note that the NC programme is a mix of Level 5 and Level 6 Units. From there, s/he goes onto the HND award, the first year of which is an HNC. Learners who complete the HND would gain advanced standing at university, either directly into second or third year of a B.Sc. course.

It is also important to recognise that nearly all articulation routes will impact on the language chosen for the second year mandatory Units. At the time of writing Java and/or C# are likely to be pre-requisites for successful articulation.

Throughout the development of this award, the lead developer has had direct consultations with colleagues at a small selection of universities including Glasgow Caledonian University, University of the West of Scotland, Edinburgh Napier University and the Open University in Scotland. These consultations have indicated that it should be possible to maintain current articulation routes for 2nd and 3rd year direct entry to computing related degree courses providing centres adopt appropriate teaching languages for the mandatory HND Units.

The Open University in Scotland offers a number of alternative articulation routes for candidates who progress on to employment. At the time of writing, successful completion of the HND Software Development could be counted towards both the BSc Computing degree and the BSc (Hons) Computing and IT Practice degree.

The lead developer for the HND *Computer Science* award also discussed a number of articulation routes to a number of universities. At all of the centres, successful articulation would require OOPs. The fact that this is mandatory in the *Software Development* award would strongly suggest that these routes would be available to HND *Software Development* candidates.

The table below indicates **some** of the articulation routes that are likely to be available on successful completion of the HND *Computing: Software Development* award. Some of these will be dependent on the grades obtained in the Graded Units.

UWS	BSc (Hons) Computing	Direct entry into Year 3
GCU	BSc (Hons) Computing (Web Systems Development)	Direct entry into Year 3 providing appropriate level Maths
Napier University	BEng Computing BEng Software Engineering	Direct entry into stage 3 (level 9) with a sufficient pass mark in Graded Unit.
Glasgow University	BSc (Hons) Computing	Direct entry Year 2 providing appropriate level Maths
Strathclyde University	BSc (Hons) Computing	Direct entry Year 2 providing appropriate level Maths
The Open University	BSc (Hons) Computing BSc (Hons) Computing and IT Practice degree.	Accreditation for level 2 OO courses providing appropriate level of Java Top Up degree for learners in IT related employment.
RGU	BSc (Honours) Computing (Application Software Development)	Direct entry into Year 3 (based on optional Unit chosen)
Stirling University	BSc Computer Science (Honours) BSc Software Engineering*	Direct entry into Year 2/3 (based on optional Unit chosen) Direct entry into Year 2 (based on optional Unit chosen)
Abertay University	BSc (Honours) Computing BSc (Honours) Web Design & Development BSc (Hons) Engineering & Intelligent Systems BSc (Hons) Digital Forensics BSc (Hons) Ethical Hacking	Direct entry into Year 3 (based on optional Unit chosen) Direct entry into Year 3 (based on optional Unit chosen) Direct entry into Year 3(based on optional Units chosen). These courses will be available from 2015/16
UHI	BSc Computing (Honours)	Direct entry into year 3

6.2.2 HN Enhancement Project

The most popular destination for graduates from this award is university. SQA has recently received money from the *Scottish Funding Council* to improve articulation from college to university. It was agreed that a new project 'HN Enhancement' would commence where the primary aim would be to identify whether and what enhancements might be necessary to improve articulation between college HN programmes and university degree courses.

The project will explore four subject areas, one of which is Computing, to see how the existing awards can be improved to make the transition from college to university easier for students.

As part of the project, a Qualification Review Team (QRT) for the area of Computing has been formed consisting of college and university representation (including the Open University). Their role is to look at the structure, contents, assessment and supporting guidance to see if some or all of these can be improved to support articulation.

The project has six defined objectives. These are:

1 Undertake initial scoping work to:

- ♦ identify good practice and barriers to articulation in SQA HN qualifications
- ♦ identify and consider the broader implications of enhancements across the sectors
- ♦ identify and consider policy and guidance activity required to support the above

2 Establish Qualification Review Teams to explore the above in the context of each subject pilot area.
3 Develop supporting guidance for any new approaches to HN development and/or assessment where required.
4 Consider alignment in relation to degree-level assessment structures
5 Undertake restricted pilot activity over an agreed period of time
6 Evaluate the impact of the changes and decide on roll-out to more or all SQA HN Qualifications.

This project is on-going. At the time of writing, members of the QRT have been commissioned to develop a number of university-type 'alternative assessments', which better reflect the likely demands faced by college students who progress to university.

These alternative assessments will be piloted from August 2013.

6.2.3 Professional recognition

There are two professional bodies associated with this development:

1 E-Skills UK
2 British Computer Society

E-Skills UK is the Sector Skills Council with special responsibility for the IT sector. The Director of Qualifications (Chris Morrow) is a member of the Sector Panel for Computing & IT.[2] This development has been discussed at Sector Panel on several occasions. Separately from this, E-Skills has been kept abreast of developments on an on-going basis. The current draft proposals are with E-Skills for their comment.[3]

The validation panel includes an ex-member of E-Skills UK, who maintains links with that organisation.

The *British Computer Society* (also known as *The Chartered Institute for IT*) is the main professional body for the subject area. BCS also has representation on the Sector Panel. No formal accreditation between this award and BCS is proposed. However, an indication of that organisation's broad support for the award is currently being sought.

The Sector Panel for Computing & IT includes a wide range of professional representation (in additional to E-Skills and BCS), including:

- Scotland IS
- Skills Development Scotland
- Cisco
- Microsoft
- Oracle

This award has been considered by the Panel on several occasions during its inception and development, and the Panel has expressed its support for it on each occasion.

6.2.4 Transitional Arrangements

HN awards in Computing have a long tradition of providing detailed guidance on credit transfer between existing and new awards.[4] This is done, at the request of centres and External Verifiers, to ensure consistency between centres. Credit transfer tables have been provided in this subject area since 1995. However, final decisions relating to credit transfer lies with centres.

[2] The Sector Panel is a long-standing SQA committee, which aims to capture external stakeholder input for planning and development purposes.

[3] E-Skills does not guarantee to provide feedback on qualification proposals to awarding bodies. This may or may not be provided based on available capacity.

[4] Standard SQA policy is to permit centres to decide on credit transfer.

Section 6.2.5 has been populated with equivalent Units which have been approved by an External Verifier. The External Verifier uses specific criteria to determine when two Units are equivalent and one can provide credit for another. Many of the 'new' (2011/12) Units in this table are revisions of the 'old' (2004/5) Units, making credit transfer more credible and easier to identify.

Units within computing related frameworks prior to 2004 are not eligible for credit transfer into the new framework due to the importance of contemporary skills in this sector.

6.2.5 Credit transfer

HNC *Computing* was validated by SQA in December 2011 and HND *Computing* awards are due for validation in December 2012. These courses will replace a number of older Group Awards including:

G7GL 15 HNC *Computing*
G7DX 15 HNC *Computer Networking*
G7DY 16 HND *Computer Networking and Internet Technology*
G7TT 16 HND *Computing: Software Development*
G7TR 16 HND *Computing: Technical Support*

These Group Awards have been available since 2004/5 and themselves replaced older Group Awards, dating back to 2001. This section covers **full** credit transfer from Units in the 2004/5 Group Awards to Units in the 2012 Group Awards.

When new Group Awards are introduced, students often wish to transfer between the old and the new frameworks. For example, they may have started on an HNC under an older framework and wish to complete their HND on the new framework, or they may have completed Units some time ago and wish to use these as part of an HNC or HND under the new framework.

To assist in this process, SQA normally provides centres with guidance on Credit Transfer between the old and the new frameworks. SQA have clear criteria for deciding if two syllabuses are equivalent. All the following criteria must be satisfied if full credit transfer is to be recognised between both syllabuses:

1 *The syllabuses have the same SCQF levels.*
2 The syllabuses have the similar credit values (or equivalent).
3 The syllabuses are equivalent in terms of Core Skill coverage.
4 The syllabuses relate to the same subject area and the main topics are common to both.
5 The syllabuses present a similar level of cognitive demand.
6 The syllabuses encompass similar skill-sets.
7 The syllabuses are contemporary in terms of terminology, techniques and technology.
8 Employers, admission officers and other users would perceive both syllabuses as broadly equivalent.
9 The assessment demands are similar in terms of candidate activity and Performance Criteria, or candidates would be equally likely to pass both assessments.
10 Special conditions (where they exist) are applicable to both syllabuses.

This guidance is of an advisory nature. The final decision on whether or not to grant credit transfer must be made by the centre and is subject to external moderation. However, external moderators are unlikely to raise objections to any credit transfer based on the advice given here.

2004/5 GROUP AWARD UNITS		2012 GROUP AWARD UNITS	
Unit No	**Unit title**	**Unit No**	**Unit title**
DF9M 34	Client Operating System	H1EM 34	Client Operating Systems
DH2Y 34	Computer Hardware: Hardware Installation and Maintenance	H1FY 34	Computer Hardware: Hardware Installation and Maintenance
F1XA 34	Computing: PC Hardware and Operating System Essentials	H17E 34	Computing: PC Hardware and Operating Systems Essentials
F1X9 34	Computing: PC Hardware and Operating System Support	H17F 34	Computing: PC Hardware and Operating Systems Support
DH36 34	Computing: Graded Unit 1 (Exam)	H1J8 34	Computing: Graded Unit 1 (Exam)
DH37 34	Information Technology: Information Systems and Services	H1G0 34	IT: Information Systems & Services
DM30 35	Project Management 1	H17D 34	Computing: Introduction to Project Management
DH31 34	Computer Networks: Building Local Area Networks	H17C 34	Computer Networks: Building Local Area Networks
D75V 35	Computer Networks: Network Technology and Data Communications	H16V 35	Network Technology and Data Communications
DH32 35	Software Development: Developing for the World Wide Web	H1J9 35	Software Development: Developing Websites for Multiplatform Use
DH2X 34	Providing Support to Users	H17T 34	Providing Support to Users
DH3D 35/ FE77 35	Software Development Relational Database Systems	H16W 35	Relational Database Management Systems
D76V 35	Software Development Object Oriented Programming	H171 35	Software Development: Object Oriented Programming
DH3F 34	Systems Development: Introduction	H180 34	Systems Development: Introduction
DN4N 35	Computing: Software Development: Graded Unit 2 (Project)	H48W 35	Computing: Software Development: Graded Unit 2 (Project)
DN4P 35	Computing: Technical Support: Graded Unit 2 (Project)	H48X 35	Computing: Technical Support: Graded Unit 2 (Project)
DG0H 35	Computer Networking and Internet Technology: Graded Unit 2 (Project)	H48V 35	HND Computing: Networking Graded Unit 2 (Project)
F0N0 35	Professional Issues in Computing	H1F7 34	Professionalism and Ethics in Computing
DH21 34 D75X 34	Working Within a Project Team **AND** Information Technology: Applications Software 1	H178 34	Team Working in Computing
DH2T 34 DH33 34	Computer Architecture 1 **AND** Computer Operating Systems 1	H175 34	Computer Systems Fundamentals
F6BV 35	Human Computer Interface	H17L 34	Human Computer Interaction

2004/5 GROUP AWARD UNITS		2012 GROUP AWARD UNITS	
Unit No	**Unit title**	**Unit No**	**Unit title**
D59P 34	Network Concepts	H17S 34	Network Concepts
DG02 34	Security Concepts	HT9G 34*	Network Security Concepts
DM3H 35	Systems Development: Object Oriented Design	H172 35	Systems Development: Object Oriented Analysis and Design
DG07 34	Mail Server Administration	H17N 34	Mail Server Management
D75V 35	Computer Networks: Network Technology and Data Communications	H17A 34	Computer Networking Fundamentals

6.3 Opportunities for e-assessment

The Units in this award offer numerous opportunities for e-assessment ranging from the more obvious objective question based closed-book assessments to the use of e-portfolios and video for some of the open-book assessments. It is also possible to use social media software to record and facilitate group work where appropriate. Each Unit specification includes suggestions of how e-assessments might be used effectively.

Some SQA Units already have assessment banks developed SOLAR (**www.sqasolar.org.uk**) and centres are encouraged to use these where appropriate.

As part of an assessment strategy, centres are encouraged to investigate the option of e-assessment to support the programme. E-assessment may take a number of forms, and while it may be feasible in the future to conduct all assessment in an on-line format, currently some formats are more amenable to e-assessment than others.

The most obvious format is that of objective tests, eg Multiple-choice or short-response tests, and some SQA Units already have an Evidence Requirement mandating the use of this type of test. Centres could adopt tests supported by SOLAR (**www.sqasolar.org.uk**) where appropriate.

Below is a sample from within the core Units of the Group Award of where the possibility of e-assessment may exist:

Multiple-choice/Short-response e-assessment opportunities		
Unit title	**Code**	**Outcome**
Software Development: Data Structures	H16Y 35	1
Systems Development: Object Oriented Analysis and Design	H172 35	1
Software Development: Developing Small Standalone Applications	H17W 34	1

e-portfolio opportunities			
Unit title	**Code**	**Outcome**	**Type**
HND Computing Software Development: Graded Unit (Project)	H48W 35	All	Project proposal Project Documentation
Software Development: Data Structures	H16Y 35	2,3 & 4	Portfolio of development exercises
Software Development: Object Oriented Programming	H171 35	All	Development and testing documentation

6.4 Support materials

A range of Assessment Support Packs (ASPs) have been produced for a number of mandatory and optional Units in this Group Award. These packs are available on the SQA secure website and access can be sought through the SQA coordinator in each centre.

6.5 Resource requirements

The mandatory SCQF level 8 Units in this award will require the use of a modern object orientated integrated development environment such as Eclipse or Microsoft's Visual Studio. Eclipse is an open source development environment available from **www.eclipse.org**. The express version of Visual Studio is available as a free download from **www.microsoft.com/visualstudio** although the professional versions do offer some benefits. At the time of writing it is envisaged that the mandatory Units would best be delivered using either Java or C#.

Centres intending to deliver the optional Units *Relational Database Management Systems* (H16W 35) and *SQL: Introduction* (DH3J 34) might consider adopting the Oracle Academy. Further information on this is available from **www.sqa.org.uk/mini/27044.htm**l

7 General information for centres

Equality and inclusion

The Unit specifications making up this Group Award have been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners will 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**

Internal and external verification

All instruments of assessment used within this/these qualification(s) should be internally verified, using the appropriate policy within the centre and the guidelines set by SQA.

External verification will be carried out by SQA to ensure that internal assessment is within the national guidelines for these qualifications.

Further information on internal and external verification can be found in *SQA's Guide to Assessment* **(www.sqa.org.uk/GuideToAssessment)**

8 Glossary of terms

Embedded Core Skills: is where the assessment evidence for the Unit also includes full evidence for complete Core Skill or Core Skill components. A learner successfully completing the Unit will be automatically certificated for the Core Skill. (This depends on the Unit having been successfully audited and validated for Core Skills certification.)

Finish date: The end of a Group Award's lapsing period is known as the finish date. After the finish date, the Group Award will no longer be live and the following applies:

- Candidates may not be entered for the Group Award.
- The Group Award will continue to exist only as an archive record on the Awards Processing System (APS).

Graded Unit: Graded Units assess learners' ability to integrate what they have learned while working towards the Units of the Group Award. Their purpose is to add value to the Group Award, making it more than the sum of its parts, and to encourage learners to retain and adapt their skills and knowledge.

Lapsing date: When a Group Award is entered into its lapsing period, the following will apply:

- The Group Award will be deleted from the relevant catalogue.
- The Group Award specification will remain until the qualification reaches its finish date at which point it will be removed from SQA's website and archived.
- No new centres may be approved to offer the Group Award.
- Centres should only enter candidates whom they expect to complete the Group Award during the defined lapsing period.

SQA Credit Value: The credit value allocated to a Unit gives an indication of the contribution the Unit makes to an SQA Group Award. An SQA credit value of 1 given to an SQA Unit represents approximately 40 hours of programmed learning, teaching and assessment.

SCQF: The Scottish Credit and Qualification Framework (SCQF) provides the national common framework for describing all relevant programmes of learning and qualifications in Scotland. SCQF terminology is used throughout this guide to refer to credits and levels. For further information on the SCQF visit the SCQF website at **www.scqf.org.uk**

SCQF credit points: SCQF credit points provide a means of describing and comparing the amount of learning that is required to complete a qualification at a given level of the Framework. One National Unit credit is equivalent to 6 SCQF credit points. One National Unit credit at Advanced Higher and one Higher National Unit credit (irrespective of level) is equivalent to 8 SCQF credit points.

SCQF levels: The level a qualification is assigned within the framework is an indication of how hard it is to achieve. The SCQF covers 12 levels of learning. HNCs and HNDs are available at SCQF levels 7 and 8 respectively. Higher National Units will normally be at levels 6–9 and Graded Units will be at level 7 and 8. National Qualification Group Awards are available at SCQF levels 2–6 and will normally be made up of National Units which are available from SCQF levels 2–7.

Subject Unit: Subject Units contain vocational/subject content and are designed to test a specific set of knowledge and skills.

Signposted Core Skills: refers to opportunities to develop Core Skills arise in learning and teaching but are not automatically certificated.

History of changes

It is anticipated that changes will take place during the life of the qualification and this section will record these changes. This document is the latest version and incorporates the changes summarised below. Centres are advised to check SQA's APS Navigator to confirm they are using the up to date qualification structure.

NOTE: Where a Unit is revised by another Unit:

- No new centres may be approved to offer the Unit which has been revised.
- Centres should only enter candidates for the Unit which has been revised where they are expected to complete the Unit before its finish date.

Version Number	Description	Date
15	**Addition of Optional Unit:** J27L 34 Data Flow added as an Optional unit.	24/03/20
14	**Addition of Optional Unit:** J0H9 34 Data Security added as an Optional unit.	17/12/19
13	**Revision of Units:** H17V 34 Security Concepts (finish date 31/07/2020) has been replaced by HT9G 34 Network Security Concepts.	24/09/19
12	**Addition of Optional Units:** HF3K 34 Web Technologies 1: HTML and CSS added as Local Optional unit. H16S 35 Managing a Web Server as a Local Optional Unit (APS only)	11/09/18
11	**Addition of Optional Units:** These units were developed by the college and are added in the Local Option of the framework for the local college: HL9T 35, HL9V 35, HL9W 35 and HL9X 35.	19/05/17
10	**Addition of Optional Units:** H8W9 35 Data Science has been added to Group 2**.**	21/12/16
09	**Revision of Unit:** F8L2 35 Game Customisation and Scripting has been replaced by HH3E 35 Game Customisation and Scripting.	18/11/16
08	**Revision of Units:** F6C4 35 Web Development: Producing a Data Driven Website has been replaced by HF56 35. F6C2 35 Web Development: Dynamically Generated Content has been replaced by HF57 35. F1VV 34 User Interface Design has been replaced by HF55 34. H17J 34 Developing Mobile Web Based Applications: An Introduction has been replaced by HF4Y 34. F1YY 34 Web Development: Essential Content has been replaced by HF58 34. All old units will finish 31/07/2019	12/07/16
07	**Addition of Optional Units:** H9DE 34 Digital Skills (Group 2	27/08/15
06	**Revision of Unit:** DE1K 33 Workplace Communication in English has been revised by H8T2 33 and finishes on 31/07/2016.	19/05/15
05	**Addition of Optional Units:** D85F 34 Using Software Applications Packages (Group 2), D75X 34 Information Technology: Applications Software 1 (Group 2), DH35 34 Computing: Planning (Group 2), FR22 35 Routing Technology (Group 1) and FR24 35 Networking Technology (Group 1)	09/04/15

04	**Revision of Unit:** DK2K 34 Getting Started in Business *has been revised by* H7V4 34 Preparing to Start a Business *and will finish on* 31/07/2016.	20/01/15
03	*Bring Your Own Device (BYOD): Introduction* (H6D0 34) added as an optional Unit to framework (Group 2). Napier University articulation route added.	09/06/14
02	**Addition of optional Units: Group 3:** *Database Design and Programming in SQL* (H4KJ 34) and *Database Programming with PL/SQL* (H4KP 35).	22/10/13

Acknowledgement

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

9 General information for learners

This section will help you decide whether this is the qualification for you by explaining what the qualification is about, what you should know or be able to do before you start, what you will need to do during the qualification and opportunities for further learning and employment.

As the title of the award indicates, this qualification is about learning how to develop software using modern integrated development environments. Successful completion of the qualification could be your first step towards a challenging and exciting career in software development.

In the first year of the award you will learn about computing in general and how software is at the heart of how computing devices operate. You will also be introduced to the key development skills of analysis, design, implementation and testing and will have the opportunity to start applying these skills to develop and deploy your own small scale application which might take the form of a mobile or web based App.

In the second year of the course, you will be introduced to the Object Oriented approach to developing software. This will let you see how you can start to design and develop class libraries both as an individual and within teams. You will learn how to use UML to analyse and design static and dynamic models of software systems. You will use these models to implement solutions using a modern object oriented programming language such as Java and/or C#.

On successfully completion of the course you should have acquired the skills needed to develop and test small applications, know how to use software libraries and be able to understand how the object oriented paradigm can help in software re-use. There is an increasing number of employment opportunities with many small businesses seeking individuals with the skills needed to develop and support e-commerce activities, adapt and customise off the shelf application and design and develop small mobile apps. All of these activities use object libraries. You can further expand your employment opportunities by progressing on to a range of computing related degree courses. Your HND will allow direct entry to 2nd and 3rd year of a wide number of degree courses in Scotland.

Ideally you should have had some experience using computer systems and have gained some relevant SCQF level 6 qualifications prior to undertaking this qualification but remember entrance to the qualification is at the discretion of the delivery centre. Contact your local centre to discuss if direct entry to the course is advisable or if they would recommend undertaking a feeder course prior to undertaking this qualification.