Higher National Unit Specification

General information

Unit title: Blockchain (SCQF level 8)

Unit code: J1GW 35

Superclass: CC

Publication date: February 2019

Source: Scottish Qualifications Authority

Version: 02

Unit purpose

The purpose of this unit is to develop learners' knowledge and understanding of the principles of Blockchain. This is a **specialist** unit intended for learners with a vocational interest in computer science or financial services. It is beneficial, but not required, if learners had previously completed the corresponding unit at SCQF level 7.

Learners will gain an understanding of the precise way in which Blockchain works at a low level of detail. The focus of the unit is Blockchain technological workings, rather than the higher-level aspects of Blockchain concepts. Topics covered include: common Blockchain platforms, understanding how blocks are coded, how smart contracts are coded, complex relationships that link blocks, and resolving conflicts in chains. Learners will also gain experience of programming. Programming techniques are not part of this unit so some previous experience of coding is desirable.

On completion of this unit, learners may progress to more advanced studies in Computer Science or Financial Services.

Outcomes

On successful completion of the unit, the learner will be able to:

1 Describe the components of Blockchain.
2 Explain Blockchain processes.
3 Write code to execute Blockchain functions.

Credit points and level

1 Higher National Unit credit at SCQF level 8: (8 SCQF credit points at SCQF level 8)

Higher National Unit Specification: General information (cont)

Unit title: Blockchain (SCQF level 8)

Recommended entry to the unit

It would be beneficial if learners understood the basic concepts of Blockchain and had previous experience of computer programming. This could be evidenced by possession of Higher National units J1GV 34 *Blockchain* (SCQF level 7) and J0HA 34 *Computer Programming* (SCQF level 7).

Core Skills

Achievement of this Unit gives automatic certification of the following Core Skills component:

Core Skill component Critical Thinking at SCQF level 6

There are also opportunities to develop aspects of Core Skills which are highlighted in the Support Notes of this Unit specification.

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.

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**.

Higher National Unit Specification: Statement of standards

Unit title: Blockchain (SCQF level 8)

Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

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

Outcome 1

Describe the components of Blockchain.

Knowledge and/or skills

- Topological architecture of Blockchain solutions
- Definition and role of the distributed ledger
- Governance model concepts
- Role of the genesis block in managing and verifying chains
- Transaction process concepts
- Peer nodes role and governance
- Cryptocurrencies as a core proponent in the development of Blockchain technologies

Outcome 2

Explain Blockchain processes.

Knowledge and/or skills

- Creating a SHA256 hash from an existing value
- Adding a new block to the blockchain
- Querying for the latest block in the chain
- Communication between nodes using HTTP protocols (cURL)
- Proof of work and other consensus algorithms
- Third-party verifications
- Peer node reviews for accepting a new block
- Resolving issues created by blocks of different lengths
- Functionality of smart contracts and common usage scenarios
- Blockchain mining and associated cryptocurrency compensation models
- Key considerations when planning to create a Blockchain solution

Higher National Unit Specification: Statement of standards (cont)

Unit title: Blockchain (SCQF level 8)

Outcome 3

Write code to execute Blockchain functions.

Knowledge and/or skills

- Common Blockchain development platforms and their governance models, associated cryptocurrencies, and ledger types
- Core tasks and functionality addressed when programming Blockchain solutions
- The programmatic elements of a block object including its index, timestamp, data, hash, and previous hash
- Process for generating and properly hashing a new block in a chain
- Calculating a new hash using an existing code library or service
- Storing blocks in an in-memory array representing all of the elements of a Blockchain as a means managing the blocks programmatically
- Validating the integrity of existing blocks
- Resolving conflicts in chain versions by choosing the longest chain
- Controlling nodes using cURL or other common tools used to transfer data via HTTP protocol
- Definition and derivation of smart contracts

Evidence requirements for this unit

Learners will need to provide evidence to demonstrate the knowledge and/or skills across all outcomes. The evidence requirements for this unit will take two forms.

1 Knowledge evidence
2 Product evidence

The **knowledge evidence** will relate to Outcome 1 and Outcome 2, and the underpinning knowledge in Outcome 3. Knowledge evidence is required for all knowledge and/or skills statements in these outcomes. The amount of evidence may be the minimum required to infer competence. The evidence may be produced over an extended period of time in lightly controlled conditions.

Knowledge evidence may be sampled when testing is used. In this case, the evidence must be produced under controlled conditions in terms of location (supervised), timing (limited) and access to reference materials (not permitted). The sampling frame must cover all outcomes but not all knowledge/skills statements; however, the majority of the knowledge/skills should be sampled (at least once) in every instance.

The **product evidence** will relate to Outcome 3. It will comprise **at least one** program that:

- creates a SHA256 hash from an existing value using an online SHA256 hash generator
- calculates a new hash using an existing code library or service using a common programming language
- generates and hash a new block in a chain
- creates an array that contains all of the blocks in the associated Blockchain by first creating the genesis block

Higher National Unit Specification: Statement of standards (cont)

Unit title: Blockchain (SCQF level 8)

The product evidence may be distributed across several programs. It may be produced over the life of the unit, under loosely controlled conditions (including access to reference materials).

The evidence may be written or oral or a combination of these. Evidence may be captured, stored and presented in a range of media (including audio and video) and formats (analogue and digital). Particular consideration should be given to digital formats and the use of multimedia.

The SCQF level of this unit (Level 8) provides additional context on the nature of the required evidence and the associated standards. Appropriate level descriptors should be used when making judgements about the evidence.

When evidence is produced in loosely controlled conditions, it must be authenticated. The guide to assessment provides further advice on methods of authentication.

The support notes section of this specification provides specific examples of instruments of assessment that will generate the required evidence.

Higher National Unit Support Notes

Unit title: Blockchain (SCQF level 8)

Unit support notes are offered as guidance and are not mandatory.

While the exact time allocated to this unit is at the discretion of the centre, the notional design length is 80 hours.

Guidance on the content and context for this unit

The purpose of this unit is to provide participants the basic skills and knowledge required to be a knowledge worker in a Blockchain-enabled organisation and to equip them with foundation needed to further their development in more technical areas of Blockchain eg, Blockchain specialist, or in other technical areas such as cybersecurity. In terms of workforce readiness, the opportunity to communicate concepts and ideas in a persuasive and professional manner is facilitated by the suggestion of an evidence-based differentiated instruction collaborative model described herein.

The following paragraphs provide additional guidance for each individual outcome in this unit.

Outcome 1 — The primary objective relating to this outcome is enabling participants to understand what Blockchain is as a concept and the role and key attributes of the individual Blockchain components. This knowledge is a critical pre-requisite for understanding how these individual components work together to perform the operations and tasks in Outcome 2.

Outcome 2 — The primary objective relating to this outcome is transferring the skills and knowledge required for participants to understand the data and user flow of Blockchain operations and processes in preparation for getting hands-on with the code in Outcome 3. Some of the concepts related to these processes and operations are unique to Blockchain and therefor completely new to most learners so keep this in consideration as you are measuring their mastery and take ample time to reinforce concepts wherever possible.

Outcome 3 — The primary objective relating to this outcome is building a foundation for a programming role or other technical role in a career setting. While emphasis on one set of tools or programming language is up to the discretion of the instructor, the importance should be placed on the programmatic concepts needed to code and execute core Blockchain processes.

With the explosion of fintech and cryptocurrency market in general, the demand for tech-savvy professionals has grown at an atmospheric rate. For example, online freelancing site, Upwork, saw the growth rate for Blockchain jobs on the site surpass 2,000% for three quarters (2018) and post a 6,000% year-over-year growth rate this year. Furthermore, Burning Glass Technologies reports there were 5,743 mostly full-time jobs in the Blockchain sector posted over the last year (2018), which represents an annual growth rate of approximately 320%.

Higher National Unit Support Notes (cont)

Unit title: Blockchain (SCQF level 8)

Introducing challenge into this astronomic increase in demand, there are scarce options for practitioners to upskill in Blockchain knowledge and skills as the training and education sector have traditionally been quite sluggish in updating their offerings to match current market requirements. The rapidity in the emergence of Blockchain has made the lack of related offerings even more glaring.

These facts underpin the importance of the knowledge and skills covered within this qualification in terms of providing pathways to lucrative employment opportunities.

Mastering Blockchain core concepts and having an in-depth understanding of its innerworkings are undeniable pre-requisites to transitioning into the workplace as a Blockchain practitioner.

Potential Blockchain-specific career roles for individuals possessing this qualification: Blockchain solution architects, Blockchain solution engineers, sales pre-sales professionals for Blockchain products and solutions, and Blockchain programmers.

Existing/traditional market sectors that are experience a huge surge in demand for Blockchain professionals: financial services (fintech), legal services, insurance, and supply chain management among many others.

Blockchain programming encompasses the full complement of core programming skills including: variable declaration and management, control and branching structures, conditional structures, constructing and calling functions, etc. The concepts of server-to-server data transfer with cURL as part of the peer management of a Blockchain is also a critical computational concept and how broad applicability outside of the domain of Blockchain.

Specific examples of opportunities to develop computational thinking in this unit:

- **Abstraction —** coding Blockchain solutions requires to learner to not only think abstractly but to operate simultaneously on multiple layers of abstraction eg, what are the components I need to build? What order do I need to create them in? What is the relationship between components in executing operations?
- **Type checking —** the concept of storing the contents of a block in an in-memory variable ie, a two-dimensional array, provides a tangible opportunity for learners to build a deeper understanding of variable types and ways that they can be used in applying creative problem-solving for complex programming tasks.
- **Modularizing —** given the very nature of how Blockchain applications are structured, this qualification provides ample opportunity for learners to develop an understanding how each of Blockchain's core processes eg, adding a new block, can and should be coded in a modular manner to maximize reuse and efficiency on future projects.

Please note that the following guidance, relating to specific outcomes, does not seek to explain each knowledge/skills statement, which is left to the professionalism of the teacher. It seeks to clarify the statement of standards where it is potentially ambiguous. It also focuses on non-apparent teaching and learning issues that may be over-looked, or not emphasised, during unit delivery. As such, it is not representative of the relative importance of each knowledge/skill.

Higher National Unit Support Notes (cont)

Unit title: Blockchain (SCQF level 8)

Outcome 1: Describe the common components of Blockchain.

The overarching learning goals for students in Outcome 1 is preparing to understand how the individual components work together to perform tasks in Outcome 2. This is the primary reason that it is highly recommended to cover the learning outcomes in Outcome 1 before progressing to the content in Outcome 2. Learners should be comfortable describing the role of all the major components in preparation for seeing how they behave in a system of processes in Outcome 2.

A useful reference for both instructors and students alike for this outcome is *Blockchain for Dummies* created by IBM and available online from several trusted sources on the Internet. This reference is free to download.

Another helpful reference is Matthew Connor's book *Blockchain: Ultimate Beginner's Guide to Blockchain Technology*, available from Google Books and in Audiobook format from Audible among several other locations on the internet.

There are many other free or inexpensive references available online with the most reliable sources being Investopedia (**https://www.investopedia.com/**) and the Bitcoin Wiki (**https://en.bitcoin.it/wiki/Main_Pagehttps://en.bitcoin.it/wiki/Main_Page**).

Wikipedia also maintains frequently updated pages on most of the standalone topics covered in this unit. However, it is important to note that these sites are informational sites and not educational sites and as such, are intended to be used as a reference for keeping up with evolving technologies and standards related to Blockchain.

- Topological architecture of Blockchain solutions
  - The core essential elements of Blockchain architecture:
    - A node application
    - A shared ledger
    - A consensus algorithm
    - A virtual machine
  - Each of the four elements above are described in detail here: **https://medium.com/@neocapita/the-logical-components-of-blockchain-870d781a4a3a**
- Governance model concepts
  - 'Blockchain is needed to achieve network mining consensus through special algorithms. Typical algorithms are Proof-of-Work (PoW), Proof-of-Stake (PoS) and a hybrid of these.'
  - **Proof-of-Work —** a requirement to define an expensive computer calculation, also referred to as 'mining'
    - Reward is given to first miner who solves each block's problem (a mathematical puzzle)
  - **Proof-of-Stake —** the creator of a new block is chosen in a deterministic manner depending on its wealth aka 'stake'
    - No reward is given but the miner gets to keep the transaction fee
- Transaction process concepts
  - The important point is that data is received, potentially validated by a third-party, then passed on to the peer nodes (governance model) for acceptance and distribution of the new block to all of the ledgers in the Blockchain

Higher National Unit Support Notes (cont)

Unit title: Blockchain (SCQF level 8)

- Cryptocurrencies as a core proponent of Blockchain technologies
  - Create context by presenting the story of Satoshi Nakamoto and why he selected the Blockchain approach for governing his cryptocurrency (and the first cryptocurrency) Bitcoin.

Outcome 2: Identify and describe common Blockchain processes.

The skills and knowledge covered in this outcome is progressively more complex than and builds upon the content covered in Outcome 1. Without the knowledge acquired in Outcome 1, it would be very difficult for learners to master the operating principles and associated processes in Outcome 2. Therefore, it is highly recommended to go through Outcome 1 before moving onto this Outcome. The same logic applies in covering the content in this outcome before moving onto Outcome 3.

- Controlling nodes with HTTP protocol
  - Examples of how nodes are controlled:
    - Listing all the blocks in a node
    - Creating a new block from user input
    - Adding or listing peer nodes
  - References for cURL and similar protocols can be difficult to locate. The example below is from the Bitcoin Wiki https://en.bitcoin.it/wiki

```
#include <stdlib.h>
#iclude <curl/curl.h>
int main()
{
  CURL *curl = curl_easy_init();
  struct curl_slist *headers = NULL;
  if (curl) {
       const char *data =
         '{\'jsonrpc\': \'1.0\', \'id\':\'curltest\', \'method\':
\'getinfo\', \'params\': [] }';
       headers = curl_slist_append(headers, 'content-type:
text/plain;');
       curl_easy_setopt(curl, CURLOPT_HTTPHEADER, headers);
       curl_easy_setopt(curl, CURLOPT_URL,
'http://127.0.0.1:8332/');
       curl_easy_setopt(curl, CURLOPT_POSTFIELDSIZE, (long)
strlen(data));
       curl_easy_setopt(curl, CURLOPT_POSTFIELDS, data);
       curl_easy_setopt(curl, CURLOPT_USERPWD,
                        'bitcoinrpcUSERNAME:bitcoinrpcPASSWORD');
       curl_easy_setopt(curl, CURLOPT_USE_SSL, CURLUSESSL_TRY);
       curl_easy_perform(curl);
  }
  return 0;
}
```

Higher National Unit Support Notes (cont)

Unit title: Blockchain (SCQF level 8)

Outcome 3: Write and troubleshoot code needed to execute basic Blockchain functions.

The overarching goal of this outcome is to prime the students to transition to hands-on technical work on building and maintaining Blockchain solutions.

A useful reference for both instructors and students alike for this outcome is Lauri Hartikka's popular reference, *A Blockchain in 200 Lines of Code*:

https://medium.com/@lhartikk/a-blockchain-in-200-lines-of-code-963cc1cc0e54

In this reference guide, you will find simple code examples for beginning and intermediate programmers to follow and use as examples for all the programming-related exercises in this outcome.

As an alternative, the Ethereum Blockchain platform offers a free to use sandbox to practice writing Blockchain code and is easily found in GitHub. Ethereum also offers a sandbox for the smart contract programming language, solidity:
https://solidity.readthedocs.io/en/v0.4.24/

- Common Blockchain development platforms and their governance models, associated cryptocurrencies, and ledger types
  - The table below from HFS research represents the key attributes of the current top five Blockchain platforms:

Summary of Features of top 5 Blockchain Platforms for Enterprises

	Ethereum	Hyperledger Fabric	R3 Corda	Ripple	Quorum
Industry-focus	Cross-industry	Cross-industry	Financial Services	Financial Services	Cross-industry
Governance	Ethereum developers	Linux Foundation	R3 Consortium	Ripple Labs	Ethereum developers & JP Morgan Chase
Ledger type	Permissionless	Permissioned	Permissioned	Permissioned	Permissioned
Cryptocurrency	Ether (ETH)	None	None	Ripple (XRP)	None
% providers with experience[1]	93%	93%	60%	33%	27%
% share of engagements[2]	52%	12%	13%	4%	10%
Coin Market Cap[3]	$91.5 B (18%)	Not applicable	Not Applicable	$43.9 B (9%)	Not Applicable
Consensus algorithm	Proof of Work (PoW)	Pluggable framework	Pluggable framework	Probabilistic voting	Majority voting
Smart contract functionality	Yes	Yes	Yes	No	Yes

1. *Based on responses from 15 leading blockchain service providers*
2. *Based on a random sample of set of 50 enterprise blockchain engagements across multiple industries*
3. *Coinmarketcap.com as of Feb 20, 2018, 6:20 PM UTC*

Source: HfS Research, 2018

HfS

Higher National Unit Support Notes (cont)

Unit title: Blockchain (SCQF level 8)

Guidance on approaches to delivery of this unit

The outcomes in this unit should be delivered and assessed in the order provided in this document; ideally with a demonstration of mastery by the learner in one outcome before being allowed to proceed to the following outcome.

It is recommended that a small group approach by undertaken applying the principles differentiated instruction: pair students with strong technical skills and background with students with less experience and skills and pair more extroverted students who may be more comfortable in presenting in a classroom environment with students who may be less comfortable. Students within the group should collaborate to build and deliver presentations demonstrating their mastery of the knowledge covered within this qualification.

For the coding exercises in Outcome 3, it is recommended that the instructor review the code examples line-by-line several times before prompting the students to attempt the coding exercises on their own. Similar to the differentiated instruction method described above for the knowledge content, encourage students who are strong in programming skills to assist those students who may be having difficulty with the assignments.

Although the actual distribution of time may vary based on the rate that a given cohort group progresses and demonstrates mastery within an outcome, the following represents the intended temporal commitments for this unit:

- Outcome 1: 20 hours
- Outcome 2: 20 hours
- Outcome 3: 40 hours

Summative assessment may be carried out at any time. However, when testing is used (see evidence requirements) it is recommended that this is carried out towards the end of the unit (but with sufficient time for remediation and re-assessment). When continuous assessment is used (such as the use of a web log), this could commence early in the life of the unit and be carried out throughout the duration of the unit.

There are opportunities to carry out formative assessment at various stages in the unit. For example, formative assessment could be carried out on the completion of each outcome to ensure that learners have grasped the knowledge contained within it. This would provide assessors with an opportunity to diagnose misconceptions and intervene to remedy them before progressing to the next outcome.

Guidance on approaches to assessment of this unit

Evidence can be generated using different types of assessment. The following are suggestions only. There may be other methods that would be more suitable to learners.

Centres are reminded that prior verification of centre-devised assessments would help to ensure that the national standard is being met. Where learners experience a range of assessment methods, this helps them to develop different skills that should be transferable to work or further and higher education.

Higher National Unit Support Notes (cont)

Unit title: Blockchain (SCQF level 8)

Assessments on knowledge evidence could be achieved by a combination of the evidence-based assessment utilizing the differentiated instruction methods described above and traditional multiple-choice assessments. In some circumstances, it may be more practical to carry out the entirety of the knowledge assessment with a traditional multiple-choice based approach.

For the product-based skills covered in Outcome 3, it is suggested that the learner provide one of the following types of evidence, dependent on the context of the knowledge evidence:

- Short answer responses (interpret evidence)
- Standalone files (create and write evidence)

When assessing mastery of programming skills, it is recommended that students be assessed in a computer-lab environment while being proctored and marked by appropriate centre personnel.

Suggested instruments for knowledge evidence produced for group and individual presentations:

Knowledge evidence

1 Rubric for an instructor/proctor/tutor to mark evidence-based assessment as described above regarding small group presentations for demonstrating knowledge. The rubric should account for elements such as: thoroughness of content, accuracy of content, sequencing of content, appropriate levels of sophistication, originality, sourcing of references, and overall quality of the delivery of the presentation.
2 Online or paper-based selected-response test comprised of 30–40 questions with one correct response and three distractors for each question. The test should cover all the knowledge statements across all three outcomes with at least one question for each statement.

Product evidence

1 Rubric to a mark accuracy and thoroughness of code samples provided by learners. The rubric should account for observations such as: ability to understand the assignment being addressed, ability to apply programming concepts to Blockchain concepts, overall solution design, quality of code syntax, demonstration of understanding of core concepts, eg, function creation and object instantiation, organisation of code, efficiency of code, etc.
2 Rubric for marking efficacy of plan to build a Blockchain product. The rubric should account for key plan attributes such as: originality of the product, appropriateness of the product for being delivered on Blockchain, ability to effectively synthesize and pitch the product effectively, representation of the key attributes of a typical Blockchain application, etc.

Higher National Unit Support Notes (cont)

Unit title: Blockchain (SCQF level 8)

Learners should be encouraged to complete formative assessments in a closed-book manner then use any books or reference materials for the course for checking their responses. Learners should be able complete formative assessments at any time and repeat them as often as needed. In some instances, instructors may want to collect student responses to formative assessment for the purposes of gauging the overall master level of the cohort group as mentioned above. In addition to this traditional approach to formative assessment, learners may also achieve the same outcomes and provide the same level of gauging for instructors via the blog-based approach.

Traditional multiple-choice based summative assessments should be delivered under supervision by appropriate personnel in a closed-book environment.

For assessing the coding skills addressed in Outcome 3, it is recommended that the students perform the related summative assessment activities in a computer lab proctored and scored by appropriate personnel.

Formative assessment within an outcome should occur either at the statement level or across a small collection of related statements where possible and when it creates a more logical context for assessment.

Summative assessments should be administered at the completion of instruction for each outcome. However, given the foundational progression of the outcome sequence, a summative assessment demonstrating mastery of Outcome 3 could serve as enough evidence of mastery of the entire unit, especially when administered as an evidence-based capstone assignment encompassing the knowledge addressed across all outcomes.

Where possible and practical learners should be provided with the opportunity to present their knowledge directly to the rest of the class, either via in-classroom discussions and presentations or via their blog posts.

For both formative and summative assessment of learner's coding skills, the learner should be physically present and working independently on a computer under the supervision of a proctor or instructor when possible.

Opportunities for e-assessment

E-assessment may be appropriate for some assessments in this unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or social software. Centres which wish to use e-assessment must ensure that the national standard is applied to all learner evidence and that conditions of assessment as specified in the evidence requirements are met, regardless of the mode of gathering evidence. The most up-to-date guidance on the use of e-assessment to support SQA's qualifications is available at **www.sqa.org.uk/e-assessment**.

Higher National Unit Support Notes (cont)

Unit title: Blockchain (SCQF level 8)

Opportunities for developing Core and other essential skills

Blockchain programming encompasses the full complement of core programming skills including: variable declaration and management, control and branching structures, conditional structures, constructing and calling functions, etc. The concepts of server-to-server data transfer with cURL as part of the peer management of a Blockchain is also a critical computational concept and how broad applicability outside of the domain of Blockchain.

Specific examples of opportunities to develop computational thinking in this unit:

- **Abstraction —** coding Blockchain solutions requires to learner to not only think abstractly but to operate simultaneously on multiple layers of abstraction eg, what are the components I need to build? What order do I need to create them in? What is the relationship between components in executing operations?
- **Type checking —** the concept of storing the contents of a block in an in-memory variable, ie, a two-dimensional array, provides a tangible opportunity for learners to build a deeper understanding of variable types and ways that they can be used in applying creative problem-solving for complex programming tasks.
- **Modularizing —** given the very nature of how Blockchain applications are structured, this qualification provides ample opportunity for learners to develop an understanding how each of Blockchain's core processes eg, adding a new block, can and should be coded in a modular manner to maximize reuse and efficiency on future projects.

The principle recommended design for delivering this unit, small group/differentiated instruction, will provide learners with an opportunity to develop a wide variety of workforce-readiness and other critical interpersonal skills:

- Teamwork and collaboration skills
- Communication skills
- Problem-solving skills
- Reading for information skills
- Locating information skills
- Observation skills

The Critical Thinking component of Problem Solving at SCQF level 6 is embedded in this unit. When a learner achieves the unit, their Core Skills profile will also be updated to include this component.

History of changes to unit

Version	Description of change	Date
02	Core Skills Component Critical Thinking at SCQF level 6 embedded.	13/2/19

General information for learners

Unit title: Blockchain (SCQF level 8)

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

Unit overview

The purpose of this unit is to provide you the basic skills and knowledge required to be a knowledge worker in a Blockchain-enabled organisation and to equip you with the foundation needed to further your development in more technical areas of Blockchain eg, a Blockchain solution architect, or in other technical areas such as cybersecurity, computer programming, and fintech.

In terms of workforce readiness, this unit will provide you with skills, knowledge, and practice needed to communicate concepts and ideas in a persuasive and professional manner as well as providing you highly sought after skills needed for highly sought after roles in developing Blockchain solutions.

Your journey through this unit

Throughout the delivery of this unit you will be engaged in individual and group activities aimed on providing you a variety of opportunities to perfect, apply, and assess your knowledge. These activities might include small group-based collaboration in building and delivery presentations on important concepts as well as individual assignments based on your personal interests and/or skill level.

For programming related activities, you will be hands-on in the computer lab learning to code and troubleshoot common Blockchain functionality in a common programming language such as JavaScript or Python.

Knowledge and skills you will develop

Upon successful completion of this unit you will be able to:

- Describe the common components of Blockchain and their related operating principles
- Identify and describe common Blockchain processes and how they work together to provide Blockchain-based solutions
- Write and troubleshoot code needed to execute basic Blockchain functions such as creating blocks and working with cryptographic hashes

Assessing your progress

At key points within each outcome you will be presented with opportunities to assess your mastery of the knowledge and skills being covered. This assessment may take the form of a group or individual based presentation or in the form of a traditional multiple-choice closed-book assessment.

For assessing programming related activities, the instructor and/or a proctor will evaluate the quality of the code you write based on its overall design, functionality, quality of code syntax, demonstration of understanding of core concepts of both programming and Blockchain, etc.

General information for learners (cont)

Unit title: Blockchain (SCQF level 8)

Core Skill development and certification

Successfully completing this unit will provide you with the skills and knowledge needed to participate and/or lead.

The principle recommended design for delivering this unit, small group/differentiated instruction, will provide learners with an opportunity to develop a wide variety of workforce-readiness and other critical interpersonal skills:

- Teamwork and collaboration skills
- Communication skills
- Problem-solving skills
- Reading for information skills
- Locating information skills
- Observation skills

The Critical Thinking component of Problem Solving at SCQF level 6 is embedded in this unit. When a learner achieves the unit, their Core Skills profile will also be updated to include this component.