Next Generation Higher National Unit Specification

Blockchain (SCQF level 7)

Unit code: J68X 47

SCQF level: 7 (8 SCQF credit points)

Valid from: session 2022–23

Prototype unit specification for use in pilot delivery only (version 1.0) May 2022

This unit specification provides detailed information about the unit to ensure consistent and transparent assessment year on year.

This unit specification is for teachers and lecturers and contains all the mandatory information required to deliver and assess the unit.

This edition: May 2022 (version 1)

Unit purpose

This unit introduces learners to the concepts underpinning blockchain, and explores how this technology is used in a range of employment sectors, particularly financial technology (fintech). This non-specialist unit is intended for a wide range of learners, particularly those with a vocational interest in computing, financial services or supply chain management. However, all learners can benefit from developing an understanding of how this emerging technology is affecting business and society.

Learners gain an understanding of the basic principles of blockchain, and discover how the technology is used to create applications and services for a range of market sectors. The unit focuses on the core constructs that comprise blockchain, such as cryptography, distributed ledgers, block verification, smart contracts and cryptocurrency. It does not cover application development.

On completion of this unit, learners can progress to the Blockchain unit at SCQF level 8, which explores the coding principles of blockchain and how they are applied to create and enforce smart contracts and build distributed applications.

Unit outcomes

Learners who complete this unit can:

1 describe the development of blockchain
2 explain the operating principles of blockchain
3 describe the applications of blockchain

Evidence requirements

Learners must provide knowledge evidence for this unit. The evidence requirements for this unit takes one form.

Knowledge evidence

The knowledge evidence should relate to outcomes 1, 2 and 3. Knowledge evidence is required for all knowledge and skills statements. The amount of evidence may be the minimum required to infer competence. The evidence can be produced over an extended period under lightly controlled conditions.

Knowledge evidence can be sampled when testing is used. In this case, learners must produce the evidence under controlled conditions in terms of location (supervised), timing (limited) and access to reference materials (not permitted). The sampling frame must cover all outcomes (1, 2 and 3) but not all knowledge and skills statements. Most of the knowledge and skills should be sampled (at least once) in every instance. The sampling frame must include questions relating to the following knowledge and skills statements:

- Definition and derivation of blockchain
- Characteristics of a blockchain network
- Applications of blockchain (in at least two areas)

Learners' evidence can be written or oral or a combination of these. Evidence can be captured, stored and presented in a range of media (including audio and video) and formats (analogue and digital). You should consider digital formats and the use of multimedia.

The SCQF level of this unit (level 7) provides additional context on the nature of the required evidence and the associated standards. You should use appropriate level descriptors when making judgements about learners' evidence.

When evidence is produced under lightly controlled conditions, it must be authenticated. The Guide to Assessment provides further advice on methods of authentication.

The 'Additional guidance' section in this unit provides specific examples of assessment.

Knowledge and skills

The following table shows the knowledge and skills covered by the unit outcomes:

Knowledge	Skills
Learners should understand: ♦ the definition and derivation of blockchain ♦ the historical development of blockchain including distributed networks ♦ the milestones in the development of blockchain including Bitcoin ♦ blockchain concepts and components including blockchain nodes, cryptographic techniques and certificate authority ♦ the limitations of traditional transaction systems including types of market friction ♦ centralised and decentralised ledgers ♦ permissioned and permissionless ledgers ♦ the characteristics of a blockchain network ♦ blockchain standards including what constitutes a 'block' ♦ the importance of cryptography as a security provider for blockchain ♦ the roles in a blockchain system including regulator and certificate authority ♦ the types of security provided by blockchain including block verification processes ♦ peer nodes and the blockchain governance model ♦ the applications of blockchain, including financial services, cross-border finance, government, supply chain management, healthcare and the Internet of Things	Learners can demonstrate: ♦ communication skills ♦ presentation skills ♦ critical evaluation skills ♦ collaboration skills

Knowledge	Skills
Learners should understand: ♦ the role of smart contracts in the operationalising of business processes in the blockchain ♦ cryptocurrencies including Bitcoin and Scotcoin ♦ use of the blockchain through decentralised applications (dApps) to expedite application development ♦ the benefits and challenges of blockchain compared to traditional database technology ♦ the key considerations for implementing blockchain ♦ the ethical aspects of blockchain including improved transparency in the supply chain	

Meta-skills

Throughout the unit, learners develop meta-skills to enhance their employability in the computing sector.

Self-management

This meta-skill includes:

- integrity: ethics
- adapting: openness, adaptability

Social intelligence

This meta-skill includes:

- communicating: receiving information, listening, giving information
- feeling: empathy, social conscience
- collaborating: relationship building, team working and collaboration

Innovation

This meta-skill includes:

- curiosity: observation, questioning, problem recognition
- sense-making: pattern recognition, synthesis, analysis
- critical thinking: deconstruction, logical thinking, computational thinking

Literacies

Communication

Learners develop communication skills by working collaboratively with others in a small group and delivering presentations to the class.

Digital

Learners develop digital skills throughout this unit.

Delivery of unit

You should deliver and assess the outcomes sequentially, ideally with learners demonstrating knowledge in one outcome before proceeding to the following outcome.

We recommend that you use a small group approach and apply the principles of differentiated teaching. You could pair learners with strong technical skills and background with learners with less experience and skills. Likewise, you could pair more extroverted learners, who are comfortable presenting in a classroom environment, with learners who are less comfortable. Learners within the group should collaborate to build and deliver presentations demonstrating their understanding of the knowledge covered within the unit. You should assign more advanced learners with research activities on advanced topics and ask them to present their findings to the rest of the class.

To address the key considerations for implementing blockchain in outcome 3, we recommend that, where feasible, you assign learners a capstone project of building a high-level business plan. This should demonstrate not only an understanding of what goes into a plan for implementing a blockchain solution, but also that they can apply and transfer the knowledge on existing blockchain implementations and other topics covered in outcome 3. In the right context, learners can complete this activity in a small group, with each member of the group playing a unique role to further enforce employment readiness skills. These roles can include:

- PowerPoint creator
- researcher
- graphics and media specialist
- writer
- business analyst
- presenter
- salesperson

Suggested distribution of time across all outcomes

While the exact time allocated to this unit is at your centre's discretion, the notional design length is 40 hours.

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

Outcome 1 — Describe the development of blockchain
(12 hours)
Outcome 2 — Explain the operating principles of blockchain
(12 hours)
Outcome 3 — Describe the applications of blockchain
(16 hours)

You can carry out summative assessment at any time. However, when you use testing (see ‘Evidence requirements’ section) we recommend that you carry it out towards the end of the unit. When you use continuous assessment (such as the use of a blog), this can commence early in the life of the unit and continue throughout its duration.

There are opportunities to carry out formative assessment at various stages in the unit. For example, you can carry out formative assessment on the completion of each outcome to ensure that learners have grasped the knowledge contained within it. This would help you to diagnose misconceptions and intervene to remedy them before progressing to the next outcome.

Learners do not require previous knowledge or experience of blockchain. It is beneficial if they have some knowledge of cryptography and coding. They can evidence this with Higher National units in computer programming, data security or ethical hacking.

If you deliver this unit as part of a group award, we recommend that you teach and assess within the subject area of the group award to which it contributes.

Where evidence for outcomes is assessed on a sample basis, the whole of the content listed in the ‘Knowledge and skills’ section must be taught and available for assessment. You should not give learners advance information about the items they are being assessed on, and you should sample different items on each assessment occasion.

Additional guidance

The guidance in this section is not mandatory.

Content and context for this unit

This unit provides learners with the knowledge required to understand, communicate and apply the basic concepts of blockchain. It helps establish the foundation they need to pursue more technical skills and knowledge in blockchain and other related areas, such as financial services, computer programming, IT, and cyber security. This unit provides learners with a valuable narrative and subject-matter expertise on this rapidly evolving and disruptive emerging technology, which is in historic demand in the marketplace, and prepares them for the workplace.

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

Describe the development of blockchain (outcome 1)

The primary objective of this outcome is to provide learners with the key facts and details related to the historical evolution of blockchain technology. It gives them an understanding of the most basic components of blockchain via exposition, disambiguation (for example, the difference between blockchain and Bitcoin), and knowledge transfer on the key business impacts of this disruptive technology. Most learners should consider this knowledge and present it as their first introduction to blockchain.

Explain the operating principles of blockchain (outcome 2)

The primary objective of this outcome is to provide learners with a concrete mental model of the core principles and related processes that comprise blockchain solutions. It is extremely important that they demonstrate understanding of the system-based flow of blockchain transactions (for example, how data flows from user input through to governance models, peer nodes, and to a new block that is added to all peer nodes' ledgers) as a prerequisite to understanding how blockchain is applied in outcome 3 of this unit.

Describe the applications of blockchain (outcome 3)

The primary objective of this outcome is to provide learners with a broad understanding of how blockchain is currently used and how it is likely to be used in the near- to long-term future. This knowledge should prepare learners to transfer these applications to other market and solution types and to contribute or lead in the application of blockchain in their place of employment.

With the explosion of the fintech and cryptocurrency market in general, the demand for tech-savvy professionals has grown significantly. For example, online freelancing site, Upwork, saw the growth rate for blockchain jobs on the site surpass 2000 per cent for three quarters (2018) and posted a 6000 per cent year-over-year growth rate for that year. Furthermore, Burning Glass Technologies reports there were 5743 mostly full-time jobs in the blockchain sector posted in 2018, which represents an annual growth rate of 320 per cent.

Despite this marked increase in demand, there are scarce options for practitioners to be introduced to, or upskill in, blockchain knowledge and skills. The training and education sector has been slow to update its offerings to match current market requirements, particularly in emerging technology. The rapid emergence of blockchain has made this even more apparent.

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

Understanding the blockchain outcomes provided in this unit is a valuable set of skills for learners pursuing careers in environments where blockchain is currently being used, or being considered.

Potential blockchain-specific career roles for learners who have completed this unit include:

- IT professional, including app and dApp developers and cyber security specialists
- financial services and fintech professional in areas, such as investor advisory cryptocurrency services, and initial coin offering (ICO) support
- pre-sales and sales professionals for blockchain-related products and solutions

Existing or traditional market sectors that are experiencing a significant surge in demand for blockchain professionals include:

- fintech
- legal services
- insurance
- supply chain management
- commercial organisations
- governmental organisations

The concepts related to blockchain technology present an opportunity for learners to develop and apply the skills essential to computational thinking. The diversity of process types and systems that work together to support the blockchain can be complex, so you should reinforce computational thinking techniques as learners progress through this unit, to prepare them to apply and transfer their knowledge in a meaningful and practical manner.

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

- abstraction — understanding blockchain processes requires learners to think abstractly and to operate simultaneously on multiple layers of abstraction to master the principles and corresponding processes related to blockchain
- decomposition — given that blockchain transactions and solutions have many discrete components that work together in a system-based manner, learners must think and communicate about blockchain in a decomposed collection of largely independent and specialised technologies and processes

Specific outcome statements

Please note that the following guidance relating to specific outcomes does not seek to explain each knowledge and skills statement, which is at your discretion. Rather, 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 and skill.

Describe the development of blockchain (outcome 1)

The overarching goal in outcome 1 is to provide learners with the necessary foundational knowledge to understand how blockchain operates, as addressed in outcome 2. We strongly recommend covering the knowledge and skills in outcome 1 before progressing to the material in outcome 2. Learners should be comfortable describing what blockchain is, where it came from, and its core concepts and components, in preparation for learning how blockchain behaves in a system of processes in outcome 2.

A useful reference for teachers, lecturers and learners 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 at time of writing being Investopedia and the Bitcoin Wiki.

Wikipedia maintains frequently updated pages on most of the standalone topics covered in this unit. Nonetheless, it is important to note that these are information rather than education sites and, as such, should be used as a reference for keeping up with evolving technologies and standards related to blockchain.

Regarding some of the specific knowledge in this unit, you may find it useful to cover the below information.

Definition of blockchain

Many concise definitions that touch all the main topics of this unit are easily located online. The standard definition may change periodically, so it is good practice to research recent definitions prior to each term in which you deliver this unit.

A good standard definition of blockchain is from medium.com: ‘A blockchain is a cryptography-based, tamper-resistant distributed ledger that stores data in a consensus driven, peer-to-peer network.’

Historical development of blockchain, including distributed networks

The core technology of blockchain started in 1991 as a system in which documents' time stamps could not be altered in any way (Haber, Stuart; Stornetta, W. Scott (January 1991). 'How to time stamp a digital document'. Journal of Cryptology. 3 (2): 99–111. This approach was not adopted until Satoshi Nakamoto decided to utilise it to build the first blockchain in 2008, as the core component and distributed ledger technology for his ground-breaking cryptocurrency, Bitcoin.

The common misconception that Bitcoin and blockchain are the same thing can present a significant barrier to learning about blockchain. The key point to make in this distinction is that blockchain is a technology, and Bitcoin was the first application built on this technology. Bitcoin is one of several cryptocurrencies on the market, with new cryptocurrencies being created nearly every day via ICOs and through the release of blockchain platforms that require mining services. Cryptocurrency is only one application of blockchain technologies.

Limitations of traditional transaction systems, including types of market friction

The two key areas to address are:

- how blockchain addresses the double-spending problem via irreversible transactions, and how it prevents double spending of Bitcoin
- how blockchain significantly reduces the amount of time to not just process transactions but to clear settlements. You should consider international real-time payments, transparent transactions and how blockchain payments can make life easier for business-to-business (B2B) companies

Emergence of ICOs as a means of funding blockchain start-ups

You should present or discuss how start-ups, particularly tech start-ups, go through a standard series of venture capital funding phases (such as angel or seed funding, round 1, round 2, and so on) and how equity is distributed among shareholders accordingly. This helps learners to apply the venture capital approach to funding with the starkly different capitalisation alternative provided ICOs. You should research the definition of an ICO, and compare ICOs to traditional venture capital funding models.

There are good articles and references for ICOs on the internet, and new stories and relevant case studies are published daily. Because this aspect is evolving so rapidly, we suggest that you research the internet for the most recent case studies around ICO successes and challenges that you think learners might relate to easily.

Explain the operating principles of blockchain (outcome 2)

The skills and knowledge covered in this outcome are more complicated than those in outcome 1, given the challenges of understanding the technical concepts of blockchain management. To understand these concepts, it is important for learners to have a concrete mental model of how the end-to-end process works in serial and parallel modalities. Learners need to have a strong grasp of the operating principles of blockchain to understand how to apply it in outcome 3.

Below we outline some of the specific concepts you should cover in this unit.

Centralised and decentralised ledgers

Given that some learners have no prior experience or knowledge of accounting principles, it is helpful to introduce this topic by defining what a ledger is; for example, 'a book of records of all the financial transactions within an organisation'. You should provide examples of the type of information typically stored in a ledger, such as goods purchased, properties transferred and contract details, as a means for contextualising the general use for a ledger.

The definitions of centralised and decentralised ledgers can be researched online. A key point for learners is understanding the difference between the two:

- Centralised ledgers — traditional database technology has a centralised ledger, which decreases transparency in which a single point of failure can increase the likelihood of fraud or corruption
- Decentralised ledgers — blockchain and other distributed ledger technologies (DLTs) use decentralised ledgers, which maximise transparency and minimise the likelihood of fraud or corruption because distributed copies of the ledger are maintained in a governed manner across their respective peer nodes

It is useful to cover the following areas:

- Compare the two ledger types (centralised versus decentralised).
- Permissioned vs permissionless ledgers:
  - In the broadest terms, permissionless ledgers are completely open and transparent to all stakeholders in the blockchain (common for most cryptocurrency-based blockchains), whereas permissioned ledgers allow for point-to-point 'channels' to be created (for example, in the supply chain) that only allow members of the blockchain to see the blocks and the corresponding transaction data that they have the permission to view.
- Characteristics of a blockchain:
  - It uses cryptography to ensure privacy and security of transaction data.
  - It is difficult and expensive to change or manipulate the data that it stores.
  - It stores data in 'blocks' (each containing information on one or more transactions).
  - The distributed ledger for the blockchain is managed by several members of the blockchain, referred to as nodes or peer nodes.
  - The peer nodes must all agree on the validity of a new block before it is added to all the ledgers in a blockchain.
- Blockchain standards, including what constitutes a 'block':
  - A block in a blockchain consists of an index, a hash, some data, hash of the previous block in the chain, the timestamp from its creation, and a difficult-to-solve puzzle (used in the proof-of-work approach).
  - The International Organisation for Standardisation (ISO) currently has more than 10 international standards in development for blockchain (ISO/TC 307), covering everything from ontological standards to standards on governing legally binding contracts via smart contracts.

  - The development of blockchain standards is rapidly evolving: some vendor-specific consortia, such as the Enterprise Ethereum Alliance, are developing their own blockchain standards that conflict with the scope and tenor of the independent standard consortia.
- The importance of cryptography as a security provider for blockchain:
  - A general definition and introduction to cryptography should be carefully considered before positioning cryptography as a specific component of blockchain.
  - Given that the blockchain uses SHA256 cryptography, it can be a helpful exercise for learners to go to an SHA256 generator site, such as SHA256 hash generator, to see cryptography in action, and encourage them to use this encrypted approach to creating passwords to be more secure online.
  - Explain the difference between private and public keys.
  - Revisit the role of the crypto hash in the architecture of a block — it has its own hash that is generated by hashing its index, timestamp, and the hash of the previous block, and contains the hash of the previous block in the chain.
- Roles in a blockchain system, including the regulator and certificate authority:
  - Regulator: regulates the industry in a conventional manner and could play a major role in terms of how the blockchain is governed.
  - Certificate authority (CA): the centralised certificate authority for a blockchain stores all the public keys of users within a blockchain as part of a public key infrastructure (PKI) approach, to secure records within a blockchain. CAs ensure that those participating in a blockchain, such as a bank, are who they say they are using the certificate standard X.509.
  - Blockchain solution architect: designs the blockchain solution and oversees the development of the solution.
  - Blockchain solution engineers (‘developers’): develop the applications and smart contracts under the guidance of the blockchain solution architect.
  - Blockchain network administrators: like the existing role of a network administrator, they ensure that all the myriad components of the blockchain solution are maintained and working properly.
- Types of security provided by blockchain, including new block verification processes:
  - There are many benefits to the security provided by blockchain, with various levels of complexity and sophistication. There are three main types of security provided by blockchain solutions that fall within the intended scope of this unit.
    - The architecture of the blockchain itself provides security as each new block is linked to the previous block in a verifiable and fixed manner. This makes it extremely difficult to change an individual piece of data recorded in the blockchain.
    - Access to the blockchain is secured through a cryptographic scheme that requires users to use a private key to sign their transactions. If any record of their transaction is altered, their signature becomes invalid, thereby alerting all the members of the peer network that there is something wrong.
    - The distribution of ledgers across multiple networks means that even if a hacker were to successfully alter a record in one ledger (highly unlikely) this change would still have to be accepted via consensus through the block verification process by the other peer nodes — also highly unlikely and prohibitively expensive.

- Peer nodes and how they fit in the blockchain governance model:
  - The distributed ledgers of a blockchain are each individually managed by a peer node on a series of different servers. When a user attempts to add a new block to a blockchain (which may or may not require the initial validation of the transaction by a third party such as a bank) it must be accepted by a minimum consensus of 51 per cent before a block is added to all the ledgers managed by all of the peer nodes.
  - A slightly advanced concept is that peer nodes can get information stored in other peer nodes through standard HTTP protocols. This allows peer nodes to see, list, and retrieve the blocks stored in other peer nodes for purposes of validation and resolving issues when there are blocks of different lengths in different ledgers. This topic is covered more in-depth in the Blockchain unit at SCQF level 8.

Describe the applications of blockchain (outcome 3)

The overarching goal of this outcome is to prepare learners to understand how blockchain is currently being applied in the real world, such as: cryptocurrency and smart contracts; sector-specific applications, such as operationalising and enforcing legal contracts via smart contracts; and the implications for supply chain management. On understanding this outcome, learners should be capable of taking part in a professional conversation about what blockchain is, how it works, how it is used today, and how it may be used tomorrow.

You may find it useful to cover the specific information below.

- Applications of blockchain in financial services (such as fintech), cross-border finance, government, supply chain management, healthcare and the Internet of Things:
  - Examples of blockchain applications in these areas are easily available via researching examples on the internet. Given how rapidly these are evolving, we recommend that you research new case studies for every term that you deliver this content, to keep it relevant.
- The role of smart contracts in business processes in the blockchain:
  - If this is learners' introduction to smart contracts, you should consider providing a basic definition of the concept of smart contracts, such as the following definition from Investopedia: 'Smart contracts are self-executing contracts with the terms of the agreement between buyer and seller being directly written into lines of code. The code and the agreements contained therein exist across a distributed, decentralised blockchain network.'
  - Key smart contract use cases include:
    - identity management: enabling individuals to own and control their personal identity, data, digital assets and reputation
    - record management and automation: automatically digitising, filing, renewing, and releasing records
    - operationalising and enforcing legal contracts: converting traditional monolithic contracts into a series of modular self-executing and self-governing smart contracts
    - eliminating the mediator in transactions: digitising workflows that used to involve several mediators and intermediate parties can be eliminated, making transactions faster and less expensive
    - product provenance and tracking: tracking products throughout their lifecycle in the supply chain where each party in custody can log evidence about the product

- Cryptocurrency concepts and types, including Bitcoin and Scotcoin.
- A basic definition of the concept of cryptocurrency, such as the following definition provided by Investopedia: ‘A cryptocurrency is a digital or virtual currency that uses cryptography for security. [...] A defining feature of a cryptocurrency, and arguably its most endearing allure, is its organic nature; it is not issued by any central authority, rendering it theoretically immune to government interference or manipulation.’
- An overview of cryptocurrency with reference to resources such as Investopedia and the Bitcoin Wiki, at a level appropriate for learners.
- A well-maintained list of all known cryptocurrencies.
- An introduction to cryptocurrency wallets as a common means of buying, selling, storing, and using cryptocurrency. You should cover how cryptocurrency wallets work and how they are created.
- You can compare cryptocurrency exchanges with traditional stock market exchanges if time allows. You should consider the benefits and challenges of blockchain compared to traditional database technology.
- A comparison of blockchains versus centralised databases.
- The unique attributes and challenges of blockchain, including how dApps leverage the blockchain to expedite app development.
- A definition of dApps that run on the blockchain.
- Differentiate dApps from smart contracts — dApps perform several functions with several participants for both buyers and sellers, where smart contracts tend to be more transitionally oriented between two parties; for example, party A wants to sell item C to party B.
- Key attributes of all dApps:
  - Open source: the source code of the app is available to all
  - Decentralised: use a blockchain-like cryptographic technology
  - Incentive: the app has crypto-tokens or digital assets for fuelling itself
  - Algorithm or protocol: generates tokens and has an inbuilt consensus mechanism
- As blockchain already exists, dApp developers do not have to worry about building out their own underlying data structure, leaving them with just the business layer of the app to develop. This decreases development time.
- Key considerations for implementing blockchain.
- The application of blockchain to the career goals and interests of learners.
- Blockchain implementation strategies.

Approaches to assessment

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 and may vary greatly from one cohort of learners to the next.

Assessments on knowledge evidence could be achieved by a combination of:

1 Evidence-based assessment utilising the differentiated teaching methods described above (requiring the learners to create and present presentations to the class, demonstrating their knowledge).
2 Traditional multiple-choice assessments. In some circumstances, it can be more practical to carry out the entirety of the knowledge assessment with a traditional multiple-choice-based approach.

If you are using evidence-based assessment by way of presentations, you should have a checklist to mark the evidence of small group and individual presentations. The checklist 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.

If you carry out a multiple-choice assessment, it can be an online or paper-based selected-response test, comprising around 30 or 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. You should set a pass mark of 60 per cent.

An alternative approach to assessment involves learners using blogs to record their learning (and associated activities) throughout the life of the unit, as opposed to the group and individual presentation approach previously described. The blogs should provide knowledge evidence in the descriptions and explanations provided in learners' posts. You should assess learners' blogs using defined criteria to permit a correct judgement about the quality of the digital evidence. In this scenario, learners must evidence every knowledge and skill; sampling is not appropriate.

You should carry out formative assessments frequently to gauge the overall level of understanding of every topic of the entire learner cohort group.

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

You should deliver traditional multiple-choice summative assessments under supervision by appropriate staff in a closed-book environment. For the evidence-based summative assessment approach, you should allow learners to either work on their own or in groups, in and outside the classroom to create their presentation. Using a blog for summative assessment also facilitates formative assessment, since learning (including misconceptions) would be apparent from the blog, and remediation could take place to correct misunderstandings on an ongoing basis.

Where possible and practical, you should provide learners 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.

Equality and inclusion

This unit is designed to be as fair and as accessible as possible with no unnecessary barriers to learning or assessment.

You should take into account the needs of individual learners when planning learning experiences, selecting assessment methods or considering alternative evidence.

Guidance on assessment arrangements for disabled learners and/or those with additional support needs is available on the assessment arrangements web page: www.sqa.org.uk/assessmentarrangements.

Information for learners

Blockchain (SCQF level 7)

This section explains:

- what the unit is about
- what you should know or be able to do before you start
- what you need to do during the unit
- opportunities for further learning and employment

Unit information

This section helps 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 need to do during the unit and opportunities for further learning and employment.

This unit provides you with the knowledge required to understand, communicate, and apply the basic concepts of blockchain. It helps you establish the foundation required to pursue more technical skills and knowledge in blockchain and other related areas, such as financial services (fintech), computer programming, IT, and cyber security.

This unit provides you with valuable knowledge and skills in this rapidly evolving and disruptive emerging technology that is in historic demand in the job market.

You do not require previous knowledge or experience of blockchain before you start this unit, but it is beneficial if you have some knowledge of cryptography and coding. For example, Higher National units in computer programming, data security or ethical hacking.

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

Once you successfully complete this unit, you can:

1 describe the development of blockchain and define its most essential components
2 explain the operating principles of blockchain and how transactions are processed from individual records to blocks contained across a distributed network
3 describe the current applications of blockchain in a manner that is relevant to employers and other blockchain professionals

At key points within each outcome, you have opportunities to assess the knowledge and skills you have gained. This assessment may take the form of a group or individual-based presentation or a traditional multiple-choice closed-book assessment.

Throughout this unit you develop meta-skills. Meta-skills are timeless, higher-order skills that support the development of additional skills and promote future success. These meta-skills include:

- teamworking and collaboration
- communicating
- problem recognition
- receiving information
- giving information
- observation

On completing this unit, you may want to continue building your knowledge of blockchain and further prepare yourself for a more technical job role in blockchain. You can progress to:

- Blockchain at SCQF level 8
- a Higher National qualification in cyber security

Administrative information

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Superclass: CB

History of changes

Version	Description of change	Date

Note: please check SQA's website to ensure you are using the most up-to-date version of this document.