Group Award Specification for:

PDA Data Science (SCQF level 7)
PDA Data Science (SCQF level 8)
PDA Data Science (SCQF level 9)

Group Award Code: GR68 47
GR67 48
GR66 49

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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.

Data science is one of a number of emerging technologies, which include artificial intelligence and cloud computing, that are becoming increasingly important in modern societies. 'Big Data analytics' was one of four technologies (along with cyber security, mobile computing and cloud computing) identified by *The Tech Partnership* as an area of future skills shortage (Employer Insights, 2017). The skills shortage in data science has been widely reported.

Qualifications in data science will attract learners for a number of reasons. The demand for data skills is high among employers. Most contemporary jobs require data skills of some kind, and the ability to manipulate data, and draw insights from it, is a valuable skill for any employee. Data science is a prominent topic in the media, which will drive demand for qualifications. And the need for specialist skills in data science is forecast to grow significantly over the next decade. Centres that offer this suite of awards are likely to find strong demand among learners for the qualifications.

Data science is defined as:

Data science provides meaningful information based on large amounts of complex data or big data. Data science, or data-driven science, combines different fields of work in statistics and computation to interpret data for decision-making purposes.

Investopedia

Data science is a multi-disciplinary field, and data scientists are required to possess a range of skills including data skills, statistical skills and analytical skills.

'Effective data scientists are able to identify relevant questions, collect data from a multitude of different data sources, organize the information, translate results into solutions, and communicate their findings in a way that positively affects business decisions. These skills are required in almost all industries, causing skilled data scientists to be increasingly valuable to companies.'

'What is Data Science?', Berkeley University

Skills in accurately formulating the data question, carrying out reproducible analysis on large datasets and then presenting the findings in an actionable format are particularly important.

'The ability to take data — to be able to understand it, to process it, to extract value from it, to visualize it, to communicate it — that's going to be a hugely important skill in the next decades.'

Hal Varian, chief economist at Google

Education has responded to the growing demand for data skills by providing qualifications in data science/data analytics at graduate and post-graduate levels (SCQF levels 9–12) including a graduate apprenticeship. Recent reports have highlighted the need for improved provision at school and college, including *Analytic Britain* (Nesta, 2015) and *Dynamics of Data Science* (Royal Society, 2019). SQA recently (2019) introduced new national qualifications in data science at SCQF levels 4, 5 and 6. The *National Progression Awards in Data Science* are designed to provide basic skills in this area and stimulate interest in data science among young learners.

There are few qualifications at intermediate level (SCQF levels 7–9) in this area. Two initiatives seek to address that. A new *HND Data Science* (SCQF level 8) will be developed during 2020–21; this two-year, full time qualification will be available in colleges for first delivery in August 2021. It will be designed for learners who wish to pursue a career in data science/data analysis. It is likely that it will be included in appropriate Modern Apprenticeships. The second initiative is the development of this suite of Professional Development Awards. These smaller qualifications, available at SCQF levels 7, 8 and 9, are designed for people in employment and those who wish to retrain in the field.

The **Professional Development Awards (PDAs) in Data Science** provides a suite of intermediate (SCQF levels 7, 8 and 9) qualifications to address the educational and training requirements of two distinct cohorts of learners.

1 Learners who wish to gain data skills and analysis skills to improve their existing work role effectiveness (data workers).
2 Learners who wish to develop data analysis/data science knowledge and skills to specialise in the field (data professionals).

The **SCQF level 7** award is designed for people in employment who wish to acquire data skills as part of their current job role. The **SCQF level 9** award is designed for learners who wish to retrain or transition into a career in data science. The **SCQF level 8** award is designed for both — people in employment who wish to gain analysis skills to progress in their current job role or progress to a specialist role in data analysis.

The focus of the award at SCQF level 7 is to improve the learner's effectiveness in their current job role, which may be non-technical and not directly related to data science. The SCQF level 8 award may be used for progression to more advanced and specialised qualifications in data science as a pathway to a career change. The focus of the SCQF level 9 award is prepare learners for a specialist job role in data science/data analysis.

This qualification articulates with a number of qualifications.

- HND Data Science
- HND Computer Science
- Technical Apprenticeship in Data Analytics
- Graduate Apprenticeship in Data Analytics
- BSc Computer Science
- BSc Data Science.

If a learner wishes to specialise in data science, a variety of future career opportunities will be available including:

- Business intelligence analyst
- Data analyst
- Data engineer
- Data scientist
- Machine learning engineer

Although there is no formal professional recognition for this qualification, nor formal articulation arrangements with colleges or universities, the qualification was designed in consultation with employers and representatives from colleges and universities to ensure that it meets their requirements.

SQA would like to thank the following organisations for their contributions to this qualification:

- Edinburgh College
- Effini Limited
- Fife College
- New College Lanarkshire
- Skills Development Scotland
- The DataLab
- University of Edinburgh
- University of Strathclyde

2 Qualifications structure

This group award is available at **three levels**: SCQF level 7, 8 and 9.

The award comprises three SQA credits at SCQF level 7 (22 SCQF points); four SQA credits at level 8 (32 SCQF points); and five SQA credits at SCQF level 9 (40 SCQF points). The award, at all three levels, includes mandatory units (16–32 SCQF points) that must be taken by all learners. The remaining unit (6–8 SCQF points) is optional and will be selected from a list of optional units.

A mapping of Core Skills development opportunities is available in Section 5.3.

2.1 Structure

The structure of each qualification differs from level to level. The **SCQF level 7** award requires **3 credits** (22 SCQF credit points), **SCQF level 8** requires **4 credits** (32 SCQF credit points), and **SQCF level 9** requires **5 credits** (40 SCQF credit points).

SCQF level 7: Both mandatory units and one optional unit must be selected

4 code	2 code	Unit title	SQA credit	SCQF credit points	SCQF level
Mandatory units					
J4Y4	34	Working with Data	1	8	7
J4Y5	34	Communicating with Data	1	8	7
Optional units (select one)					
HT9T	34	Artificial Intelligence	1	8	7
J0HA	34	Computer Programming	1	8	7
J2GT	46	Data Science Project	1	6	6
J0H9	34	Data Security	1	8	7
J0J9	34	Machine Learning	1	8	7
J4YB	35	Programming for Data	1	8	8
J4Y8	35	Statistics for Data	1	8	8
J4Y3*	36	Data Science Project	2	16	9

*Refer to History of Changes for revision changes.

SCQF level 8: All mandatory and one optional unit must be selected

4 code	2 code	Unit title	SQA credit	SCQF credit points	SCQF level
Mandatory units					
J4Y6	35	Working with Data	1	8	8
J4Y7	35	Communicating with Data	1	8	8
J4Y2	35	Data Science Project	1	8	8
Optional units (select one)					
J4Y9	35	Data Management	1	8	8
J1BB	35	Machine Learning	2	16	8
J4YB	35	Programming for Data	1	8	8
J4Y8	35	Statistics for Data	1	8	8

SCQF level 9: Both mandatory units and one optional unit must be selected

4 code	2 code	Unit title	SQA credit	SCQF credit points	SCQF level
Mandatory units					
J4YC	36	Data Engineering	2	16	9
J4Y3	36	Data Science Project	2	16	9
Optional units (select one)					
J4Y9	35	Data Management	1	8	8
J4YD	36	Machine Learning	2	16	9
J4YA	36	Statistics for Data	1	8	9

2.2 Selection of optional unit

The choice of optional unit can customise the award for different audiences. For example, at SCQF level 8, learners who want to improve their analysis skills (only) and not specialise in the area, may select the *Data Management* unit; learners who intend to specialise in the field, may select a more technical optional unit such as *Programming for Data* or *Machine Learning*. The choice of *Data Security* (SCQF level 7) and *Data Management* (SCQF level 8) would lead towards data oversight and governance roles.

The choice of optional unit would also affect progression. For example, learners who undertake the SCQF level 8 award with a view to progressing to SCQF level 9 would be best selecting an optional unit (such as *Statistics for Data*) at SCQF level 8 that facilitates progression to SCQF level 9.

3 Aims of the qualifications

The over-arching aim (of all three awards) is to develop learners' data analysis skills and gain an appreciation of the wider field of data science.

The aims of the qualification are categorised as **general aims** and **specific aims**. General aims relate to broad educational objectives; specific aims relate to the vocational area. Please note that general aims may be repeated in specific aims but contextualised in the vocational area. The specific aims at SCQF level 8 and SCQF level 9 are in addition to (or a refinement of) the specific aims at lower level(s).

The order of the aims provides a broad indication of their relative importance.

3.1 General aims of the qualifications

1 Develop academic abilities, consistent with the SCQF level of the qualification, to facilitate progression to further studies.
2 Develop vocational competencies and improve work-role effectiveness.
3 Develop a range of transferable skills, particularly numeracy, communication and problem- solving skills.
4 Develop a range of technical skills, particularly computational and statistical skills.
5 Develop awareness of data science as a career and improve the supply of skilled data workers and data professionals.
6 Develop an awareness of data ethics.

3.2 Specific aims of the qualifications

3.2.1 SCQF level 7

7 Improve the data skills of learners to prepare them to work more capably with data in their role as data workers.
8 Develop learners' statistical and communication skills as they relate to data science.
9 Develop analytical skills to gain insights into datasets and make data-driven decisions in a business or organisational context.
10 Permit learners to explore specialised areas of data science such as artificial intelligence or machine learning.

3.2.2 SCQF level 8

11 Develop learners' analysis and communication skills to prepare them to work in a data professional role.
12 Appreciate the range of tools and techniques available for data analysis, including packages, visualisation tools, notebooks and programming languages.
13 Create data models, using large datasets, to gain insights into business data using a range of visualisations and dashboards.
14 Create reproducible and automatable analyses of large datasets.
15 Apply their knowledge and skills, in a collaborative context, to the analysis of large and/or complex datasets to produce insights.

3.2.3 SCQF level 9

16 Apply engineering techniques to the implementation of data science systems.
17 Carry out a start-to-finish analysis of a large, complex dataset to provide insights of real value to an organisation.
18 Work with domain experts to provide insights into business data.
19 Permit learners to specialise in machine learning or statistical learning.
20 Adhere to the regulatory, legal, ethical and governance standards when working with data.

4 Recommended entry to the qualifications

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.

Professional Development Awards (PDAs) are designed for people in employment and those wishing to retrain in a new field. Qualifications in data science are likely to attract a wide range of learners, with varied experiences and prior qualifications. Given the multi-disciplinary nature of data science, a wide range of subjects may provide the necessary foundation for attempting this award. The entry requirements for these learners will vary from learner to learner, depending on their individual experiences and motivations.

However, to benefit from undertaking the qualifications, at any level, learners should possess appropriate numeracy, communication and problem-solving skills, prior to entry. No previous experience of data analysis is essential for entry to any of the levels.

The **SCQF level 7** award, in particular, is designed for learners with no previous experience of data analysis; however, a familiarity with spreadsheet software is desirable.

The **SCQF level 8** award is also designed for learners with no previous experience of data analysis but, in this case, learners would be expected to possess more advanced numeracy skills.

The **SCQF level 9** award is designed for learners who wish to specialise in data science and, as such, previous experience of data analysis, or a related subject, is required. However, direct entry to this level for graduates in STEM-based subjects is feasible. Previous programming experience is recommended.

The qualification has been designed to facilitate progression from level to level. The ideal entry requirements for SCQF level 8 and SCQF level 9 is possession of the lower level of the award.

Possession of specialist qualifications in data science is particularly appropriate. For example, learners who possess NPA Data Science at SCQF level 6 will be well prepared for the PDA Data Science at SCQF level 7 (and, perhaps, SCQF level 8).

The recommended entry for each unit defines the knowledge and skills that learners should possess before attempting specific units within this award.

4.1 Core Skills entry profile

Core Skills exist, in five areas, at SCQF levels 2–6. The following table illustrates the level of core skill, in each of the areas, which learners should possess to have a realistic prospect of gaining the qualification.

Core Skill	Recommended SCQF entry profile		
	Data Science level 7	**Data Science level 8**	**Data Science level 9**
Communication	SCQF level 5	SCQF level 5	SCQF level 6
Numeracy	SCQF level 6	SCQF level 6	SCQF level 6
Information and Communication Technology	SCQF level 5	SCQF level 6	SCQF level 6
Problem Solving	SCQF level 5	SCQF level 5	SCQF level 6
Working with Others	SCQF level 5	SCQF level 5	SCQF level 6

The table permits centres to identify additional learning support that will need 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.

4.2 Core Skills exit profile

All component units embed Core Skills. The following table summarises the exit profile of learners who gain the qualification (assuming that they satisfy the corresponding entry profile). Levels **in bold** highlight where Core Skills have been improved.

Core Skill	SCQF exit profile		
	Data Science level 7	**Data Science level 8**	**Data Science level 9**
Communication	**SCQF level 6**	**SCQF level 6**	SCQF level 6
Numeracy	SCQF level 6	SCQF level 6	SCQF level 6
Information and Communication Technology	**SCQF level 6**	SCQF level 6	SCQF level 6
Problem Solving	**SCQF level 6**	**SCQF level 6**	SCQF level 6
Working with Others	SCQF level 5	**SCQF level 6**	SCQF level 6

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 skill, known as Core Skills through doing this qualification.

5.1 Mapping of qualification aims to units

Code	Unit title	SCQF level	Aims																		
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
J2GT 46	Data Science Project	6	X	X	X	X	X	X	X	X												
HT9T 34	Artificial Intelligence	7	X	X	X	X		X	X			X										
J4Y5 34	Communicating with Data	7	X	X	X	X	X	X	X	X	X	X		X								
J0HA 34	Computer Programming	7	X	X	X	X		X														
J0H9 34	Data Security	7	X	X		X		X		X	X											
J0J9 34	Machine Learning	7	X	X	X	X		X	X			X										
J4Y4 34	Working with Data	7	X	X	X	X	X	X	X	X	X	X										
J4Y7 35	Communicating with Data	8	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
J4Y9 35	Data Management	8	X	X	X	X	X	X		X	X		X	X								
J4Y2 35	Data Science Project	8	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
J1BB 35	Machine Learning	8	X	X	X	X		X	X			X	X	X	X							
J4YB 35	Programming for Data	8	X	X	X	X	X	X	X	X	X		X	X	X							
J4Y8 35	Statistics for Data	8	X	X	X	X						X	X	X	X	X						
J4Y6 35	Working with Data	8	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
J4YC 36	Data Engineering	9	X	X	X	X	X	X		X	X		X		X			X	X	X	X	X
J4Y3 36	Data Science Project	9	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
J4YD 36	Machine Learning	9	X	X		X		X	X			X			X			X	X	X	X	X
J4YA 36	Statistics for Data	9	X	X	X	X	X	X	X	X		X						X	X	X	X	X

5.2 Mapping of National Occupational Standards (NOS)

The National Occupational Standards (NOS) for IT professionals are industry standards for skills, developed in collaboration with employers, professional bodies and others. They are continually updated for all key disciplines of the tech profession and provide the building blocks for qualifications and training. The IT (Data Science) National Occupational Standards are organised in five sub-disciplines (May 2020):

1 Data Management
2 Data Analytics
3 Data Science
4 Artificial Intelligence
5 Machine Learning

Furthermore, Cyber Security NOS are also applicable to some option units within the PDA Data Science. All NOS relevant to PDA Data Science are:

NOS discipline	Sub-discipline	Level 3		Level 4	
Cyber Security	Information Security Governance	TECIS60131	Contribute to information security governance activities		
	Security Testing	TECIS60431	Contribute to information security testing activities		
	Secure Operations Management, Vulnerability Assessments, and Identity and Access Management	TECIS60531	Contribute to operational information security management activities		
		TECIS60532	Contribute to information security vulnerability assessments		
		TECIS60533	Contribute to information security identity and access management activities		
Data Science	Data Management	ESKITP801301	Assist in delivering the data management infrastructure to support data analysis and reporting	ESKITP801401	Deliver data management infrastructure projects to support data analysis and reporting
	Data Analytics	ESKITP802301	Assist in delivering routine data analysis studies	ESKITP802401	Design and implement data analysis studies

NOS discipline	Sub-discipline	Level 3		Level 4	
Data Science (cont)	Data Science	ESKITP803301	Assist in delivering data driven business insights	ESKITP803401	Deliver data driven business insights using a range of data sources
	Artificial Intelligence			TECIS804301	Assisting in the development and implementation of artificial intelligence and solutions
	Machine Learning			TECIS805301	Assist in the development and implementation of machine learning

Code	Unit title	SCQF level	National Occupational Standard												
			TECIS60131	TECIS60431	TECIS60531	TECIS60532	TECIS60533	ESKITP801301	ESKITP801401	ESKITP802301	ESKITP802401	ESKITP803301	ESKITP803401	TECIS804301	TECIS805301
J2GT 46	Data Science Project	6					X	X		X		X			
HT9T 34	Artificial Intelligence	7					X							X	
J4Y5 34	Communicating with Data	7					X	X		x		X			
J0HA 34	Computer Programming	7					X	X				X			
J0H9 34	Data Security	7	X	X	X	X	X								
J0J9 34	Machine Learning	7					X	X		X		X		X	X
J4Y4 34	Working with Data	7					X	X		X		X			
J4Y7 35	Communicating with Data	8					X		X		X		X		
J4Y9 35	Data Management	8					X	X		X		X			
J4Y2 35	Data Science Project	8					X		X		X		X	X	X
J1BB 35	Machine Learning	8					X							X	X

Code	Unit title	SCQF level	National Occupational Standard												
			TECIS6 0131	TECIS6 0431	TECIS6 0531	TECIS6 0532	TECIS6 0533	ESKITP 801301	ESKITP 801401	ESKITP 802301	ESKITP 802401	ESKITP 803301	ESKITP 803401	TECIS8 04301	TECIS8 05301
J4YB 35	Programming for Data	8					X	X		X		X			
J4Y8 35	Statistics for Data	8					X	X				X			
J4Y6 35	Working with Data	8					X		X		X		X		
J4YC 36	Data Engineering	9					X		X		X		X	X	X
J4Y3 36	Data Science Project	9					X		X		X		X	X	X
J4YD 36	Machine Learning	9					X							X	X
J4YA 36	Statistics for Data	9					X						X		

5.3 Mapping of Core Skills development opportunities across the qualifications

Core Skills can be delivered within an award by embedding them (in which case the award will lead to additional certification for learners' Core Skills) or signposting them (which does not lead to certification). Some Core Skills may be embedded in the units ('E' denotes 'embedding') and some units signpost certain Core Skills ('S' denotes 'signposting'). This is summarised in the table below.

Unit code	Unit title	SCQF level	Communication			Numeracy		ICT		Problem Solving			Working with Others	
			Written (Reading)	Written (Writing)	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
J2GT 46	Data Science Project	6		S(6)	S(6)		S(6)	S(6)	S(6)	E(5)	E(5)	E(5)		
HT9T 34	Artificial Intelligence	7								E(5)				
J4Y5 34	Communicating with Data	7		S(6)	S(6)	S(6)	S(6)	S(6)	S(6)	S(6)		S(6)		
J0HA 34	Computer Programming	7						S(5)	S(5)	E(5)				

Unit code	Unit title	SCQF level	Communication			Numeracy		ICT		Problem Solving			Working with Others	
			Written (Reading)	Written (Writing)	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
J0H9 34	Data Security	7						E(5)	E(5)	E(5)			S(5)	
J0J9 34	Machine Learning	7				S(5)	S(5)	S(5)		E(5)				
J4Y4 34	Working with Data	7				S(6)	S(6)	E(6)	E(6)	E(6)				
J4Y7 35	Communicating with Data	8				S(6)	S(6)		S(6)	S(6)	S(6)	S(6)	S(6)	S(6)
J4Y9 35	Data Management	8				S(6)		S(6)	S(6)	S(6)			S(5)	
J4Y2 35	Data Science Project	8		S(6)	S(6)		S(6)	S(6)	S(6)	S(6)	S(6)	S(6)	S(6)	S(6)
J1BB 35	Machine Learning	8				S(6)	S(6)	S(6)	E(6)	E(6)				
J4YB 35	Programming for Data	8				S(6)		S(6)	S(6)	E(6)	E(6)	E(6)		
J4Y8 35	Statistics for Data	8				S(6)	S(6)	E(6)	E(6)	S(6)				
J4Y6 35	Working with Data	8				S(6)	S(6)	E(6)	E(6)	E(6)	E(6)			
J4YC 36	Data Engineering	9							S(6)	S(6)				
J4Y3 36	Data Science Project	9		S(6)	S(6)		S(6)	S(6)	S(6)	S(6)	S(6)	S(6)		
J4YD 36	Machine Learning	9				S(6)	S(6)	S(6)		S(6)				
J4YA 36	Statistics for Data	9				S(6)	S(6)	S(6)						

5.4 Assessment strategy for the qualifications

Unit code	Unit title	SCQF level	Evidence requirements		
			Knowledge	Product	Performance
J2GT 46	Data Science Project	6		X	
HT9T 34	Artificial Intelligence	7	X	X	
J4Y5 34	Communicating with Data	7	X	X	
J0HA 34	Computer Programming	7	X	X	
J0H9 34	Data Security	7	X	X	
J0J9 34	Machine Learning	7	X	X	
J4Y4 34	Working with Data	7		X	
J4Y7 35	Communicating with Data	8		X	X
J4Y9 35	Data Management	8	X	X	
J4Y2 35	Data Science Project	8		X	X
J1BB 35	Machine Learning	8	X	X	
J4YB 35	Programming for Data	8		X	
J4Y8 35	Statistics for Data	8	X	X	
J4Y6 35	Working with Data	8		X	
J4YC 36	Data Engineering	9	X	X	
J4Y3 36	Data Science Project	9		X	X
J4YD 36	Machine Learning	9	X		
J4YA 36	Statistics for Data	9	X	X	

Most units require two types of evidence: knowledge evidence and product evidence. Normally, evidence is required for all outcomes and performance criteria. Some units permit knowledge evidence to be sampled when testing is used. Typically, knowledge evidence is produced by a selected response test and product evidence is produced by a practical assignment. The guidelines on assessment, within the support notes, suggest that this could take the form of both computer-marked tests and human-marked responses, and practical analyses for product evidence.

6 Guidance on approaches to delivery and assessment

PDA Data Science is designed for learners who wish to gain or improve their data skills, either to pursue a career in data science or to improve their effectiveness in their work-role. The SCQF level 7 award is explicitly designed for the latter cohort, although it can be used as stepping stone to higher levels in the suite of awards. The SCQF level 9 award is designed to produce data professionals — individuals who wish to pursue a career in data science in specialist roles such as business analysts and data engineers. The SCQF level 8 award is for both groups. Learners with no career goals in data science can use it as an exit point to further develop their data skills (for their current work roles) and learners with a career aspirations in data science can use it as an entry point to commence their studies in this field.

The qualification can be delivered in a number of ways, including full-time, part-time or day-release. This award has been designed so that learners understand the key skills involved in consuming, producing, analysing and managing data. The flexibility of the optional units will allow centres to create a customised qualification built around the priorities of their learners.

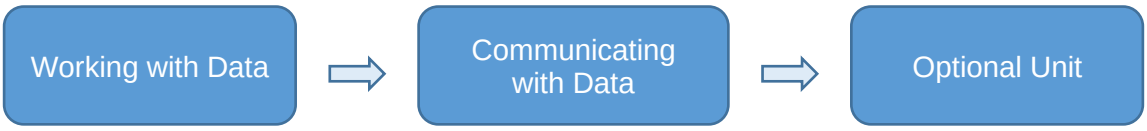
Centres could adopt the following suggested delivery methods:

- lectures
- tutorials
- virtual learning labs
- projects
- group work
- case studies

6.1 Sequencing/integration of units

At SCQF level 7, it is suggested to complete the mandatory units prior to the optional unit with a limited number of exceptions.

SCQF level 7:



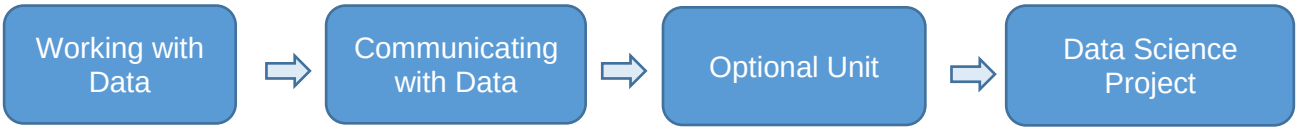
The optional units that could be completed out of sequence are:

- Data Security
- Data Management

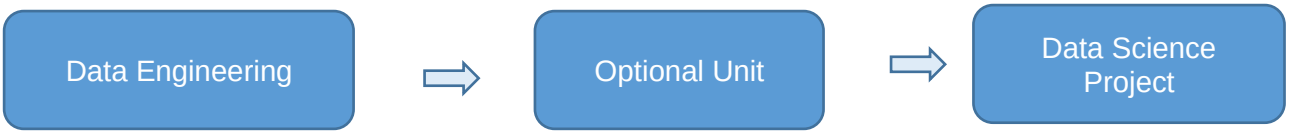
Working with Data and *Communicating with Data* units have considerable scope to be combined and delivered as a single curriculum, and their assessments combined into a single, integrated practical activity.

At SCQF levels 8 and 9, it is suggested that the mandatory units and the optional unit are completed prior to attempting the *Data Science Project* unit. The following delivery sequences are recommended at each level.

SCQF level 8:



SCQF level 9:



It is possible for the units to be delivered separately by lecturers with different skillsets and knowledge areas.

At SCQF level 7, there is no requirement for programming. However, if a learner wishes to progress to the SCQF level 8 award, it is recommended that they take the option *Programming for Data*, as all units at SCQF level 8 and beyond are built on an assumption of a capability to write procedural code. Therefore, it is recommended that if learners have no prior experience of coding, then they commence with this unit.

6.1.1 Treatment of programming

The qualification has been designed permit learners without programming skills to undertake it. The SCQF level 7 award requires no programming knowledge or skills. The required analysis (in units such as *Working with Data* and *Communicating with Data)* can be done using low code or no code software such as Microsoft Excel™ or Power BI™. It is expected that learners who undertake the SCQF level 8 award will possess, or acquire, some coding skills, although this may be "non-standard" skills in functional programming languages (such as DAX) or skills in using notebooks such as Noteable™. The SCQF level 9 award *does* require coding skills. Units such as *Data Engineering* assume that learners possess programming knowledge and skills — and build on that knowledge.

General purpose programming languages (such as Python) and statistical programming languages (such as R) can be used at any level. However, care should be taken at lower levels (particularly SCQF level 7) due to the steep learning curves involved in using these languages. These languages are well-suited to SCQF level 9.

The treatment of programming will depend on the vocational goals of learners. Non-specialist learners, who only wish to gain data skills as part of their current work role, are unlikely to want (or need) to learn programming languages. For this cohort, the focus should be the acquisition of data skills using no/low code environments. Conversely, learners who wish to pursue a career in data science should be exposed to programming at the earliest opportunity.

There are two dedicated units that deal with programming. *Computer Programming* (SCQF level 7), which is an optional unit within the SCQF level 7 award, is a good, gentle introduction to coding. *Programming for Data* (SCQF level 8), which is an optional unit within the SCQF level 8 award, focusses on data programming. It is recommended that learners who wish to progress through the qualifications, with a view to employment in data science, select both of these optional units. *Computer Programming* also provides a taster in coding for learners who are unsure about their vocational goals.

6.1.2 Ethics

Data ethics is an important part of this suite of qualifications. Raising awareness of data ethics among learners is a general aim of this qualification (see page 6) at all levels. This aim is manifested within the award in a number of ways.

Several units (Mandatory (M) and Optional (O)) explicitly reference data ethics in their outcomes and associated knowledge and skills statements. The following table shows the units that incorporate ethics.

Code	Unit title	SCQF level	Type of unit	Covered	Outcome	Ethics referenced	Unit content
J4Y5 34	Communicating with Data	7	M	Yes	2	Statement of Standards (SoS) (Knowledge and Skills (K/S)	Ethical considerations (*in the explanation of features of effective data communication*).
J4Y4 34	Working with Data	7	M	Yes	1	SoS (K/S)	Data quality including data bias.
					2	SoS (K/S)	Legal and ethical considerations for data storage.
J4Y7 35	Communicating with Data	8	M	Yes	3	SoS (K/S)	Ethical considerations in the communication, visualisation and presentation of data.
J4Y9 35	Data Management	8	O	Yes	2	SoS (K/S)	Ethics and legislation relating to data management.
					3	SoS (K/S)	Ethical considerations in data governance.
J4Y2 35	Data Science Project	8	M	Yes	1	SoS (K/S)	Ethical and legal considerations of a data science project.
J4YB 35	Programming for Data	8	O	No	N/A	N/A	N/A
J4Y8 35	Statistics for Data	8	O	No	N/A	N/A	N/A
J4Y6 35	Working with Data	8	M	Yes	1	SoS (K/S)	Ethical implications of business requirements.
					2	SoS (K/S)	Ethical issues in data sourcing and extraction.
					3	SoS (K/S)	Legal and ethical considerations for data storage.
J4YC 36	Data Engineering	9	M	Yes	1	SoS (K/S)	Trends in data engineering including data ethics.
J4Y3 36	Data Science Project	9	M	Yes	1	SoS (K/S)	Ethical issues in data science and how they relate to the project.
J4YD 36	Machine Learning	9	O	Yes	4	SoS (K/S)	Ethical implications of machine learning and deep learning
J4YA 36	Statistics for Data	9	O	No	N/A	N/A	N/A

Both mandatory units at SCQF levels 7 and 8 require learners to consider ethical issues, particularly problems associated with data bias.

The evidence requirements for some units require learners to provide evidence that ethics have been considered. For example, *Communicating with Data* at SCQF level 8 requires, as part of the observation evidence, that learners have taken ethical issues into consideration when they create and present their data dashboards.

The support notes in many units highlight data ethics. For example, *Programming with Data*, at SCQF level 8, requires learners to consider data bias and algorithmic bias, and possible strategies to address these issues.

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.

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

There are no formal articulation routes for this award. However, the qualification could lead to a number of potential destinations including under-graduate and post-graduate degree courses in data science.

The main progression for this award is from level to level. The most likely progression paths are:

Data workers: SCQF level 7 to SCQF level 8
Data professionals: SCQF level 8 to SCQF level 9

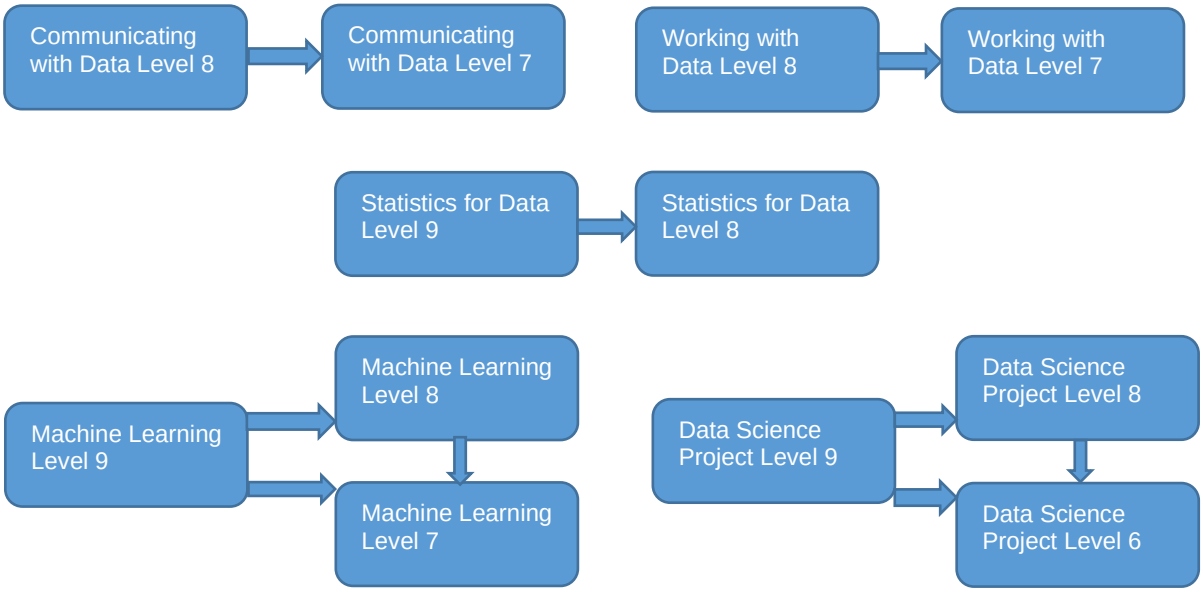
6.2.2 Credit transfer

The progression of the following units through the SCQF levels is accomplished by increasing the:

- ♦ amount of content (higher levels may contain new topics)
- ♦ scope of content (higher levels may expand the content of lower levels)
- ♦ complexity of content (higher levels may study the content in more complex ways)

Therefore, leaners who have successfully completed the higher level units will be awarded full credit transfer to the lower level units. For example, if a learner has passed the Level 9 Machine Learning unit, s/he will automatically achieve the Level 7 or Level 8 unit without providing additional evidence.

Centres must retain the evidence for the higher level unit and enter the learner for the lower level unit otherwise the learner will not be certificated.



6.3 Opportunities for e-assessment

Some of the assessments for this qualification will be available via SOLAR www.sqasolar.org.uk. If your centre is not already on SOLAR you can complete the form on the SOLAR website and get immediate access. The SOLAR website contains training materials and answers many of the common questions you may have. If you would like to know more contact the SOLAR team on **solar@sqa.org.uk**.

6.4 Support materials

A **list of existing ASPs** is available to view on SQA's website.

6.5 Resource requirements

Learners will require access to computing resources capable of carrying out data analysis. Internet access will be required to use some online resources.

The qualification should not be delivered using general purpose software (such as spreadsheet software) for SCQF level 8 and above. Any programming languages designed for data analysis (such as Python and R) will be suitable. In addition, source control software will also be necessary (such as git). Specialist visualisation tools (such as Tableau or PowerBI) may also be used.

Learners will require Internet access to use a variety of online resources including accessing cloud environments. Learners may require their own accounts for cloud services or source control environments.

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 assessments 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)

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
02	**Additional Unit:** J4Y3 36 Data Science Project has been added as an optional unit.	11/10/2022

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.

The Professional Development Award in Data Science is available at three levels: SCQF level 7, SCQF level 8 and SCQF level 9. The SCQF level 7 qualification is comprises three units; the SCQF level 8 qualification is comprised of four units; and the SCQF level 9 qualification is comprised of three units (two double-credit units). Each credit is expected to take around 40 hours of learning and an additional 40 hours of independent study.

The qualification aims to develop your knowledge and practical skills in data science. Data science is an increasingly important field as the world becomes digitised and organisations move towards making data-driven decisions either internally or for their customers. Jobs in data science include data analysts, data engineers, data management, machine learning engineers or business intelligence analysts. Equally as important are existing roles such as finance analysts or marketeers that now require data science skills to make them more efficient, accurate or effective. SCQF level 7 is suitable for those that interpret data on a daily basis and wish to start to produce their own reports. SCQF level 8 is suitable for those who already produce data but wish to improve their skills and effectiveness. SCQF level 9 is suitable for those wishing to become a data analyst and require a good grounding in the tools and techniques. The qualification is also suitable for those wishing to use it as a stepping-stone to further qualifications such as under-graduate and post-graduate degree courses.

You are not expected to know anything about data science or computing before you commence this qualification at SCQF level 7. However, it is recommended that you possess Mathematics at SCQF level 5 or equivalent before commencing.

What skills will you learn?

You will learn how to manipulate data using appropriate tools. You will then learn how to visualise the data, create insights and tell stories using data. At the higher levels you will learn sufficient statistics to ensure you are correctly interpreting your insights and correctly design approaches to solving problems using data. You will design and develop a dashboard to show key insights. At SCQF level 9 you will not only create algorithms to predict outcomes but will work with text data to capture insights. As data moves increasingly into the cloud, you will learn how to carry out analysis using data situated in the cloud, utilising fast machines capable of analysing very large datasets. You will also question everything you do with your data from an ethical standpoint and ensure you do not perpetuate bias in your results.

There are a selection of optional units, which include projects, both individual and group, to give you an opportunity to practise working with messy data on real-world problems. You can also specialise in data management, data security or Machine Learning.

Assessment

The assessments are a mix of testing your knowledge and a demonstration of your practical abilities working with data.

What's next?

You can progress from level to level within this suite of awards or undertake more advanced qualifications in data science at university. There is a skills shortage for qualified data professionals. Alternatively, you may wish to use the skills gained within your existing role and demonstrate to your employer the power of data.

Why should you choose this award?

Data science is a growing industry and many jobs will transition from manual to automated processes utilising and understanding data. Data science is an increasingly important part of many areas of life, learning and work.