

**Level 3 Advanced Technical
Extended Diploma in Digital
Technologies (720) (5220-32)
Level 3 Digital Technologies
5220-036 / 5220-536
(System Infrastructure)**

November 2017 Version 1.1

Guide to the examination

Who is this document for?

This document has been produced for centres who offer

This document has been produced for centres who offer **City & Guilds Level 3 Advanced Technical Extended Diploma in Digital Technologies (720) (5220-32)**. It gives all of the essential details of the qualification's external assessment (exam) arrangements and has been produced to support the preparation of candidates to take the exam/s.

The document comprises four sections:

1. **Details of the exam.** This section gives details of the structure, length and timing of the exam.
2. **Content assessed by the exam.** This section gives a summary of the content that will be covered in each exam and information of how marks are allocated to the content.
3. **Guidance.** This section gives guidance on the language of the exam, the types of questions included and examples of these, and links to further resources to support teaching and exam preparation.
4. **Further information.** This section lists other sources of information about this qualification and City & Guilds Technical Qualifications.

1. Details of the exam

External assessment

City & Guilds Technical qualifications have been developed to meet national policy changes designed to raise the rigour and robustness of vocational qualifications. These changes are being made to ensure our qualifications can meet the needs of employers and Higher Education. One of these changes is for the qualifications to have an increased emphasis on external assessment. This is why you will see an external exam in each of our Technical qualifications.

An external assessment is an assessment that is set and/or marked by the awarding organisation (ie externally). All City and Guilds Technical qualifications include an externally set and marked exam. This must be taken at the same time by all candidates who are registered on a particular qualification. We produce an exam timetable each year. This specifies the date and time of the exam so you can plan your delivery, revision and room bookings/PC allocation in plenty of time.

The purpose of this exam is to provide assurance that all candidates achieving the qualification have gained sufficient knowledge and understanding from their programme of study and that they can independently recall and draw their knowledge and understanding together in an integrated way. Whilst this may not be new to you, it is essential that your learners are well prepared and that they have time to revise, reflect and prepare for these exams. We have produced a Teaching, Learning, and Assessment guide that is you should refer to alongside the present document ([Teaching, Learning and Assessment Guide](#)). If a learner does not pass the exam at their first attempt, there is only one opportunity to resit the exam, so preparation is essential.

Exam requirements of this qualification

This qualification has **one** pathway. This pathway is assessed by the following examination:

- **Level 3 in Digital Technologies (036/536) (System Infrastructure)** – Theory exam (2) (2 hours and 30 minutes).

The exam is graded and a candidate must achieve at least a Pass grade in order to be awarded the qualification. (In addition to the exam, a synoptic assignment must also be completed and passed. You can find full details of the synoptic assignment in the *Qualification Handbook* and the *Synoptic Assessment Guide* -please see the links at the end of this document).

When does the exam take place?

The exam is offered on two fixed dates in March and June. The exact dates will be published at the start of the academic year in the *Assessments and Exam Timetable*
<http://www.cityandguilds.com/delivering-our-qualifications/exams-and-admin>

At the start of the programme of study for each of the two years, in order to effectively plan teaching and exam preparation, centres should know when the exam will be taking place and allocate teaching time accordingly. Section 2 of this document gives a summary of the content that needs to be covered in order to prepare learners for the exam and full details of this are given in the *Qualification Handbook*.

Form of exam

The exam for this qualification can be taken either on paper or online.

Can candidates resit the exam?

Candidates who have failed an exam or wish to retake it in an attempt to improve their grade, can do so **twice**. The third and final retake opportunity applies to Level 3 only. The best result will count towards the final qualification. If the candidate fails the exam three times then they will fail the qualification.

How the exam is structured

Each exam has a total of **80 marks** available.

Each exam is made up of:

- Approximately 10-12 short answer questions;
- 1-2 extended response questions.

Short answer questions are used to confirm **breadth of knowledge and understanding**.

The extended response questions are to allow candidates to demonstrate **higher level and integrated understanding** through written discussion, analysis and evaluation. These questions also ensure the exam can differentiate between those learners who are 'just able' and those who are higher achieving.

More details about and examples of question types are given in Section 3 of this document.

Assessment Objectives

The exams are based on the following set of assessment objectives (AOs). These are designed to allow the candidate's responses to be assessed across the following three categories of performance:

- **Recollection** of knowledge.
- **Understanding** of concepts, theories and processes.
- **Integrated application** of knowledge and understanding.

In full, the assessment objectives covered by the exam for this qualification are:

Assessment objective	Mark allocation (approx %)
<i>The candidate..</i>	
AO1 Recalls knowledge from across the breadth of the qualification	20%
AO2 Demonstrates understanding of concepts, theories and processes from a range of learning outcomes.	57.5%
AO4 Applies knowledge, understanding and skills from across the breadth of the qualification in an integrated and holistic way to achieve specified purposes.	22.5%

Booking and taking the exam

All assessments for City & Guilds Technical Exams must be booked through Walled Garden. There is a deadline for booking exams, synoptic assessments and any other centre marked assessments, please refer to the time line to check these dates.

The exam must be taken under the supervision of an invigilator who is responsible for ensuring that it is conducted under controlled conditions. Full details of the conditions under which the exam must be taken can be found in the Joint Council for Qualifications (JCQ) document, [*Instructions for Conducting Examinations \(ICE\)*](#).

Special consideration

Candidates who are unable to sit the exam owing to temporary injury, illness or other indisposition at the scheduled time may qualify for special consideration. This is a post-examination adjustment that can, in certain circumstances, be made to a candidate's final grade. The Joint Council for Qualifications' guide to the special consideration process can be found at www.jcq.org.uk.

To make a request for special consideration, please contact: policy@cityandguilds.com

Access arrangements

Access arrangements are arrangements that allow candidates with particular requirements, disabilities or temporary illness to take assessments, where appropriate, using their normal way of working. The Joint Council for Qualifications document, *Access Arrangements and Reasonable Adjustments* gives full details and can be downloaded [here](#).

For further information and to apply for access arrangements please see:

[Access arrangements - When and how applications need to be made to City & Guilds](#)
[Applying for access arrangements on the Walled Garden](#)

2. Content assessed by the exam

Level 3 Advanced Technical Extended Diploma in Digital Technologies (720) (5220-32)

The exam assesses:

- **Unit 320: Information systems development**
- **Unit 321: Cloud technologies**
- **Unit 322: Create a computer network**
- **Unit 323: Manage networks**
- **Unit 324: Provide technical support**
- **Unit 325: Infrastructure management**

Each exam assesses a sample of the content of these units. This means that a single exam will **not** cover 100% of the unit content. The full range of content will be assessed over a number of examination series. Details of the coverage of a particular exam paper will **not** be released in advance of the exam itself. Centres should **not** make assumptions about what will be assessed by a particular exam based on what has been covered on previous occasions. In order to be fully prepared for the exam, learners **must** be ready to answer questions on **any** of the content outlined below.

The table below provides an overview of how the qualification's Learning Outcomes are covered by each exam and the number of **marks** available per Learning Outcome (ie **not** the number of *questions* per Learning Outcome). In preparing candidates for the exam, we recommend that centres take note of the number of marks allocated to Learning Outcomes and to assign teaching and preparation time accordingly.

In preparing candidates for the exam, centres should refer to the Qualification Handbook which gives full details of each Learning Outcome.

The following is a summary of only that qualification content which is assessed by the exam and **not** a summary of the full content of the qualification.

Unit	Learning outcome	Topics	Number of marks
320 Information systems development	LO1 Determine a methodology to use during system	1.1 Methodologies available for designing systems 1.2 Select a methodology 1.3 Stages of the system life cycle	12 marks
	LO2 Use analysis to define the scope	2.1 Gather information required defining the scope 2.2 Scope the development of an information system	
	LO3 Design information systems	3.1 Analyse a system	

		3.2 Document the findings of the analysis 3.3 Document the design	
	LO4 Prototype systems	4.1 Implement designs 4.2 Configure the software 4.3 Test the system 4.4 Document findings	
321 Cloud technologies	LO1 Recognise cloud technology concepts	1.1 The principles of cloud technologies 1.2 Social aspects of cloud technologies	
	LO2 Determine how cloud technologies may be used	2.1 Cloud services for professional use 2.2 Cloud services for personal use	12 marks
	LO3 Justify the use of cloud technologies	3.1 The adoption of cloud technologies for a given business scenario 3.2 The validation of metrics	
322 Create a computer network	LO1 Connect network components	1.1 Set up the connection of network infrastructure 1.2 Set up the connection of network media 1.3 Configure network software including services and protocols	
	LO2 Configure network technologies	2.1 Network configuration 2.2 User accounts configuration	8 marks
	LO3 Test network configurations	3.1 Configuration of technologies tested 3.2 Document the network testing and configuration	
323 Manage networks	LO1 Recognise network performance and management	1.1 The impact of network design factors 1.2 Network performance fundamentals 1.3 Network management fundamentals	

	LO2 Determine network security threats	2.1 The necessity of network security 2.2 Types of threats to be protected against	8 marks
	LO3 Manage computer networks	3.1 Network management tools 3.2 Remote management 3.3 Monitor and manage a computer network	
324 Provide technical support	LO1 Identify techniques for providing technical support	1.1 Requirements for technical support 1.2 Support tools 1.3 Information gathering	
	LO2 Perform technical diagnosis	2.1 Justify tests or actions taken during diagnosis 2.2 Select tools to diagnose faults 2.3 Validate information for correct fault diagnosis	10 marks
	LO3 Report on testing outcomes	3.1 Test system functions 3.2 Record remedial actions	
	LO4 Communicate technical support	4.1 Methods of communication 4.2 Classification of users 4.3 Technical advice and guidance	
325 Infrastructure management	LO1 Identify infrastructure management roles and benefits	1.1 Engineering and data roles 1.2 Support roles 1.3 Infrastructure management benefits	
	LO2 Identify public-facing infrastructure	2.1 Services provided 2.2 Service hosting 2.3 User validation	12 marks

	LO3 Determine internal infrastructure	3.1 Core computing facilities 3.2 Network management 3.3 Internal authentication	
	LO4 Manage data	4.1 Data server architecture 4.2 Data backup strategy 4.3 Making data public 4.4 Data mining	
	LO5 Create an infrastructure plan	5.1 Infrastructure planning 5.2 Presenting the plan	
		Total marks for sections:	62 marks
		Integration across units*:	18 marks
		Total marks for exam: 80 Marks	

* *Integration across units.* These marks relate to Assessment Objective 4). These marks are awarded to differentiate between levels of performance by candidates taking the exam. The marks are given for how well a candidate has applied their knowledge, understanding and skills from across the units that make up the qualification in an integrated way to meet the requirements of the exam questions.

3. Guidance

Vocabulary of the exam: use of 'command' verbs

The exam questions are written using 'command' verbs. These are used to communicate to the candidate the type of answer required. Candidates should be familiarised with these as part of their exam preparation.

The following guidance has been produced on the main command verbs used in City & Guilds Technicals exams.

A more detailed version of this table, which also includes the command verbs used in the assignments is published in *City & Guilds Technical Qualifications Teaching, Learning and Assessment* guide.

Command verb	Explanation and guidance
Analyse	Study or examine a complex issue, subject, event, etc in detail to explain and interpret, elements, causes, characteristics etc
Calculate	Work out the answer to a problem using mathematical operations
Compare (...and contrast) (or describe the similarities/differences)	Consider and describe the similarities (and differences) between two or more features, systems, ideas, etc
Define	Give the meaning of, technical vocabulary, terms, etc.
Describe	Give a detailed written account of a system, feature, etc (..the effect of...on...) the impact, change that has resulted from a cause, event, etc (..the process..) give the steps, stages, etc
Differentiate between	Establish and relate the characteristic differences between two or more things, concepts, etc
Discuss	Talk/write about a topic in detail, considering the different issues, ideas, opinions related to it
Distinguish between	Recognise and describe the characteristic differences between two things, or make one thing seem different from another
Evaluate	Analyse and describe the success, quality, benefits, value, etc (of an end product, outcome, etc)
Explain	Make (a situation, idea, process, etc) clear or easier to understand by giving details, (..how..) Give the stages or steps, etc in a process, including relationships, connections, etc between these and causes and effects.
Give example(s) illustrate/	Use examples or images to support, clarify or demonstrate, an explanation, argument, theory, etc

Give a rationale	Provide a reason/reasons/basis for actions, decisions, beliefs, etc
Identify	Recognise a feature, usually from a document, image, etc and state what it is
Justify	Give reasons for, make a case for, account for, etc decisions, actions, conclusions, etc, in order to demonstrate why they suitable for or correct or meet the particular circumstances, context
Label	Add names or descriptions, indicating their positions, on an image, drawing, diagram, etc
List	Give as many answers, examples, etc as the question indicates (candidates are not required to write in full sentences)
Name	Give the (technical) name of something
Propose	Present a plan, strategy, etc (for consideration, discussion, acceptance, action, etc).
Select	choose the best, most suitable, etc, by making careful decisions
State	Give the answer, clearly and definitely
Summarise	Give a brief statement of the main points (of something)

Question types

The following explains, and gives examples of, types of questions used in City & Guilds Technical exams. In preparing candidates to take the exam, it is recommended that you familiarise them with the requirements of each question type so that they can be effective and make best use of the time available when sitting the exam.

- An effective candidate will gauge the type and length of response required from the question and the number of marks available (which is given for each question on the exam paper).
- Short answer questions may not require candidates to write in complete sentences. Extended response questions will require a more developed response.
- Candidates should read the exam paper before attempting to answer the questions and should allocate time proportionate to the number of marks available for each question or section.

Question type:

Short answer questions (restricted response)

These are questions which require candidates to give a brief and concise written response. The number of marks available will correspond to the number of pieces of information/examples and the length of response required by the question.

Example question:

Mark scheme:

State the correct connectors used to terminate the following network cable types:

- Twisted pair
- Coaxial.

(2 marks)

Answer:

Accept any of the following or any other reasonable answer

- Twisted pair – RJ45 (1)
- Coaxial – BNC (1)

One mark for each connector stated, maximum of two marks.

Test spec reference: 322 1.2

Total marks: 2

Question type:

Structured Response Questions

These are questions that have more than one part (eg a), b), etc.). The overall question is made up of linked, short answer questions which move the candidate through the topic in a structured way. For example, the question will usually start with a 'recall'/'state'/'describe' question followed by an 'explain' to draw out understanding of the topic. They usually have a shared introductory 'stem', and the number of marks may increase through the question.

Example question:

Mark scheme:

- a) State **two** ways that data or information that needs to be accessed by external users of an organisation might be hosted. (2 marks)
- b) Explain one authentication method that may be used when accessing the data or information identified in Question a). (2 marks)

Answer:

a) Accept any of the following or any other reasonable answer

- Organisation's own Server Provision (1)
- Paid-for hosting (1)
- Cloud-based services (1)
- Outsourced (managed) services (1)

One mark for each way stated, maximum of two marks.

Answer:

b) Accept any of the following or any other reasonable answer

- Conventional Credential Database (1) – a credential database maintained by the organisation containing usernames and passwords (1) - for matching authenticated users.
- Third Party Authentication Services (1) – where a user logs into a 3rd party (eg Google / Microsoft / Facebook) and is subsequently authenticated by this service (1) when accessing other locations.

Two marks for an explanation, maximum of two marks.

Test spec reference: 325 2.2-2.3

Total marks: 4

Question type:

Extended response questions

Extended response questions are those that require the candidate to write a longer written response using sentences and paragraphs. These usually require candidates to discuss, explain, etc. a topic in some detail. The question is often based on a short case study, scenario or other prompt. The level of detail should be gauged from the question and the number of marks available.

Example question:

Mark scheme:

Discuss how a large organisation that uses cloud technologies in multiple locations, can manage their systems and data to ensure availability in the event of a threat taking place.

(9 marks)

Answer

Indicative content

- System Methodologies, Analysis, Design and Implementation
- Cloud Technologies and Services, use of Metrics
- Managing Networks, Technical Support and Backup Strategies

0 – No awardable material

Band 1:

1– 3 marks

The response demonstrates a limited understanding of the processes and technologies involved and is mostly a statement of facts which are not developed. The approach to the task is inconsistent. Statements may be occasionally incorrect and the use of precise technical language is sparse.

Band 2:**4 – 6 marks**

The candidate has produced a discussion that expands on the factual knowledge but lacks detail in some areas. They show an adequate understanding of the processes and technologies involved including some reasons for their selection. They have provided some valid reasons for their choices. The response is structured and presented in a logical order.

Band 3:**7 – 9 marks**

The candidate has produced a thorough discussion in a logical and professional manner. They show a thorough understanding of the processes and technologies involved and have covered these in the correct logical order, including reasons behind the processes and technologies, the factors that need to be considered and the impact these factors may have on the implementation. They have clearly understood how all of the processes and technologies link to one another in terms of order and importance. They have provided valid reasons for their choices. The response is clear, coherent and all information has been presented in a logical order.

Test spec reference:**320: 2.1, 2.2, 3.1, 3.2, 4.3****321: 1.1, 1.2, 2.1, 3.1, 3.2****322: 2.1****323: 1.1, 1.3, 2.1, 2.2, 3.3****324: 1.1, 3.1****325: 3.1, 4.1, 4.2, 5.1****Total marks: 9**

Band 1

1– 3 marks

Example band 1 response

The technical services team must make sure that the ID's and passwords used by employees to login to the different locations are not easy to guess so that no unauthorised access takes place. They should contain upper and lower case letters with numbers and punctuation and should have a secret question to check when the user forgets their password. There must be a firewall and antivirus software from a reputable company installed to make sure that viruses and Trojans are not installed. The users must only have access to the data they are allowed to see to prevent an employee from stealing or deleting other data before they are fired. The company policy must not allow employees who work from home, to access the cloud location and download lots of data and leave it on their home PC where it could be stolen or corrupted or get a virus that is then copied back onto the cloud location and infects the network.

Band 2

4 – 6 marks

Example band 2 response

The organisation will need to fully analyse all aspects of their systems, using a methodology to analyse, design, build and implement a software solution. The analysis may show that an off the shelf piece of software will be sufficient as it might already have all the necessary functionality. This would be the best solution as it would allow the organisation to monitor their cloud technologies in the different locations from a central point. The software would include network management features that allows the organisation's technicians to remotely manage the hardware and software in the various locations.

They would be able to monitor the locations and see if any unauthorised attempts had been made to access the data and look for attempts to infect the system with malware or spyware. They would also be able to change or reset user's passwords when they are forgotten or compromised. The software should also allow the technicians to monitor the network performance to ensure there is no bottleneck or attempt to cause a DoS attack. The technicians should be able to remotely back up the data and set a time for automatic backups to take place at the different locations. The software should encrypt all communication between the technicians and the different locations, making it impossible for anyone to snoop on their activities and steal their passwords.

Band 3

7 – 9 marks

Example band 3 response

In the given situation, the organisation would need to conduct an analysis of their systems and data, design an appropriate response to the potential threat event and implement the response. Such activities would likely require the structure of a 'methodology' when considering a large organisation, one such being Soft Systems Methodology (SSM). This allows complex and ill-defined problems ("*Unidentified threats to data availability*") to be analysed and a solution devised (which may meet most of the requirements) and to structure a method of implementation, suitable for the needs of the organisation.

In analysing the scenario, the potential cloud technologies could be: Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS), Infrastructure-as-a-Service (IaaS), and Solution-as-a-Service (SoaaS), or any combination of these according to location requirements.

The threats to data availability (risks) might include: loss or corruption of data (due to software failure), loss or corruption of data (due to hardware failure), theft of data, confidentiality of data being compromised, connectivity failure between locations; overall – a threat to the integrity of the data.

Determining the effectiveness of a specific solution will require the use of various 'Metrics' as measured against a baseline. These may include: improvements to productivity justifying the cost, increased business, improved allocation of resources across the organisation, reduced wage costs (eg technicians) if outsourced, client feedback, and specifically, security of data storage.

Any solution to the identified threat, will therefore rely firstly on both the 'Data' and the 'System' at any one location having a fully functional backup at a different location. Secondly that the organisation has sufficient technical resources and support (including technicians) to maintain the backup and alongside it, to maintain the security and integrity of the 'network'. This requires maintaining firewalls, monitoring the backup, enforcing network authentication procedures, monitoring network performance and regular testing of the organisation's procedures.

Examination technique

Candidates with a good understanding of the subject being assessed can often lose marks in exams because they lack experience or confidence in exams or awareness of how to maximise the time available to get the most out of the exam. Here is some suggested guidance for areas that could be covered in advance to help learners improve exam performance.

Before the exam

Although candidates cannot plan the answers they will give in advance, exams for Technical qualifications do follow a common structure and format. In advance of taking the exam, candidates should:

- be familiar with the structure of the exam (ie number and type of questions).
- be aware of the amount of time they have in total to complete the exam.
- have a plan, based on the exam start and finish time for how long to spend on each question/section of the exam.
- be aware of how many marks are available for each question, how much they should expect to write for each question and allow most time for those questions which have the most marks available.

At the start of the exam session

At the start of the exam, candidates:

- should carefully read through the exam paper before answering any questions.
- may find it helpful, where possible, to mark or highlight key information such as command words and number of marks available on the question paper.
- identify questions which require an extended written answer and those questions where all or part of the question may be answered by giving bullets, lists etc rather than full sentences.

Answering the questions

Candidates do not have to answer exam questions in any particular order. They may find it helpful to consider, for example:

- tackling first those questions which they find easiest. This should help them get into the 'flow' of the exam and help confidence by building up marks quickly and at the start of the exam.
- tackling the extended answer question at an early stage of the exam to make sure they spend sufficient time on it and do not run out of time at the end of the exam.

Candidates should avoid wasting time by repeating the question either in full or in part in their answer.

Candidates should **always** attempt every question, even questions where they may be less confident about the answer they are giving. Candidates should be discouraged however, from spending too long on any answer they are less sure about and providing answers that are longer and give more detail than should be necessary in the hope of picking up marks. This may mean they have less time to answer questions that they are better prepared to answer.

Extended answer questions

Before writing out in full their answer to extended questions, candidates may find it helpful to identify the key requirements of the question and jot down a brief plan or outline of how they will answer it. This will help clarify their thinking and make sure that they don't get 'bogged down' or provide too much detail for one part of the question at the expense of others.

Towards the end of the exam

Candidates should always set aside time at the end of the exam to read back through and review what they have written in order to make sure this is legible, makes sense and answers the question in full.

If a candidate finds they are running out of time to finish an answer towards the end of the exam, they should attempt to complete the answer in abbreviated or note form. Provided the content is clear and relevant, examiners will consider such answers and award marks where merited.

Further guidance on preparing candidates to take the exam is given in the City & Guilds publication, [Technical Qualifications, Teaching, Learning and Assessment](#) which can be downloaded free of charge from City & Guilds website.

4. Further information

For further information to support delivery and exam preparation for this qualification, centres should see:

City & Guilds

Qualification homepage: <http://www.cityandguilds.com/qualifications-and-apprenticeships/it/it-professional/5220-technical-in-digital-technologies#tab=information> which includes:

- Qualification handbook
- Synoptic Assignment
- Sample assessments

Technical Qualifications, Resources and Support:

<http://www.cityandguilds.com/techbac/technical-qualifications/resources-and-support>

Joint Council for Qualifications

Instructions for Conducting Examinations: www.jcq.org.uk/exams-office/ice--instructions-for-conducting-examinations