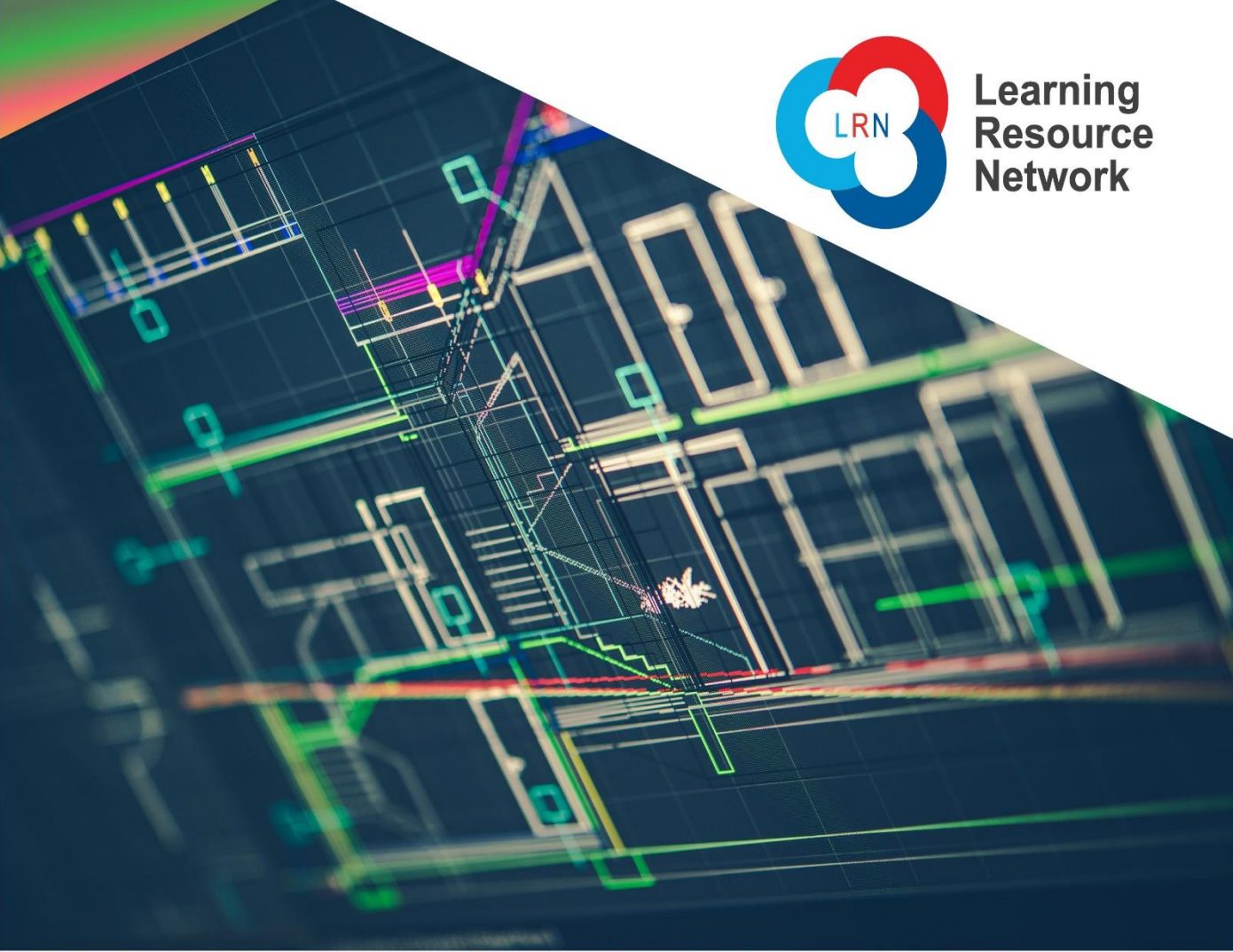


For exams January, May and November onwards
For teaching from September 2021 onwards.

SPECIFICATION



Learning
Resource
Network

LRN INTERNATIONAL GCSE **COMPUTER SCIENCE** (7925)



THE QUEEN'S AWARDS
FOR ENTERPRISE:
INTERNATIONAL TRADE

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BACKGROUND TO LRN

Learning Resource Network (LRN) is a recognised Awarding Organisation that offers a range of qualifications to candidates, educational institutes, training providers, schools and employers.

LRN is recognised for its high quality qualifications that enable candidates to progress to other areas of study and employment in their designated fields.

In producing its qualifications, LRN uses the experience and expertise of academics, professionals working in the pertinent industries and assessment practitioners with a wealth of best practice and knowledge of validation, verification, delivery and assessment.

ACCOLADES

Queen's Award

In April 2020, LRN received the Queen's Award for Enterprise for International Trade. LRN is one of 220 organisations in the UK to be recognised with this prestigious accolade. This was in recognition of the expansion LRN brought to the overseas qualification market.

MANAGEMENT SYSTEMS

LRN has been awarded international accreditation as part of its quality controls, policies, systems and overall approach to its management systems. These awards are externally validated by the British Assessment Bureau. LRN has achieved accreditation in the form of ISO 9001: Quality Management Systems, ISO 14001: Environment Management Systems and ISO 27001: Information Security Management Systems.

CUSTOMER SERVICE EXCELLENCE

LRN has achieved the prestigious award of Customer Service Excellence. This is in recognition of its customer service practices, approach to managing and dealing with UK and Overseas customer needs, including the diverse needs of its centres.

LRN was the first UK Awarding Organisation to achieve Customer Service Excellence. Following reaccreditation in 2019, LRN received an award for Customer Service Excellence: Compliance Plus, demonstrating that LRN went above and beyond the delivery of its customer service principles.



INTRODUCTION

This specification provides an overview to the LRN International GCSE Computer science¹. This document is suitable for various users, including candidates, centres, administrators, employers, parents/guardians, teachers (and other related staff) and examiners. The specification outlines the key features and administrative procedures required for this international qualification.

OBJECTIVE

The LRN International GCSE Computer science is designed to enable international candidates to demonstrate their proficiency in various areas, including systems architecture, algorithms, programming logic, and data representation. This qualification aims to equip students with the foundational knowledge and skills necessary for further education and careers in the field of computer science.

MODE OF DELIVERY

This qualification has been constructed to be delivered within centres. Centres will need to demonstrate to LRN, through the centre recognition processes, that they have the resources, facilities and competence to deliver. However, centres must be able to demonstrate, in line with LRN's criteria, that they have the means, capability, capacity and resources (including suitably qualified centre staff) to deliver by the method chosen by the centre.

PROGRESSION

The LRN International GCSE Computer science has been designed to reflect the wide variation in candidates' origins, levels of education and career aims. Progression opportunities may, therefore, take a variety of paths. Depending on the level of qualification achieved, it may be appropriate for the candidate to progress to:

1. Similar level 2 qualification in Computer science;
2. LRN Level 2 Certificate or Diploma in Pre-A Foundation Studies;
3. LRN Level 3 Diploma in Pre-U Foundation Studies;
4. A higher level of any qualification – e.g. A-Level, Diploma
5. Vocationally Related Qualifications

¹ LRN International GCSEs are globally recognised qualifications designed specifically for international candidates and are available outside the United Kingdom. Candidates based in England refer to the Ofqual register.

QUALIFICATION OVERVIEW

Number	Subject Content	AO	Exam
1	Systems architecture	2 and 3	Combination of written exam papers (externally set and marked) Paper 1: Short Answer and Data Response Duration: 1 hour 45 minutes Paper 2: Problem solving and Programming Duration: 1 hour 45 minutes
2	Algorithms, Programming and Logic	1 and 2	
3	Data representation	1 and 2	

BREAKDOWN OF ASSESSMENT OBJECTIVES

AO 1 – demonstrate knowledge and understanding of the principles and concepts of computer science, including abstraction, logic, algorithms and data representation.

AO 2 – apply knowledge and understanding of the principles and concepts of computer science, including to analyse problems in computational terms.

AO 3 – design, program, and evaluate computer systems to solve problems, making reasoned judgements about these and evaluate business information and issues to demonstrate understanding of business activity, make judgements and draw conclusions

ASSESSMENT

The assessment for this qualification consists of written exam papers, set and marked by the LRN.

Assessment objectives (AOs)	Weighting	
	Paper 1	Paper 2
AO1	50%	30%
AO2	20%	20%
AO3	30%	50%

GUIDED LEARNING HOURS

The guided learning hours (GLH) for this qualification are 130. Please note the hours stated are indicative.

ENTRIES CODES

One entry per qualification is sufficient and will cover all the question papers including certification.

PRIVATE CANDIDATES

Centres are advised that private candidates are only to be enrolled with prior agreement and confirmation from LRN.

GRADING

Results are reported, as 9 to 1.

RESULTS

Exam series are in:

- January (results released in March)
- June (results released in August)
- November (results released in January)

RE-TAKES

Whereas candidates can re-take the whole qualification as often as they wish, individual components cannot be re-taken as it is a traditional linear specification.

Please remember, one entry per qualification is sufficient and will cover all the question papers including certification.

CUSTOMER SERVICE STATEMENT

Learning Resource Network (LRN) is committed to ensuring all customers are dealt with promptly and in a professional and helpful manner. In order to guarantee this, we commit to ensuring the following in our day to day interactions with candidates, assessment centres and our stakeholder network:

- All customers will be treated equally and with respect;
- All customer information will only be used in a way which has been agreed in advance, unless we are informed of something that places them or others at risk of harm;
- All customers will be treated by staff in a professional manner.

LRN has arrangements in place to provide a telephone and e-mail helpdesk which will be staffed from 09:00 to 17:00 from Monday to Friday. Furthermore, it will respond to each e-mail, letter or telephone message it receives regarding feedback on its qualifications, centre approvals process or other matters relating to its products and/or services. The timetable for responding is as follows:

- E-mail: 5 working days
- Letter: 5 working days
- Telephone message: 5 working days

DIVERSITY AND EQUALITY

Learning Resource Network (LRN) is committed to ensuring fair and equal access to its qualifications, examinations and support materials. Our Diversity and Equality policy seeks to eliminate unjustifiable discrimination, harassment and/or victimisation and to advance equality of opportunity, thereby ensuring all candidates are treated fairly, in accordance with the protected characteristics of the Equality Act 2010. Specifically, we comply fully with the requirements laid out in the Equality Act 2010. In addition, and within the constraints of this policy, LRN will have due regard for the General data Protection Regulations (GDPR) in the retention of information which is unnecessary.

1	Systems Architecture		
Aim			
The aim of this unit is to enable students to demonstrate a theoretical and practical understanding of computing systems.			
Learning Outcomes - The learner will:		Assessment Criteria - The learner can:	
1	Understand the significance of Systems architecture	1.1	Analyse the purpose of the CPU
		1.2	Analyse Von Neumann architecture/ MAR (Memory Address Register)/ MDR (Memory Data Register)/ Program Counter/ Accumulator
		1.3	Analyse ALU (Arithmetic Logic Unit) CU (Control Unit) Cache
		1.4	Analyse the CPU's role in fetching and executing instructions stored in memory
		1.5	Analyse how CPUs affect their performance, considering factors such as clock speed, cache size, and the number of cores
		1.6	Analyse purpose of embedded systems
		1.7	Explain microprocessors and their functions
2	Understand the theoretical demonstration of Memory	2.1	Explain the purpose of ROM in a computer system
		2.2	Explain the purpose of RAM in a computer system
		2.3	Explain the difference between RAM and ROM
		2.4	Explain virtual memory; cloud, secondary, and primary storages
		2.5	Explain flash memory
3	Understand the principles of data Storage	3.1	Differentiate between common types of storage: optical/magnetic/solid state.
		3.2	Differentiate between common types of storage: optical/magnetic/solid state- and advantages and disadvantages of the types of storage in terms of:

			<ul style="list-style-type: none"> • capacity • speed • portability • durability • reliability • cost.
4	Understand the principles of Wired and Wireless networks	4.1	Investigate LAN (Local Area Network) and WAN (Wide Area Network)
		4.2	Investigate client-server and a peer-to-peer network
		4.3	Investigate DNS (Domain Name Server) and hosting the cloud.
		4.4	Investigate virtual networks.
5	Understand the concepts of Network topologies, protocols and layers	5.1	Describe star and mesh network topologies
		5.2	Describe protocols including: <ul style="list-style-type: none"> • TCP/IP (Transmission Control Protocol/Internet Protocol) • HTTP (Hyper Text Transfer Protocol) • HTTPS (Hyper Text Transfer Protocol Secure) • FTP (File Transfer Protocol) • POP (Post Office Protocol) • IMAP (Internet Message Access Protocol) • SMTP (Simple Mail Transfer Protocol)
		5.3	Describe packet switching.
		5.4	Describe encryption
		5.5	Differentiate between symmetric and asymmetric encryption
		5.6	Differentiate between network interface card (NIC) and media access control (MAC) address.

		5.7	Investigate the purpose of internet protocol (IP) address and types of IP.
		5.8	Describe the functions of a router in a network.
		5.9	Explain the purpose and functions of a web browser, including: <ul style="list-style-type: none"> • storing bookmarks and favourites • recording user history • allowing use of multiple tabs • storing cookies • providing navigation tools • providing an address bar
6	Understand the principles of System and cyber security	6.1	Describe forms of attack, including: <ul style="list-style-type: none"> • phishing • brute force attacks • poor network policy • data interception • distributed denial of service (DDoS) attack • hacking • malware (virus, worm, Trojan horse, spyware, adware, ransomware) • pharming • social engineering
		6.2	Describe network security measures to prevent vulnerabilities, including: <ul style="list-style-type: none"> • network policies • firewalls • user access levels • anti-malware, including anti-virus and anti-spyware • authentication (username and password, biometrics, two-step verification) • automating software updates • checking the spelling and tone of communications • checking the URL attached to a link • privacy settings • proxy-servers

			<ul style="list-style-type: none"> secure socket layer (SSL) security protocol
7	Understand the principles of Ethical, legal, and environmental concerns	7.1	Describe open source vs proprietary software
		7.2	Describe environmental impact of Computers
8.	Understand the concept and process of Digital Currencies and Blockchain transactions	8.1	Investigate different electronic currencies and their applications
		8.2	Investigate blockchain as digital ledger and how to track digital currency transactions.
9.	Understand automated and emerging technologies	9.1	Explain how sensors, microprocessors and actuators can be used in collaboration to create automated systems
		9.2	Describe the advantages and disadvantages of an automated system used for a given scenario such as industry, transport, agriculture, weather, gaming, lighting, and science.
		9.3	Describe the characteristics of a robot, factory equipment, domestic robots and drones, a mechanical structure or framework, electrical components, such as sensors, microprocessors and actuators, and programmable robots.
		9.4	Explain the roles that robots can perform and describe the advantages and disadvantages of their use
		9.5	Describe the main characteristics of Artificial Intelligence (AI), basic operation and components of AI systems to simulate intelligent behaviour as it relates to expert systems and machine learning.
10	Understand computer input and output devices	10.1	Explain an input device and why it is required, including: <ul style="list-style-type: none"> barcode scanner digital camera keyboard microphone optical mouse QR code scanner

			<ul style="list-style-type: none"> • touch screen (resistive, capacitive and infra-red) • two-dimensional (2D) and three-dimensional (3D) scanners
		10.2	<p>Explain an output device and why it is required, including:</p> <ul style="list-style-type: none"> • Actuator • digital light processing (DLP) projector • inkjet printer • laser printer • light emitting diode (LED) screen • liquid crystal display (LCD) projector • liquid crystal display (LCD) screen • speaker • 3D printer
		10.3	<p>Explain sensors, their purposes, and types of data captured by each sensor, including:</p> <ul style="list-style-type: none"> • Acoustic • Accelerometer • Flow • Gas • Humidity • infra-red • level • light • magnetic field • moisture • pH • pressure • proximity • temperature

11	Understand the types of software and interrupts	11.1	Describe the difference between system software and application software and provide examples of each.
		11.2	Describe the role and basic functions of an operating system (OS), including: <ul style="list-style-type: none"> • managing files • handling interrupts • providing an interface • managing peripherals and drivers • managing memory • managing multitasking • providing a platform for running applications • providing system security • managing user accounts
		11.3	Describe the role and operation of interrupts
		11.4	Explain high-level language and a low-level language, including the advantages and disadvantages of each.
		11.5	Explain the role of an integrated development environment (IDE) in writing program code and the common functions IDEs provide, including: <ul style="list-style-type: none"> • code editors • run-time environment • translators • error diagnostics • auto-completion • auto-correction • prettyprint

2		Algorithms, Programming and Logic	
Aim			
The aim of this unit is to enable students to demonstrate a theoretical and practical understanding of Computational thinking, algorithms and programming.			
Learning Outcomes - The learner will:		Assessment Criteria - The learner can:	
1	Understand the principles of computational thinking	1.1	Examine computational thinking and its key elements, including: <ul style="list-style-type: none"> • abstraction • decomposition
		1.2	Describe the use of searching algorithms, including: <ul style="list-style-type: none"> • binary search • linear search
		1.3	Describe the use of sorting algorithms, including: <ul style="list-style-type: none"> • bubble sort • merge sort • insertion sort
		1.4	Assess the use of: pseudo code vs flow diagrams
		1.5	Examine the standard methods of solution such as <ul style="list-style-type: none"> • Totalling • Counting • finding maximum • minimum and average values
2	Understand Programming techniques	2.1	Examine programming constructs used to control the flow of a program: <ul style="list-style-type: none"> • sequence • selection • iteration (count and condition controlled loops)

		2.2	Examine programming constructs used to control basic file handling operations: <ul style="list-style-type: none"> • Open • Read • write • close
		2.3	Examine programming constructs used to control basic one- and two-dimensional arrays
		2.4	Examine programming constructs used to control arithmetic operators and the common Boolean operators.
		2.5	Examine programming constructs used to control basic data types: <ul style="list-style-type: none"> • integer • real • Boolean • character and string • casting
		2.6	Examine programming constructs used to control how to identify syntax and logic errors
		2.7	Examine the purpose of testing
3	Understand how to create a maintainable programs and arrays	3.1	Create a maintainable program using appropriate and meaningful identifiers such as the commenting feature provided by the programming language, procedures and functions, relevant and appropriate commenting of syntax, variables, constants, and arrays.
		3.2	Declare and use one-dimensional (1D) and two-dimensional (2D) arrays
		3.3	Write values into, and read values from, an array using iteration.

4	Understand the principles of computational logic	4.1	Investigate logic diagrams using the operations AND, OR, NOT, NAND, NOR, XOR (EOR), the binary output produced from all the possible binary inputs, and all other gates are limited to two inputs.
		4.2	Investigate combining Boolean operators using AND, OR, NOT, NAND, NOR, XOR (EOR), the binary output produced from all the possible binary inputs, and all other gates are limited to two inputs.
		4.3	Judge the use of truth tables
		4.4	Write a Boolean logic expression from a: <ul style="list-style-type: none"> • problem statement • logic circuit • truth table
5	Understand the program development life cycle	5.1	Explain the analysis, design, coding and testing stages.
		5.2	Apply structure diagrams, abstraction, decomposition, pseudocodes, flowcharts, problem and requirement identifications, design, coding and testing techniques for test data.
6	Understand databases and data types	6.1	Define a single-table database from given data storage requirements, including: <ul style="list-style-type: none"> • fields • records • validation
		6.2	Examine suitable basic data types, including: <ul style="list-style-type: none"> • text/alphanumeric • character • Boolean • Integer • Real • date/time

		6.3	Examine the purpose of a primary key and identify a suitable primary key for a given database table.
		6.4	Examine and complete structured query language (SQL) scripts to query data stored in a single database table, including: <ul style="list-style-type: none">• SELECT• FROM• WHERE• ORDER BY DESCENDING• ORDER BY ASCENDING• SUM• COUNT• AND• OR

3		Data representation	
Aim			
The aim of this unit is to enable students to understand data representation.			
Learning Outcomes - The learner will:		Assessment Criteria - The learner can:	
1	Understand the purpose of Translators and facilities of languages	1.1	Analyse the purpose of translators
		1.2	Summarise the assembler, a compiler and an interpreter
2	Understand data representation	2.1	Describe types of compression, including: <ul style="list-style-type: none"> • lossy • lossless.
		2.2	Describe the effect of colour depth and resolution on the size of an image file.
		2.3	Describe how an image is represented as a series of pixels represented in binary
		2.4	Describe the effect of colour depth and resolution on the size of an image file.
		2.5	Describe bit, nibble, byte, kilobyte, megabyte, gigabyte, terabyte, petabyte, and exbibyte (EiB)
3	Understand the denary, binary and hexadecimal number systems	3.1	Convert between: <ul style="list-style-type: none"> • positive denary and positive binary • positive denary and positive hexadecimal • positive hexadecimal and positive binary
		3.2	Add two positive 8-bit binary integers
		3.3	Perform calculations leading to overflow of binary additions
		3.4	Perform a logical binary shift on a positive 8-bit binary integer
		3.5	Use the two's complement number system to represent positive and negative 8-bit binary integers

		3.6	Investigate why a computer represents text and the use of character sets, including American standard code for information interchange (ASCII) and Unicode.
		3.7	Investigate why a computer represents sound, including the effects of the sample rate and sample resolution.
		3.8	Investigate why a computer represents an image, including the effects of the resolution and colour depth.
		3.9	Calculate the file size of an image file and a sound file, using information given.
4	Understand types and methods of data transmission	4.1	Describe the structure of a packet
		4.2	Describe the process of packet switching
		4.3	Describe how data is transmitted from one device to another using different methods of data transmission, including: serial, parallel, simplex, half-duplex, and full-duplex.
		4.4	Explain the suitability of each method of data transmission
		4.5	Explain how universal serial bus (USB) interface is used for data transmission.
5	Understand methods of error detection	5.1	Describe the processes involved in each of the following error detection methods for detecting errors in data after transmission: <ul style="list-style-type: none"> • parity check (odd and even), • checksum and • echo check • parity byte and parity block check
		5.2	Describe how a check digit is used to detect errors in data entry and identify examples of when a check digit is used, including international standard book numbers (ISBN) and bar codes

		5.3	Describe how an automatic repeat query (ARQ) can be used to establish that data is received without error, including: <ul style="list-style-type: none">• positive/negative acknowledgements• timeout
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