



**ADVANCED**  
**General Certificate of Education**  
**2019**

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## **Digital Technology**

Assessment Unit A2 1  
*assessing*  
Information Systems

**[ADT11]**  
**MONDAY 10 JUNE, MORNING**

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## **MARK SCHEME**

## General Marking Instructions

### Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

### The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

		AVAILABLE MARKS
1	(a) <b>Network card</b> It connects a computer to a LAN [1] so that it can communicate with the file server [1] It provides a port [1] for connecting a network cable/Ethernet cable [1] Max [2]	
	<b>WAP</b> To connect a computer to a network/router [1] using Wi-Fi/Bluetooth [1] in a hotspot [1] using radio transmitters/antennae [1] Max [2]	
	<b>MAC Address:</b> To identify a computer's network interface card (NIC) [1] uniquely [1] on a LAN [1] Max [2]	[6]
(b)	A <b>LAN</b> is spread over a small geographical area/a single building/office [1] using cables/Wi-Fi/wireless/fibre optic technology [1] It provides services for a single organisation [1] Max [2]	
	A <b>MAN</b> covers a highly populated area/a large town/city [1] using fibre optic/wireless technology [1] It provides services for a community of users [1] Max [2]	[4]
(c)	There is no dedicated/central server All computers have equal status Each computer is a supplier of resources ... and a consumer of resources (4 × [1])	[4]
(d) <b>Star Network</b>	A central or dedicated/host/fileserver/hub. Each node is directly connected to the hub by its own cable. The fileserver controls all network communication. The fileserver controls the transfer of data packets.	
	<b>Data security</b> The star network is more secure. Data packets are sent to/from the fileserver from/to the node directly via a dedicated connection. The fileserver controls all security. Only the intended recipient receives the data packet.	
	<b>Bus Network</b> A main cable/backbone to which all nodes are connected. Terminators are positioned at both ends. A node sends a data packet to another node by placing it on the backbone.	
	<b>Data security</b> The bus network is less secure. There is no central control of security. All nodes have access to the backbone/all nodes could access the data packet. Data packets travel in both directions.	

Level	Marking criteria	Marks	AVAILABLE MARKS
<b>Band 2</b>	<p>The candidate:</p> <ul style="list-style-type: none"> <li>• Demonstrates an accurate knowledge of <b>BOTH</b> networks</li> <li>• Makes an accurate comparison of the data security of <b>BOTH</b> networks</li> <li>• Uses the appropriate Digital Technology terminology accurately throughout the response</li> </ul> <p>Presentation, spelling, punctuation and grammar are of a high standard.</p>	[5]–[6]	
<b>Band 1</b>	<p>The candidate</p> <ul style="list-style-type: none"> <li>• Demonstrates an accurate knowledge of <b>BOTH</b> networks <b>OR</b> makes an accurate comparison of the data security of <b>BOTH</b> networks</li> <li>• Uses some relevant Digital Technology terminology</li> </ul> <p>Presentation, spelling, punctuation and grammar are sufficiently competent to make the response clear.</p>	[3]–[4]	
<b>Band 0</b>	<p>The candidate</p> <ul style="list-style-type: none"> <li>• Demonstrates a limited knowledge of <b>BOTH</b> networks <b>OR</b> makes a simple comparison of the data security of <b>BOTH</b> networks</li> <li>• Makes limited use of Digital Technology terminology</li> </ul> <p>Presentation, spelling, punctuation and grammar are such that the intended meaning is not completely clear.</p>	[1]–[2]	

[6]

(e) Presentation  
 Session  
 Transport  
 Network  
 Data  
 Physical  
 (4 × [1])

[4]

(f) Wireless transmission uses radio waves  
 Data transfer rates measured in Mbps  
 Fibre optic uses pulses of light  
 Fibre optic uses multiple strands of glass  
 Data transfer rates measured in Gbps  
 Fibre optic has greater bandwidth than wireless  
 (4 × [1])

[4]

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2	(a)	 [1] for each of three entities [1] for each of two relationships	AVAILABLE MARKS	
			[5]	
	(b)	<b>1NF</b> STUDENT (StudentID, StudentName) STUDENT-EXAM1(Student ID Exam ID, ExamName, Result) (2 × [1])		
		<b>2NF</b> STUDENT (Student ID, StudentName) STUDENT-EXAM2 (Student ID Exam ID, Result) EXAM (Exam ID, ExamName) (3 × [1])		
		<b>3NF is the same as 2NF</b> Must be <u>stated</u> [1]	[6]	
	(c)	Contains descriptions/information about the data held in a database [1] Attribute/Field name [1] Data type [1] Field size [1] Format [1] Default value [1] Entity/table name [1] Identification of keys [1] Validation rules [1] Index(es) [1] Input masks [1] Max [6]	[6]	
	(d)	<b>Composite key:</b> Consists of more than one attribute [1] ... which uniquely identify an entity occurrence [1]		
		<b>Foreign key:</b> A primary key in one entity [1] which appears as a non-key in another entity [1] as a link [1] Max [2]	[4]	
	(e)	<b>Entity</b> An object [1] about which data is stored [1]		
		<b>Referential integrity</b> If a foreign key is used [1] it must correspond to a valid/existing primary key [1]	[4]	
	(f)	INSERT INTO ACTOR [1] VALUES [1] (TC2001, Tim Cruise, 4455667788) [1]	[3]	
	(g)	SELECT FilmID, Title [1] FROM FILM [1] WHERE Genre = "Horror" [1] ORDER BY [1] FilmID DESC [1]	[5]	33

		AVAILABLE MARKS
3	(a) The study of all aspects of intelligence ... and modelling these by computer systems The aim is to create intelligent machines ... which can function/react/think like humans ... by learning ... and adapting (2 × [1])	[2]
	(b) The test involves an interrogator/player ... a human ... and a machine/computer The player does not know which is the human and which is the machine/ which is X and which is Y The player asks questions of the human and the machine/of X and Y ... and tries to discover which is the human (5 × [1])	[5]
	(c) <b>Heuristics</b> Rules of thumb ... derived from human experience/intuition ... not purely from logic Requires judgement/estimation/evaluation (3 × [1])	
	<b>Knowledge engineer</b> The technical expert ... who obtains the information/facts/rules/is involved in knowledge acquisition ... for the knowledge base ... from subject experts/experienced practitioners in a particular field ... using structured/unstructured interviews/problem solving/concept maps Structures the knowledge into the database Validates/verifies the knowledge (3 × [1])	[6]

**(d) Car engine fault diagnosis**

The expert system contains the knowledge of a large number of car designers/mechanics. The expert system is plugged into the car. It carries out a series of automatic tests and determines the fault.

AVAILABLE MARKS

**Evaluation**

**For** Very accurate diagnosis very consistent diagnosis, reasoning provided conclusions explained.

**Against** Human intuition cannot be replaced. Risk of over reliance on technology. Human expert knowledge may be devalued.

Level	Marking criteria	Marks
<b>Band 2</b>	<p>The candidate:</p> <ul style="list-style-type: none"> <li>Provides an accurate description of this ES application</li> <li>Makes an accurate evaluation of this ES application</li> <li>Uses the appropriate Digital Technology terminology accurately throughout the response</li> </ul> <p>Presentation, spelling, punctuation and grammar are of a high standard.</p>	<b>[5]–[6]</b>
<b>Band 1</b>	<p>The candidate</p> <ul style="list-style-type: none"> <li>Provides an accurate description of this ES application OR makes an accurate evaluation of this ES application</li> <li>Uses some relevant Digital Technology terminology</li> </ul> <p>Presentation, spelling, punctuation and grammar are sufficiently competent to make the response clear.</p>	<b>[3]–[4]</b>
<b>Band 0</b>	<p>The candidate</p> <ul style="list-style-type: none"> <li>Demonstrates a limited knowledge of this ES application OR makes a simple evaluation of this ES application</li> <li>Makes limited use of Digital Technology terminology</li> </ul> <p>Presentation, spelling, punctuation and grammar are such that the intended meaning is not completely clear.</p>	<b>[1]–[2]</b>

[6]

**(e) NOTE** The benefit is needed for the second point

Leads to improved quality

... because robots work consistently

(2 × [1])

Leads to better productivity

... because robots can work faster than humans/can be reprogrammed

(2 × [1])

Leads to improved quality

... because robots produce error free work

(2 × [1])

Leads to improved safety

... because robots can work in hazardous environments

(2 × [1])

(2 × [2])

[4]

23

		AVAILABLE MARKS
4	(a) The automatic analysis/sorting [1] of large data sets/big data [1] in a data warehouse [1] Pattern recognition/algorithms used [1] to identify patterns/correlations [1] and to predict trends/relationships [1] Data is combined from multiple sources [1] Max [4]	[4]
	(b) The personal/financial data that a bank stores about a customer ... could be used by another organisation in data mining ... and used for unauthorised purposes/purposes for which the customer has not given permission/purposes unknown to the customer (2 × [1])  The personal/financial data which another organisation stores about a bank's customer ... could be used by the bank in data mining ... and used for unauthorised purposes/purposes for which the individual has not given permission/purposes unknown to the customer (2 × [1])	[4]
	(c) Personal data must be: Fairly and lawfully processed Processed for limited/specified/lawful purposes Adequate, relevant and not excessive Accurate/up to date Not kept for longer than is necessary Processed in line with the rights of the data subjects Kept secure Not transferred to other countries without adequate protection (4 × [1])	[4]
	(d) The bank must register ... with the Information Commissioner's Office (ICO) ... and appoint a data controller The bank must identify the personal data held ... and its purpose ... and the processing performed ... for the data protection register/ICO Employees must be informed of their personal responsibilities ... and trained Procedures/processes must be established ... to ensure compliance/good practice (8 × [1])	[8]
	(e) All emails are stored on server farms/virtual servers ... and can be accessed using an Internet connection (2 × [1])  Reduced hardware/software (investment) costs/maintenance costs ... as these costs are borne by the service provider (2 × [1])	[4]

**5 (a) Parity bits**

A specific bit in a byte is the parity bit/the 8th bit /MSB in a byte is the parity bit [1]

The sum of the bits in a byte is odd if odd parity is being used/even if even parity is being used [1]

When a byte is received its parity is checked [1]

If the parity of the byte has changed [1] an error has occurred/at least one bit has flipped [1]

Max [4]

AVAILABLE MARKS

**Checksums**

An algorithm is applied [1] to a block/packet of data [1] to create a checksum

The checksum is appended to the block/becomes part of the block [1]

When the block is received the checksum is recalculated [1] using the same algorithm [1]

If it differs, an error has occurred [1]

Max [4]

**Echo checking**

When data is received [1] a (copy) is transmitted back to the sender/source [1] where it is compared with the original [1]

If it differs the original data is retransmitted [1]

Echo checking is an automatic process [1]

Max [4]

[12]

**(b) https**

It is a communications protocol [1]

It ensures secure communication between a browser [1] and a web server [1]

It authenticates the website [1] and ensures the privacy/integrity of data while in transit [1]

It uses Transport Layer Security(TLS)/Secure Sockets Layer(SSL) [1]

Max [4]

**Encryption**

Data is encoded/scrambled [1] before transmission [1] using a key/cipher/algorithm [1]

Intercepted data is unreadable/meaningless [1] without the key [1]

It is decrypted upon receipt [1]

Max [4]

**Digital certificate**

An encrypted message [1] provided by a certification authority [1] confirming that the sender is who they claim to be [1] is attached to the message [1]

It includes a digital signature [1] which can be confirmed by sending a secure message to the certification authority [1]

Max [4]

[12]

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**6 (a) Online censorship**

AVAILABLE  
MARKS

Online censorship is the control/suppression  
 ... of what can be publicised/viewed on the Internet  
 It is used by governments/organisations/ISPs/individuals  
 ... to restrict access to copyright/dangerous/sensitive content  
 ... to block content they would prefer not to be accessed

Online censorship can be used to protect individuals from negative/harmful content  
 ... to protect individuals from harassment  
 ... to fight Internet-related crime  
 ... to minimise risks to national security  
 ... to ensure productivity

Online censorship can be used to restrict freedom of speech  
 ... to control citizens' access to information/the truth  
 ... to promote specific political/religious agendas  
 ... to monitor citizens/populations regarding their opinions/preferences/views  
 It can be very difficult to know when/how the Internet is being censored  
 Max [6]

**Automated decision making**

Automated decisions are made by algorithms  
 Large datasets are mined combining data from different areas – research, commerce, government, healthcare  
 The sheer number of decisions required means humans cannot make them

Automated decisions should be free of bias  
 Automated decisions are allowed when the decision is necessary and there must be no other way  
 ... and explicit consent has been given  
 Under DP legislation, you have the right not to be subject to a decision based solely on automated means if the decision significantly affects you legally

Automated decision making often replicate existing biases  
 ... and introduce new ones  
 ... particularly when machine learning is involved  
 Automated decisions are frequently made without consent/knowledge.  
 Who benefits from the decisions made?  
 The company's/organisation's interest in profit may come before the interests of the user  
 Max [6]

[12]

**(b) Relevant legislation**

AVAILABLE  
MARKS

The Copyright, Designs and Patents Act protects the intellectual property rights of creators of materials based on original ideas. In general, it is a copyright infringement to make a copy of/distribute protected software without the owner's permission/licence/EULA which may set conditions such as single-user/multi-user/site licences.

**The statement 'Copying software is not really stealing'**

Copying software which requires a licence is a recognised offence called software piracy which is the illegal copying of software for personal use or resale. It deprives the software's creator of income. It can lead to price increase for legitimate users. It can limit development of new software products. This usually applies to proprietary software.

Infringement can also lead to penalties including imprisonment/fines/confiscation of copyright material/the equipment used.

It is legal to make a copy of legally owned software for backup purposes. Open source software does not normally require a licence.

Level	Marking criteria	Marks
<b>Band 2</b>	<p>The candidate</p> <ul style="list-style-type: none"> <li>• Accurately describes the relevant legislation</li> <li>• Evaluates the statement</li> <li>• Uses the appropriate Digital Technology terminology accurately throughout the response</li> </ul> <p>Presentation, spelling, punctuation and grammar are of a high standard.</p>	<b>[5]–[6]</b>
<b>Band 1</b>	<p>The candidate</p> <ul style="list-style-type: none"> <li>• Demonstrates a limited knowledge of relevant legislation</li> <li>• Briefly discusses the statement</li> <li>• Uses some relevant Digital Technology terminology</li> </ul> <p>Presentation, spelling, punctuation and grammar are sufficiently competent to make the response clear.</p>	<b>[3]–[4]</b>
<b>Band 0</b>	<p>The candidate</p> <ul style="list-style-type: none"> <li>• Demonstrates a limited knowledge of relevant legislation <b>OR</b> briefly discusses the statement</li> <li>• Makes limited use of Digital Technology terminology</li> </ul> <p>Presentation, spelling, punctuation and grammar are such that the intended meaning is not completely clear.</p>	<b>[1]–[2]</b>

[6]

18

**Total**

**150**