This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2021 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **11** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer		Marks
1(a)	Data can become more difficult to interpret.		**1**
	All codes are easy to forget.		
	It never leads to the coarsening of data.		
	Coding of data means time is saved when entering data.	✓	
1(b)	Codes cannot be used in a flat file database.		**1**
	More mistakes are made when entering data.		
	It is possible to run out of meaningful code combinations.	✓	
	It is more difficult to use validation rules with the data.		
1(c)	**Four** from: P means pink/purple with neck 43cm and chest 95cm P could stand for any colour beginning with P – purple/pink Better to have two or three letters such as PI, PU Neck and chest could be transposed Better to have N43 or 43N followed by C95 or 95C May need 3 digits for chest … … with leading 0 for two digit chest/chest sizes < 100		**4**

Question	Answer	Marks
1(d)	**Eight** from: *Encryption:* Encryption is the scrambling of data … … into meaningless groups of symbols … … can't be understood/read without the decryption key Is asymmetric and symmetric It uses public key and private key or just private key It allows protection of sensitive data … … such as credit card numbers and personal information from computer hackers Without encryption, information could be intercepted and altered or misused by outsiders It can be used to create digital signatures to authenticate e-mail If the encryption key is lost the data is effectively lost Encrypting data and creating the keys necessary to encrypt and decrypt the data requires expensive systems Public key encryption is based on complicated mathematics … … making it very hard to both encrypt and decrypt data Many systems use a third party to certify the reliability of public keys … … if the certification authority is compromised, the criminal that did it could issue false certificates fooling people into sending data Users can have a false sense of security … … forgetting that once the data is decrypted it becomes vulnerable to attack again *Codecs* Codecs are hardware/software needed to convert data so that it can be transmitted down communication lines Used to compress and decompress /encodes and decodes data Video and music files are large so are difficult to transfer across the Internet quickly Without codecs, downloads would take three to five times longer than they do now There are many different types of codec ... … it's not always clear which codec is needed to play the video/music files It is common to need ten to twelve codecs to play a user's music and movies **Must be a proper analysis to gain full marks** **Max. six marks if bullets/list of points** **Must have expansions to be a proper analysis** **At least two of each required to gain full marks**	8

Question	Answer	Marks
2(a)	<table><tr><td>An operating system is an example of application software.</td><td></td></tr><tr><td>Software consists of data or computer instructions.</td><td>✓</td></tr><tr><td>Software consists of RAM and ROM chips.</td><td></td></tr><tr><td>A buffer is an example of application software.</td><td></td></tr></table>	1

Question	Answer	Marks
2(b)	A spreadsheet is an example of system software.	1
	A blu-ray disc is an example of system software.	
	A printer driver is an example of system software. ✓	
	Control software is an example of system software.	

2(c)	**Six** from:
	
	Benefits of spreadsheets
	Spreadsheets are <u>easy</u> to use to store data
	Max. two from:
	    sort data
	    perform numerical calculations/use formulae
	    functions e.g. SUM, COUNT, AVERAGE
	    filter
	Can adjust layouts to generate output and reports
	Advanced features make it easier to accomplish a wide range of tasks …
	… such as subtotals, power pivot tables and pivot charts, analysis toolkit
	<u>Easy</u> to produce graphs …
	… to show sales trends/records
	Can more easily be used to model sales …
	… and so predict future sales growth
	Automatically recalculates when data is edited/new data is entered
	
	Drawbacks of spreadsheets
	As work gets more complex, spreadsheets become more difficult to change and manage
	Difficult to produce well-formatted reports
	As new rows and columns are added, ranges and formulas may need to be modified …
	… or new ones created
	More difficult to create advanced filters
	
	At least one of each required to obtain full marks
	Must be a proper discussion to obtain full marks
	Max. five marks if bullets/list of points
	Must have an expansion to be a proper discussion
		6

Question	Answer	Marks
3	**Six** from: Do not trust/open emails that come from unrecognised senders Do not trust/open emails that ask you to confirm personal/financial details Do not trust/open emails that are not addressed to you by name Only contact your bank using the phone or secure web sites Do not click on links/download files/open attachments in emails <u>from unknown senders</u> Do not send personal or financial information by email even to close friends/banks Protect your computer using a firewall, spam filters, anti-virus and anti-spyware software Update your anti-malware software at regular intervals Check your online accounts and bank statements regularly to ensure that no unauthorised transactions have been made	**6**

Question	Answer	Marks
4	**Six** from: *Parents should tell children to:* Never give out personal details <u>to people you don't know</u> Use a nickname when online Not share personal details such as full name/address/email address/mobile number/school name Not post photos of family/friends/school/home <u>to people you don't kno</u>w Not reply to a message that upsets them … … but they should save the message and show the parent Never arrange to meet up with any online 'friends'/someone you've never met before without an adult you trust Make sure your privacy settings are secure Always inform parents or an adult if you are being bullied online *Parents should:* Talk to their child about what they are doing online/who they are talking to/safe and unsafe websites Get their child to show them how to use applications they are not familiar with Keep the computer in a family room Make sure their child knows how to block someone online and report them if they feel uncomfortable Let their child know that it's never too late to tell someone if something makes them feel uncomfortable	**6**

Question	Answer	Marks
5	**Six** from: A <u>private/secure</u> computer network used within one organisation Can only be accessed by workers/computers within the organisation/ restricted access network Based on internet technology/TCP/IP protocols Used to share information/resources within the organisation Tends to be a LAN Uses client-server architecture/computers are connected to a server Requires username and password Examples of information held (at least 2) Restricts websites which can be viewed	**6**

Question	Answer	Marks
6	**Five** from: Knowledge base consists of a database of facts and a rules base Database of facts is built up by the engineer on information and knowledge of the subject specialists (experts) Database of facts is also built up from databases that may exist for the topic Rules base is a set of rules which are usually of the form IF . . . THEN The shell often includes the user interface, explanation system, inference engine and knowledge base editor User interface is how the computer interacts with the user User interface displays questions/options/results/information on a screen User interface enables the user to type in answers to the questions/data Knowledge base editing software/knowledge base editor enables the knowledge engineer to edit rules and facts within the knowledge base Explanation system explains to a user the chain of reasoning used to arrive at a particular conclusion	**5**

Question	Answer	Marks
7	**Three matched pairs** from: Normal data such as a number between 5 and 80 which should be accepted by the system If it isn't, the validation rule needs to be amended to ensure the acceptable value is >=5 and <=80 Abnormal data such as 81/ 3 / "eighty" which should be rejected by the system Amend rule to ensure that it uses 5 to 80/amend rule to ensure it checks it is numeric/amend rule to make sure < hasn't been used instead of > and vice versa Extreme data such as 5 or 80 which should be accepted by the system If it isn't, amend rule so it is <= and not just < / check it is >= not just >	**6**

Question	Answer	Marks
8	**Six** from: *Advantages* Source code will run on different computers and operating systems Only needs to maintain one version of the source code Less time will be spent on source code maintenance … … when updates are needed It is easier to debug the program … … as errors are highlighted/user is alerted as they are encountered It can use up less memory than a compiler … … as only a few lines of source code are in memory at a given time Less likely to crash the computer … … as the code can run in a virtual mode *Disadvantages* The translation software may need to be kept up to date Interpreted programs run slower than compiled programs … … as they have to be interpreted every time they are run Interpreting a program is a much slower process <u>than compiling</u> … … as it stops every time an error is encountered Source code is easier to convert by fraudulent users Makes it much easier to copy the program **At least one of each required to obtain full marks** **Must be a proper evaluation to obtain full marks** **Max. five marks if bullets/list of points** **Must have an expansion or comparison to be a proper evaluation**	**6**

Question	Answer	Marks
9	**Five** from: The example is just a list of numbers separated by commas and is data This is data which consists of raw figures It does not have any meaning until it is given a context Information is data that has a context giving it meaning The context is that this is a set of numbers which could be part of the five times table Knowledge is know-how and learning of contextualised information/information which has had human experience applied to it Understanding that 6, 12, 18, 24 follows a similar type of pattern and must therefore be part of the six times table is further knowledge	**5**

Question	Answer	Marks
10(a)	**Eight** from: A one-to-one relationship is where a record in one table is associated with exactly one record in another table Customers_2 and Customers_1 have the same key field Customers_2 and Customers_1 could be combined without affecting the database A one-to-many relationship is where one record can relate to many records in another table The Date_Opened table contains many records that relate to single records in the related table A single Customer_ID in Customers_1 table relates to many records in the Date_Opened table A single Account_ID in Accounts table relates to many records in the Date_Opened table In relational database design, a many-to-many relationship is strictly speaking not allowed/is virtual To get around the problem of having a many-to-many relationship the many-to-many relationship needs to be broken down into two/several one-to-many relationships Using a third table, commonly called a "join table", in this case the Date_Opened table Each record in the "join table" would have the foreign key fields of the two tables it is joining together The Customers_1 table could be in a many-to-many relationship with the Accounts table	**8**
10(b)	**Two** from: The fields Customer_ID/Account_ID could have been set up with different data types in their related tables Data had been entered in the Customer_ID field in the Date_opened table which does not exist in the Customers_1/Customers_2 tables Data has been entered in the Account_ID field in the Date_opened table which does not exist in the Accounts table	**2**

Question	Answer	Marks
11	**Six** from: **Five max** from: Static information sources/books are more carefully checked for accuracy With static sources once the data are created, they cannot be changed easily There is a limited amount of information in a static information source/book/greater amount of information on the WWW As soon as static data source/book is published it is very difficult to have information added to it A dynamic data source/website can have information updated <u>quite quickly</u> The data in a dynamic data source/website is usually up to date/ static data tends to go out of date quickly There can be many contributors to a dynamic data source/website so the information can be inaccurate For full marks, must have at least **one** from: Both sources require the use of sophisticated analysis techniques Both sources will provide a mixture of relevant and irrelevant information Both can be inaccurate	**6**

Question	Answer	Marks
12(a)	**Two** from: *Complex* A complex query is one that searches using more than one criterion It often uses Boolean operands It is made up of AND, OR or NOT operands or a mixture of these	**2**
12(b)	**Two** from: *Nested* A nested query is a query within another query, often referred to as a subquery Nested queries help you to use the result of one query as an input parameter of another Innermost subquery is executed first, then next level, until the main query is reached	**2**
12(c)	**Two** from: *Summary* Summary queries are used to summarise the contents of a table Also called Group-By queries/aggregate queries and use aggregate functions Uses functions such as SUM, AV(ERA)G(E), MIN, MAX, COUNT	**2**

Question	Answer	Marks
13	**Six** from: It is a form of internal symbol or representation of external reality It is a model of what users know/think they know about a system Users' mental models come from their prior experience with similar software or devices A mental model is what the user will describe in terms of what they need A user interface that matches the user's mental model will be easy to learn/it will take less time to learn A user interface that matches the user's mental model will be easy to use/user friendly A user interface that matches the user's mental model will provide the user with transferable skills so … … another interface using similar ideas will be just as easy to use A user interface that matches the user's mental model enables the user to predict how to navigate the interface **Must have description and benefits to gain full marks**	**6**