Level 3 Technical Level
IT: Cyber Security, Networking, Programming, User Support

Y/507/6424–Fundamental Principles of Computing

Mark scheme

June 2018

Version/Stage: 1.0 Final

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from aqa.org.uk

Level of response marking instructions

Level of response mark schemes are broken down into levels, each of which has a descriptor. The descriptor for the level shows the average performance for the level. There are marks in each level.

Before you apply the mark scheme to a student's answer read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

Step 1 Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

When assigning a level you should look at the overall quality of the answer and not look to pick holes in small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level and then use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 3 with a small amount of level 4 material it would be placed in level 3 but be awarded a mark near the top of the level because of the level 4 content.

Step 2 Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do not have to cover all of the points mentioned in the Indicative content to reach the highest level of the mark scheme.

An answer which contains nothing of relevance to the question must be awarded no marks.

Question	Guidance	Mark
01	D	**1**
02	B	**1**
03	A	**1**
04	D	**1**
05	A	**1**
06	**Explain why solid-state drives (SSDs) do not need cooling.** Because SSDs are low energy devices that use a small amount of electricity / no mechanical or moving parts (1 mark), therefore do not generate much heat (1 mark)	**2**
07.1	**Give two different examples of information.** Note that there must be a context for a mark to be awarded. My date of birth is 22/05/2017 (1 mark) The height of the Eiffel Tower is 235 metres (1 mark) Unacceptable examples: • 22/05/2017 • 235 metres	**2**
07.2	**Explain how information is different from data.** Data is unprocessed input or raw facts or figures (1 mark). When it is processed or organised (1 mark) this gives it a context and it then becomes information (1 mark).	**3**
07.3	**Explain why the information presented in Figure 1 might be misleading.** 1 mark for each of the following to a maximum of 3 marks. Scale might be distorted (1 mark). No figures on vertical axis (1 mark) No information on what the sales periods are (1 mark). No label on vertical axis (1 mark)	**3**

| 08 | **Explain why it would be difficult for a computer to process written English or French as a programming language.**

Ideas which should be awarded a mark (up to maximum of 4 marks):
• binary
• logical and illogical
• nuances and conveying meaning accurately
• formal vocabulary
• accurate translation into binary instructions

Example answer:
Computers work only with binary instructions (1 mark). Programming languages use formal sets of instructions and logic to tell the computer what to do and these can easily be translated into binary (1 mark). Natural languages, such as English and French have massive vocabularies of words, with grammar rules that are not rigidly stuck to and nuances that mean different things to different people (1 mark). These cannot easily be translated to accurately represent the meaning (1 mark). | 4 |

| 09.1 | **State one type of application that PROLOG could be used for.**

Intelligent knowledge-based system such as medical diagnosis tool (1 mark).

Various other acceptable answers. | 1 |

| 09.2 | **Describe how the logic programming used by PROLOG is different from a program written in a high-level language such as Java or Python.**

Logic programming is based on a formal set of rules and facts about a subject (1 mark). The rules and knowledge are declared and then questions can be asked in order to arrive at a logical answer (1 mark).

Languages such as Java or Python use a set of programmed procedures to fulfil certain functions (1 mark). | 3 |

10.1	**A multi-user computer can be accessed by many users at the same time. Explain how this is possible.** This is done in various ways. The most common is a multi-tasking operating system (1 mark) such as Unix (1 mark). This allows remote users to share time on the processor (1 mark). Processors are normally so fast that each user appears to have exclusive use of the resources (1 mark). Award marks for valid explanations of application such as remote access (such as RDC) or management systems supporting a community of users or thin client systems.	**4**

Explain how the use of security software can help to increase the security of data in a multi-user system.

Level	Descriptor	Mark
3	Candidate has described a range of security software and has fully explained how their use might increase the security of data	**5 - 6**
2	Candidate has described some security software with some explanation of how their use might increase the security of data	**3 - 4**
1	Candidate has listed some security software and may have attempted to relate this to security of data	**1 - 2**
	No creditworthy response	**0**

Indicative content:

- user accounts
- levels of access
- user policies
- strong passwords
- strong security measures such as electronic token generators to authenticate individuals
- employee training
- organisational policies
- encryption
- specific examples of security software

(This table is for question **10.2**, total mark **6**)

11.1	**Give one example of a question that would be asked to obtain quantitative data.** Example answer: How many holidays have you bought from us? (1 mark)	1

11.2	**Give one example of a question that would be asked to obtain qualitative data.** Example answer: In your opinion what could be done to improve the holiday location? (1 mark)	1

11.3	**Explain why it is more difficult to analyse qualitative responses than quantitative responses.** Quantitative responses can be easily grouped into sets (1 mark) that can be enumerated (1 mark) whereas qualitative responses are more subjective and matters of opinion (1 mark) which are less easily compared (1 mark).	4

| 12 | **The fetch-execute cycle is used to control the sequence of instructions that the Central Processing Unit (CPU) carries out. Describe the sequence of steps involved in the fetch-execute cycle.**

For maximum marks, a minimum of 3 steps needs to be described in the correct sequential order.

up to 3 marks may be awarded for listing the steps.

DNA single words such as Fetch, Decode, Execute.

up to 6 marks may be awarded for descriptions of what each step involves.

Each creditworthy point has a mark awarded and therefore more than the maximum marks are shown. However, it works well as a general example.

Note that there are many potential descriptions with more or less detail, but the same general steps.

1. **Fetch the instruction (1 mark)**: The next instruction is fetched from the memory address that is currently stored in the program counter (PC) (1 mark), and stored in the instruction register (IR) (1 mark). At the end of the fetch operation, the PC points to the next instruction that will be read at the next cycle (1 mark).

2. **Decode the instruction (1 mark)**: During this cycle the encoded instruction present in the IR (instruction register) is interpreted by the decoder (1 mark).

3. **Read the effective address (1 mark)**: If the instruction has an indirect address, the effective address is read from main memory (1 mark), and any required data is fetched from main memory to be processed and then placed into data registers (1 mark).

4. **Execute the instruction (1 mark)**: The control unit of the CPU passes the decoded information to the relevant function units of the CPU (1 mark) to perform the actions required by the instruction such as reading values from registers (1 mark), passing them to the ALU to perform mathematical or logic functions on them, and writing the result back to a register (1 mark). The result generated by the operation is stored in the main memory, or sent to an output device (1 mark). Program Counter will usually be updated to show the address from which the next instruction will be fetched (1 mark).

The cycle is then repeated (1 mark). | 9 |

13.1	**Name one piece of hardware that can function as a client device.** 1 mark for any of the following: • PC • Tablet • Laptop • Smartphone • any other mobile device • some routers.	**1**

13.2	**Name one piece of systems software that can report on the status of a client device.** Systems management software, monitoring tools, mobile device management software. **Accept** relevant named software.	**1**

14.1	**Discuss the hardware features of a suitable computer system for this user.**			12
	Level	**Descriptor**	**Mark**	
	4	Candidate has considered all the user's needs and has fully justified the hardware features included in relation to them	10 - 12	
	3	Candidate has included many relevant hardware features and has discussed why they need to be included with direct reference to the user's needs	7 - 9	
	2	Candidate has included some relevant hardware features and has discussed why they need to be included	4 - 6	
	1	Candidate has included some relevant hardware features and may have given some explanation of why they need to be considered	1 - 3	
		No creditworthy response	0	

Indicative content:

- i/o devices
- storage devices
- ports
- portability
- processor speed
- graphics capability
- external devices

14.2	**Suggest three appropriate pieces of software for this user and give a reason for each.** **Indicative content** (1 mark for each, 1 mark for relevant reason): - web browser software - database software - word-processing software - security software - anti-virus software - accounting software - any other relevant software	6

14.3	**Explain how the user can be sure that any software purchased will run efficiently on the computer.** Each piece of software has a minimum spec to run (1 mark) and user should ensure that this spec is exceeded (1 mark).	2

14.4	**Some of the tasks listed in Question 14 could be carried out using shareware, freeware or open source software.** **Discuss the factors that the user would have to take into account when choosing whether to use these types of software.** 1 mark for the recommendation 1 mark (max 5 marks) for each relevant point **Indicative content:** • licencing • developer community • support • cost • new versions • compatibility with other software • limited facilities in some versions	6

14.5	**Explain how an operating system on the user's computer keeps track of files and folders.** Accept any type of operating system such as: • Mac OS • Windows versions • DOS • Unix and variations 1 mark for specifying the operating system. **up to maximum of 4 marks** for describing how the files are stored and managed. Do not allow use of a file management utility unless as part of the explanation of OS user interface.	4

Assessment Objectives						
Question	**AO1**	**AO2**	**AO3**	**AO4**	**AO5**	**Question Total**
Section A						
1		2a (1)				1
2					5a (1)	1
3			3g (1)			1
4			3j (1)			1
5		2j (1)				1
6		2p (2)				2
7.1				4a (2)		2
7.2				4a (4)		4
7.3				4b (2)		2
8					5ghj (4)	4
9.1					5h (1)	1
9.2					5gh (3)	3
10.1	1c (4)					4
10.2	1c (2)		3n (4)			6
11.1				4d (1)		1
11.2				4d (1)		1
11.3				4d (4)		4
12		2b (9)				9
13.1			3f (1)			1
13.2			3f (1)			1
Section B						
14.1		2fgklnop (12)				12
14.2			3abg (6)			6

14.3			3a (2)			2
14.4			3b (6)			6
14.5			3h (4)			4
Total	**6**	**25**	**26**	**14**	**9**	**80**