Pearson Edexcel

Mark Scheme

Specimen Set 3

Pearson Edexcel GCSE In Computer Science (1CP2)
Paper 01: Principles of Computer Science

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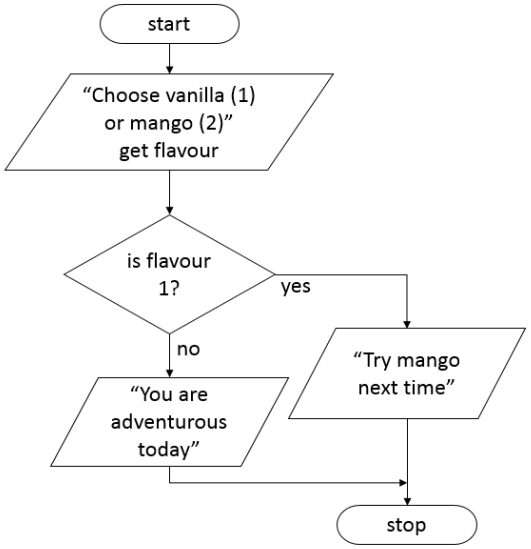
Paper 1 Mark Scheme

Question number	Answer	Additional guidance	Mark
1(a)(1)	• The number of sides on the single dice/a number between 6 and 12 (1) • The user's guess of the roll (1)	• Award variable names provided they are meaningful and uniquely identify the inputs, e.g. theGuess, sides.	**2**

Question number	Answer	Additional guidance	Mark
1(a)(ii)	D roll <= 3 • A roll = 3 is not a relational operator, but an assignment • B roll == 3 is an equivalence check, which would not allow a guess for 1 and 2 • C roll > 3 is greater than, which would not allow a guess for 1, 2, or 3		**1**

<table>
<tr><th>Question number</th><th>Answer</th><th>Additional guidance</th><th>Mark</th></tr>
<tr><td>1(b)</td><td>One mark for each correct column
<table>
<tr><th>A</th><th>B</th><th>A OR B</th><th>NOT (A OR B)</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>0</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>0</td></tr>
</table></td><td></td><td>2</td></tr>
</table>

Question number	Answer	Additional guidance	Mark
1(c)	One mark each for a maximum of 2 • A subprogram is a self-contained block (1) of code. • A subprogram performs a specific/dedicated task (1). • It can be 'called' by the main program or other subprograms, when it is needed (1).		**2**

Question number	Answer	Additional guidance	Mark
1(d)	• Start and stop terminators in correct positions (1) • Decision symbol has two outputs only, i.e. the two output messages (1) • Yes/no labels on decision match output messages (1) • Fully connected to function correctly (1) 		**4**

Question number	Answer	Additional guidance	Mark
1(e)	• Runtime (1) • Syntax (1) • Logic (1)		**3**

<table>
<tr><th>Question number</th><th>Answer</th><th>Additional guidance</th><th>Mark</th></tr>
<tr><td>1(f)</td><td>One mark for each correct cell

<table><tr><th>Input</th><th>Output</th></tr><tr><td>2</td><td>7:30am</td></tr><tr><td>7</td><td>8am</td></tr><tr><td>8</td><td>7am</td></tr></table></td><td></td><td>3</td></tr>
</table>

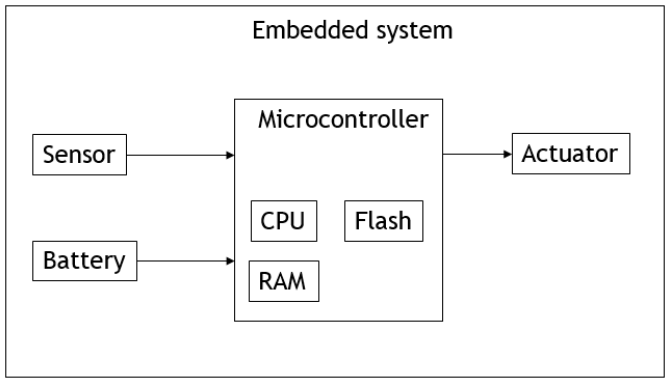
Question number	Answer	Additional guidance	Mark
2(a)	One mark each for a maximum of 2 • Use it as long as possible/don't replace it (1) • Sell/give it to a company that will recondition it (1) • Give it away to a friend or charity (1) • Repair it if it breaks (1) • Keep the software updated (1)	• Do not award responses indicating recycling, because the focus is on extending its use as a phone	**2**

Question number	Answer	Additional guidance	Mark
2(b)	C incremental • A fragmented – this is what happens to secondary storage devices after prolonged reading and writing • B full – this backup happens when all the files are backed up, whether they have been changed or not • D lossy – this is a type of data compression		**1**

Question number	Answer	Additional guidance	Mark
2(c)	One mark each for a maximum of 2 • Lawfulness (1) • Fairness and transparency (1) • Purpose limitation (1) • Data minimisation (1) • Accuracy (1) • Storage limitation (time kept) (1) • Integrity and confidentiality (security) (1) • Accountability (1)	• Award examples that fit a category	**2**

Question number	Answer	Additional guidance	Mark
2(d)	A patent prevents someone copying/using/selling an invention (1) because it gives the inventor the exclusive right to reproduce/use/sell it for 20 years (1) A person/organisation that infringes a patent can be prosecuted (1), because it gives the inventors the legal protection to defend their exclusive right (1)		**2**

Question number	Answer	Additional guidance	Mark
2(e)	One mark each for a maximum of 2 • Not enough/insufficient data (1) • Biased/prejudiced data/not representative (1) • Non-aspirational data (1)	• Accept alternative wording	**2**

Question number	Answer	Additional guidance	Mark
3(a)	• Sensor with an arrow indicating input only (1) • Actuator with an arrow indicating output only (1) 	• Position of sensor/actuator doesn't matter, as long as it's outside the microcontroller box.	**2**

Question number	Answer	Additional guidance	Mark
3(b)	Code reviews are carried out by programmers/specialist software (1) so that they can identify security bugs/security issues/bad practice (1)		**2**

Question number	Answer	Additional guidance	Mark
3(c)	D Register • A Clock – sits outside the CPU and sends a signal to the CPU • B Control bus – carries signals into and out of the CPU • C Data bus – carries data into and out of the CPU		**1**

Question number	Answer	Additional guidance	Mark
3(d)(i)	• All file blocks of each file are in sequence/one after another (1) • All blank space is together (1)	• Order of files does not matter. • Award second bullet if space is at front or end.	2

Question number	Answer	Additional guidance	Mark
3(d)(ii)	Any one from: • A solid-state device has no moving parts (1) • Seek time is not affected by scattered data because it is read electronically (1)		1

Question number	Answer	Additional guidance	Mark
3(e)	• Translates the entire source file to machine code in one go/translates all the source code prior to execution (1) • Shows all syntax errors at the end of the translation process (1) • Produces a single executable/object code/platform-dependent output (1) • Separates the tasks of translation and execution (1)	• No marks for a response that restates the question, such as inputs source code and outputs machine code.	3

Question number	Answer	Additional guidance	Mark
3(f)	C Device driver • A Analogue to digital converter – used to convert and play digital representations of audio sound • B Assembler – used to translate low-level mnemonics to machine code • D Disk defragmenter – used to rearrange file blocks on secondary storage to improve its performance		**1**

Question number	Answer	Additional guidance	Mark
3(g)	Any **two** from: • High-level languages use instructions that look like English (1), whereas a low-level language uses mnemonics/binary code (1). • A high-level language statement generates many lines of machine code (1), whereas each line of low-level languages is/generates a single machine instruction (1) • High-level languages are general purpose/exist across microprocessors/CPUs/machine-independent (1), whereas a low-level language is microprocessor/CPU/machine specific (1) • High-level languages are abstracted from the hardware (1), whereas low-level languages manipulate the hardware directly (1)	• Responses should be about the languages, not about the output of the language translators (efficiency) or other software based on the language (tools)	**4**

Question number	Answer	Additional guidance	Mark
4(a)	POP3 deletes messages from the server when downloaded (1), whereas IMAP leaves them on the server when downloaded (1)		2

Question number	Answer	Additional guidance	Mark
4(b)	Any **two** from: • Wireless networks have a short range (1) because walls and floors can block the signal (1) OR • Wireless/radio signals may not go very far (1) because solid structures (thick walls, steel beams) block the signal (1) • Wireless networks can have high latency (1) because they suffer from interference from other wireless networks or devices (1) OR • The performance of a wireless network can be adversely affected by interference from other devices (1) because they can operate on the same frequency band/they are high voltage, such as a microwave (1) • Wireless networks have low speed (1) because all the devices must share the available bandwidth (1) OR • The more devices that are connected to the network, the more likely bottlenecks are to occur (1) because they all want a share of the available bandwidth (1)	• Award responses that give examples of one of the categories in the stem.	4

Question number	Answer	Additional guidance	Mark
4(c)	One for each to a maximum of 3 • A checksum formula is applied to the packet before it leaves the source computer (1) • The source calculated checksum is added to the packet header (1) • At the receiving end, the same checksum formula is reapplied (1) • The new checksum is compared to the received checksum in the packet header (1) • If the received checksum and the newly calculated checksum do not match, a resend request is issued (1)		**3**

Question Number	Indicative content
4(d)	Discuss methods of securing networks. **Physical security** • The movie streaming company should use physical security to protect its products and data from unauthorised access. • Physical security can be used to only allow authorised people to enter critical areas, such as the room with the file servers where the movies are stored. • The machine storing the movies and the movie streaming company's data should be in locked rooms/cupboards. • Each door could be fitted with an electronic lock system which can record who enters the server room and when. • Electronic lock systems can read cards/fobs/biometrics of employees and check them against details stored on a database to determine if an employee has special permission to enter the movie server room. **Access control** • The movie streaming company should enforce strict access control to determine who can log onto its network. • Each time someone attempts to log onto the movie streaming company's network, their credentials are checked against a database. • The credentials also determine what access the person can have, such as to the customer files but not the movie files. • Different employees/people need different levels of access to do their job, for example, the billing department does not need access to employee records or the movie files. • Access control limits employees to only that level of access needed, for example, the payroll department would not need to access the stored movies. • Controlling access means that an apprentice cannot delete movies, thereby reducing the chance of accidental corruption of deletion of data. • Access control is set up by the system's administrator, who has the highest level of privileges and can see all the unencrypted data across all machines, including customer records and movie files. **Firewalls**

	• A firewall acts as a barrier between the movie streaming company's network and the internet. • The movie streaming company may choose to purchase firewalls that are software, hardware, or a combination. • The movie streaming company should have hardware firewalls on the entry points to its network and software firewalls on each company-owned device. • Firewalls use a set of rules to determine which packets of data are allowed in and out, so unauthorised access attempts to the movie streaming company's network will be denied. • Rules can be customised to suit the movie streaming company's particular needs. • They can flag up suspicious activity by employees such as downloading viruses or sending confidential data, including movie files, outside the movie streaming company.

Level	**Mark**	**Descriptor**
	0	No rewardable content.
Level 1	1–2	Basic, independent points are made, showing elements of understanding of key concepts/principles of computer science. (AO1) The discussion will contain basic information with little linkage between points made or application to the context. (AO2)
Level 2	3–4	Demonstrates adequate understanding of key concepts/principles of computer science. (AO1) The discussion shows some linkages and lines of reasoning with some structure and application to the context. (AO2)
Level 3	5–6	Demonstrates comprehensive understanding of key concepts/principles of computer science to support the discussion being presented. (AO1) The discussion is well developed, with sustained lines of reasoning that are coherent and logically structured, and which clearly apply to the context. (AO2)

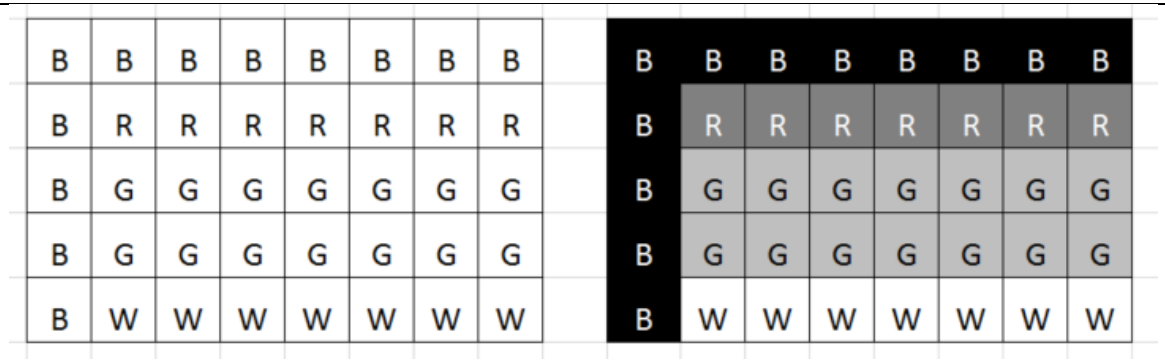
Question number	Answer	Additional guidance	Mark
5(a)	A lossless compression will allow the exact contents of the word-processed document to be reconstructed (1) whereas a lossy compression will permanently remove data from the file (1)		2

Question number	Answer	Additional guidance	Mark
5(b)	• 18 converted to 8-bit binary 0001 0010 (1) • -8 converted to two's complement 8-bit binary 1111 1000 (1) • Addition performed correctly (1 mark for each nibble) ○ 8-bit binary result of 0000 (1) 1010 (1)	• Penalise use of fewer/more than 8 bits only once. • Allow follow through errors on addition, as long as there is at least one carry.	4

Question number	Answer	Additional guidance	Mark
5(c)	One from • 2^9 gives 512 (1) patterns whereas 2^8 gives 256 patterns (1) • 2^8 (1) does not give enough patterns whereas 2^9 (1) gives more than enough patterns	• Do not award responses stating 8 bits is not big enough, as it is implied in the stem.	2

Question number	Answer	Additional guidance	Mark
5(d)	One mark for each: • Sample rate and bit depth = 44.1 × 1000 × 16 (1) • Channels and time = 2 × 4 × 60 (1) • Unit conversions = 8 × 1024 × 1024 (1) • Numerator and denominator the right way around (1) Example of an expression that gains full marks: ((44.1 × 1000 × 16) × (2 × 4 × 60)) ÷ (8 × 1024 × 1024)		**4**

Question number	Answer	Additional guidance	Mark
5(e)	Image data: One mark for any two conversions done correctly and one mark for the third conversion done correctly to a maximum of 2 • Width converted to 8 denary • Height converted to 5 denary • Colour depth converted to 2 denary Colour table: One mark for any two conversions done correctly to a maximum of 2 • Black converted to 00 binary • Red converted t 01 binary • Green converted to 10 binary • White converted to 11 binary Image grid: Sequence of cells any two colours labelled correctly to a maximum of 2 • L-shaped Black • Single row Red • Double row Green • Single row White	• Allow overruns on image grid only once for each cell, i.e. if Red overruns in to Black, award Red, but not Black.	**6**

	 B B B B B B B B B R R R R R R R B G G G G G G G B G G G G G G G B W W W W W W W B B B B B B B B B R R R R R R R B G G G G G G G B G G G G G G G B W W W W W W W		