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CAMBRIDGE
International Education

Cambridge International AS & A Level

COMPUTER SCIENCE **9618/13**

Paper 1 Theory Fundamentals **May/June 2026**

MARK SCHEME

Maximum Mark: 75

Published

This mark scheme contains the instructions and marking guidance that our examiners used to mark candidate responses for this component.

Before they start marking, examiners complete a standardisation process. They review a range of candidate responses and discuss the mark scheme in detail to agree which answers can and cannot be accepted. Examiners award marks where it is clear that candidate responses have met the requirements of the mark scheme. These requirements may vary between different components or different versions of the same component, depending on the exact requirements of the question and the candidate responses seen during the standardisation process.

Sometimes, our mark schemes may allow marks to be awarded to responses which contain elements that are factually incorrect or for content not covered by the syllabus. We do this in response to the demands of a specific question to support candidates and make sure that our assessments are fair. However, these allowances should not be used as a guide for teaching and learning.

We cannot discuss the mark scheme with schools, and we recommend that schools read the mark scheme together with the assessment material and the Principal Examiner Report for Teachers.

This document consists of **16** printed pages.

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General marking principles

All examiners must apply these marking principles when marking candidate responses.

1	Examiners must award marks for each response in line with: • the specific **content** defined in the mark scheme • the specific **skills** defined in the mark scheme or in the level descriptions • the **standard of response** required as exemplified by the standardisation scripts.
2	Examiners must award **whole marks** (not half marks, or other fractions).
3	Examiners must award marks **positively**. This means that: • marks are not deducted for errors or omissions • marks are awarded for correct/valid answers as defined in the mark scheme and also for **other valid answers** which go beyond the scope of the syllabus and mark scheme referring to your team leader as appropriate • the quality of spelling, punctuation and grammar are judged **only** when the mark scheme indicates that these features are **specifically assessed** in the question. However, the meaning of all responses must be unambiguous.
4	Examiners must **consistently** apply the requirements of the mark scheme and any rules for what to do when candidates have not followed instructions correctly.
5	Examiners must use the **full range of marks** defined in the mark scheme, unless limited by the quality of the candidate responses seen.
6	Examiners must award marks according to the mark scheme and **must not** award marks with grade thresholds or grade descriptions in mind.

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Annotations guidance for centres

Examiners use a system of annotations as a shorthand for communicating their marking decisions to one another. Examiners are trained during the standardisation process on how and when to use annotations. The purpose of annotations is to inform the standardisation and monitoring processes and guide the supervising examiners when they are checking the work of examiners within their team. The meaning of annotations and how they are used is specific to each component and is understood by all examiners who mark the component.

We publish annotations in our mark schemes to help centres understand the annotations they may see on copies of scripts. Note that there may not be a direct correlation between the number of annotations on a script and the mark awarded. Similarly, the use of an annotation may not be an indication of the quality of the response.

The annotations listed below were available to examiners marking this component in this series.

Annotations

Annotation	Meaning
	Correct
	Incorrect
	To indicate where a key word/phrase/code is missing.
	Not relevant or used to separate parts of an answer.
	Indicates a part of the answer that is incorrect.
Highlighter	To draw attention to a particular aspect or to indicate where parts of an answer have been combined.
	Too vague.
	Repetition
	No examples or not enough.

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Annotation	Meaning
BOD	Benefit of Doubt.
NAQ	Not Answered Question.
SEEN	Indicates that work or a page has been seen including blank answer spaces and blank pages.
FT	Follow through.
I	Ignore

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Question	Answer	Marks	Guidance
1	**1 mark** for each correct term **Visual check** is a method of verification where the data is entered by a user and then manually compared to the original data to make sure that they are the same. A verification method used during data transfer calculates a value from the data which is transferred with the data. The receiver performs the same calculation and compares the result with the value transferred. This method of verification is **checksum**. There are several methods of data validation. **Existence** check compares the data entered to a list of possible values that can be entered. If the data is not one of these values, it is rejected. **Format** check can be used to make sure data entered has the correct combination of letters, numbers and symbols. For example, a code may need to be two capital letters, one number followed by one symbol. **Length** check is used to make sure the correct quantity of characters has been entered. For example, a name must be more than one character and less than or equal to 100 characters.	**5**	

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>2(a)</td><td>1 mark for each correct column

<table>
<tr><th>X</th><th>Y</th><th>Z</th><th>Working space</th><th>A</th><th>B</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td></td><td>1</td><td>1</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td></td><td>0</td><td>0</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td></td><td>1</td><td>0</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td></td><td>1</td><td>1</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td></td><td>1</td><td>1</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td></td><td>1</td><td>0</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td></td><td>1</td><td>0</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td></td><td>1</td><td>1</td></tr>
</table></td><td>2</td><td></td></tr>
<tr><td>2(b)</td><td>1 mark for two correct

NAND and OR</td><td>1</td><td>Both are needed.</td></tr>
<tr><td>3(a)</td><td>1 mark for:

Each sample is stored as a 16-bit binary number // there are 2^16 / 65536 different amplitudes that can be recorded</td><td>1</td><td>Accept 2 bytes Or any equivalent.</td></tr>
</table>

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Question	Answer	Marks	Guidance
3(b)(i)	**1 mark** each to **max 3** • Image is a series of pixels • … where each pixel has one colour • Each colour has a **unique** binary number • The binary number/code of the colour of each pixel is stored in sequence	**3**	
3(b)(ii)	**1 mark** for working **1 mark** for answer • 2048 * 1536 * 2 * 8 / 1024 / 1024 • 48 MiB	**2**	
3(c)(i)	**1 mark** each **max 2** for image and **max 2** for sound Image e.g. • Run-length encoding / RLE • Store each colour and the number of times it appears **consecutively** Sound e.g. • Reduce amplitude values (dynamic range) to only those sounds used in the actual recording … • … reducing sampling resolution without impacting the sound • Record changes in amplitudes instead of each individual amplitude … • …each change requires less bits than a new amplitude	**4**	Accept RLE for sound but do not allow for both parts
3(c)(ii)	**1 mark** for: • **Storage** located on a remote server that **anyone** can sign up to and use	**1**	Not commercial sites

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Question	Answer	Marks	Guidance
3(c)(iii)	**1 mark** each to **max 2** • Animator can access anywhere that has internet access // animator can work on the animation in different locations as long as they have internet • Animator can access from any device // animator can work on different devices • Animator can give authentication/access to selected people without having to transfer the files/animation individually // Online collaboration with colleagues • Storing data in the cloud reduces the need for large amounts of internal storage on the local devices • The cloud company manages backups etc. • The Animator not responsible for security • More storage capacity readily available if needed	**2**	
4(a)	**1 mark** each • 3 tables with suitable names e.g. Student, Book, Borrow • All tables given have a suitable PK • Book has fields: author, title, category, number of pages • Student has fields: Fname LName, class • Borrow has fields: book PK, student PK, date borrowed, field to identify book is late • FKs in borrow are clearly identified as the Book PK and the Student PK e.g. Book(BID, Author, Title, Category, Pages) Student(SID, FName, LName, Class) Borrow(BwID, *StudentID*, *BookID*, DateBorrowed, Late)	**6**	Allow composite primary key for Borrow table. Borrow table must contain sensible linking related fields Do **not** accept Title or Name as PKs. Allow alternatives to late e.g. DateBorrowed, DateDueBack, DateReturned.
4(b)	**1 mark** each to max 2 • Ensure consistency of data // up-to-date // not redundant data • Ensure relationships between data remain valid and prevent orphaned records • If a change is made in one place it is made everywhere else // cascading updates/deletes • Every foreign key has a corresponding primary key	**2**	

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Question	Answer	Marks	Guidance

4(c)(i)	**1 mark** for each error line and correction
	
	• Line 01
	`CREATE DATABASE SCHOOLDATA;`
	• Line 03
	`SubjectCode VARCHAR NOT NULL,`
	• Line 04
	`SubjectName VARCHAR,`
	• Line 07
	`FOREIGN KEY (DepartmentID) REFERENCES DEPARTMENT(DepartmentID)`
		4	Do not award mark for Line 04 if extra Not Null has been added

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Question	Answer	Marks	Guidance

4(c)(ii)	**1 mark** for each correct point
	
	• Selecting department name and counting subject code …
	• Using suitable field name
	• From statement where with join / other join method
	• Grouping by department name / department ID
	• Ordering by department name in ascending order
	
	Example 1:
	`SELECT DepartmentName, COUNT(SubjectCode)` (MP1)
	`AS "NumberSubjectCodes"` (MP2)
	`FROM DEPARTMENT, SUBJECT`
	`WHERE DEPARTMENT.DepartmentID = SUBJECT.DepartmentID` (MP3)
	`GROUP BY (DepartmentID)` MP4)
	`ORDER BY DepartmentName;` (MP5)
	
	Example 2:
	`SELECT DepartmentName, Count(Subject.SubjectCode)` (MP1)
	`AS CountOfSubjectCode` (MP2)
	`FROM DEPARTMENT (INNER) JOIN SUBJECT`
	`ON DEPARTMENT.DepartmentID = SUBJECT.DepartmentID` (MP3)
	`GROUP BY DEPARTMENT.DepartmentName` (MP4)
	`ORDER BY (DEPARTMENT.DepartmentName) ASC;` (MP5)
	
	Please note that these two lines are equivalent to MP1 and MP2
	`SELECT DepartmentName,`
	`NumberSubjectCodes = Count(SUBJECT.subjectcode)`
	
	MP1: `SELECT DepartmentName,` **and** a correct `COUNT` function
	MP2: `CountOfSubject =`
		5	Accept == for =
			
			Accept any correct method of joining the tables, but no mix and match between methods
			
			In example 1 the join mark needs correct FROM **and** WHERE clauses
			
			In example 2 the join mark needs correct FROM… JOIN **and** ON clauses

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Question	Answer	Marks	Guidance
5(a)(i)	**1 mark** each to max 2 e.g. • Transfer data between peripheral devices • Translate data from I/O/peripheral devices • Loading and installation of device drivers • Hardware abstraction — hiding hardware differences from applications • Power management — sleep states, CPU throttling, battery control	**2**	
5(a)(ii)	**1 mark** each to max 2 e.g. • Memory management • Process management • File management • Security management // managing user accounts • Provide platform for running applications	**2**	
5(b)(i)	**1 mark** for: • Perform housekeeping/maintenance tasks // improving/optimising overall performance	**1**	
5(b)(ii)	**1 mark** each to **max 2** e.g. • Prepared a disk for future use by // initialising • …changing/setting file system // by example // directory structure // allocation tables • … naming the disk (volume label) • … creating a boot sector • …erasing all data • …creating partitions	**2**	

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Question	Answer	Marks	Guidance
5(c)(i)	**1 mark** for: • Set of pre-written / pre-compiled / pre-tested routines	**1**	
5(c)(ii)	**1 mark** for benefit **1 for expansion** e.g. • Maintenance not needed to be done by the programmer • ... because the DLL is separate from program // maintained by library creator • The calling program does not need recompilation by the programmer when a DLL file changes • ... because the DLL file can be updated independently of the calling program • … updates will apply to all programs that use the DLL file • (Executable) file is smaller • ... because it does not contain (all) the library routines // code only linked at execution • (Main) memory requirements for program is reduced • … because the DLL files are only loaded into memory when required • ... one DLL file can be used by several running programs	**2**	

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Question	Answer	Marks	Guidance
6(a)	1 **mark** for each **set** of lines from each denary number **Denary number** → **Equivalent unsigned value** 3120 → BCD: 0001010100001010001 289 → Hexadecimal: 121 22516 → Hexadecimal: 57F4 15851 → Binary: 11110111101011 BCD: 0011000100100000 → Binary: 110000110000	**4**	
6(b)	**1 mark** for working **1 mark** for answer. 1101 0100 1111 1111 1100 1111 1 1101 0001 1110 1111 1 1 111	**2**	No marks for answer if no evidence of using binary addition.

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>6(c)</td><td>1 mark for correct answer

1713</td><td>1</td><td></td></tr>
<tr><td>6(d)</td><td>1 mark for correct answer

1000000000000000</td><td>1</td><td>Last answer</td></tr>
<tr><td>7(a)</td><td>1 mark for each correct answer

<table><tr><th>Mode of addressing</th><th>Description</th></tr><tr><td>Direct</td><td>The operand is an address where the data is stored.</td></tr><tr><td>Indirect</td><td>The operand is an address that stores the address where the data is stored.</td></tr><tr><td>Indexed</td><td>The operand is an address. The address where the data is stored is calculated by adding the operand to the content of the index register.</td></tr><tr><td>Immediate</td><td>The operand is the data to be used.</td></tr></table></td><td>4</td><td>No mnemonics / opcodes</td></tr>
</table>

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Question	Answer	Marks	Guidance
7(b)	**1 mark** each to **max 3** • Bit manipulation allows a change/evaluation of the **state/value** of a bit // masking Monitoring: • When monitoring, bit manipulation can be used to **establish the state of a device** (read inputs) • … by testing/observing the state of an individual bit Controlling: • When controlling bit manipulation can be used to **change the state of a device** (control output) • … by setting/clearing/toggling a single bit • … or by clearing a byte	**3**	
7(c)	**1 mark** for similarity: • Both lose the Least Significant Bit(s) (LSB) // // both lose bit(s) from the right of the number **1 mark** for difference: • Arithmetic retains **sign**/**MSB** while logical does not retain **sign**/MSB • MSBs are filled with 0 for logical and copies of the **sign bit** for arithmetic.	**2**	For difference, must have both sides
8(a)	**1 mark** for name, **1 mark** for a matching description • EPROM • Erase using UV rays // needs removing to erase // have to erase whole device // supports many read/write cycles • EEPROM • Erase using electric signals // erase in situ // can update parts of memory // uses floating gate technology // supports many read/write cycles	**4**	No mark for expanding acronym for description.

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Question	Answer	Marks	Guidance
8(b)	**1 mark** each. • The microphone has a diaphragm / ribbon • The incoming sound **waves** cause **vibrations** of the diaphragm • … causing a coil to move past a magnet // causing a magnet to move past a coil (dynamic microphone). • // changing the capacitance (condenser microphone) // deforms the crystal (crystal microphone) • An electrical signal is produced	**3**	For MP1 accept diaphragm equivalent e.g. cone.
8(c)	**1 mark** each • Temporary storage of data • …until the device is ready to receive it // until a sound player takes the data • Data may be sent faster than it can be received // Allows for different speed of transmission between devices • Allows processor to carry out other tasks	**3**	

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