# A-level

# Computing

COMP2/Unit 2: Computer Components, The Stored Program Concept and The Internet
Mark scheme

2510
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Version: 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

To Examiners:

1. **When to award '0' (zero) when inputting marks on CMI+:** A mark of 0 should be awarded where a candidate has attempted a question but failed to write anything creditworthy. Insert a hyphen when a candidate has not attempted a question. By these two actions the Principal Examiner will be able to distinguish between the two (nothing credit worthy/unattempted) when analysing any statistics.

2. This mark scheme contains the correct responses which we believe that candidates are most likely to give. Other valid responses are possible to some questions and should be credited. Examiners should refer off mark scheme responses that they believe are creditworthy to a Team Leader.

The following annotation is used in the mark scheme:

;     - means a single mark
**//**     - means alternative response
**/**     - means an alternative word or sub-phrase
**A**     - means acceptable creditworthy answer
**R**     - means reject answer as not creditworthy
**NE**     - means not enough
**I**     - means ignore
**DPT**     - means "Don't penalise twice". In some questions a specific error made by a candidate, if repeated, could result in the loss of more than one mark. The **DPT** label indicates that this mistake should only result in a candidate losing one mark, on the first occasion that the error is made. Provided that the answer remains understandable, subsequent marks should be awarded as if the error was not being repeated.

| Qu | Part | Sub-part | Marking Guidance | Marks | Comments |
|---|---|---|---|---|---|
| 1 | | | First row tick in '4th' column;<br>Second row tick in '2nd' column;<br><br>**A.** Other symbols instead of ticks<br>**R.** Responses where more than one box is ticked on the same line | **2** | |

| Qu | Part | Sub-part | Marking Guidance | Marks | Comments |
|---|---|---|---|---|---|
| 2 | (a) | | Program Counter/Sequence Control Register;<br>Memory Address Register;<br>Memory Buffer Register/Memory Data Register;<br>Current Instruction Register;<br><br>**R.** Abbreviations | **MAX 2** | |

| Qu | Part | Sub-part | Marking Guidance | Marks | Comments |
|---|---|---|---|---|---|
| 2 | (b) | | **Step 1:** MAR ← [PC] / Contents of program counter transferred to MAR;<br><br>**R.** MAR ← PC | **3** | |

| | | | | | |
|---|---|---|---|---|---|
| | | | **R.** [MAR] ← PC (see note about **DPT)** | | |

**R.** PC sends/transfers

**Step 2b:** MBR ← [Memory]$_{addressed}$ / Contents of addressed memory location loaded into MBR; (must have concept of data coming from address in memory, not just going into MBR)

**Step 4:** Decode instruction;

**A.** Contents of CIR decoded
**A.** Instruction is split into opcode and operand
**R.** Data for instruction
**R.** CIR decoded, CIR decodes instruction

**Note: A.** [CIR] decoded

1 mark for each correct step

For PC accept Program Counter/SCR/Sequence Control Register
For MAR accept Memory Address Register
For MBR accept Memory Buffer Register/MDR/Memory Data Register
**A.** Other means of indicating transfer e.g. [PC] →
MAR
**A.** [Memory] for [Memory]$_{addressed}$

**DPT** – no/incorrect square bracket use for register transfer notation

| 3 | | | **General:** | | |
|---|---|---|---|---|---|
| | | | The reason mark is dependent on a correct answer for device. Each reason mark must be different. | | |
| | | | USB flash (drive); **A.** flash drive; **NE** USB // flash // USB drive; <u>Small</u> portable device (that is easily written to and read from); **NE** just 'easily transported' Files would be quite small so will easily fit onto it; No additional hardware device/drive needed to use ; Device is robust; **MAX 1 mark for reason** | 2 | |

| | | | Magnetic tape (drive);<br><br>Can hold large quantities of data;<br>Not needed for fast access to individual files;<br>(Media is portable so) archive tape can be stored away from server;<br>Fast data transfer;<br><br>**MAX 1 mark for reason** | **2** | |
| | | | DVD-R (drive);<br><br>Appropriate medium for storing a typical sized executable;<br>Can only be written to once // cannot be accidentally deleted;<br>Media is portable (so suitable for distribution);<br><br>**MAX 1 mark for reason** | **2** | |

| 4 | (a) | | A set of rules/regulations (to allow communication between devices) // set of agreed signals/codes for data exchange;<br><br>**NE** a rule // a regulation // a signal // a code<br>**NE** instruction(s) | **1** | |

| 4 | (b) | | Analyses statement by statement each line of source code;<br><br>**A.** runs/translates/executes line by line<br>**R.** compiles (line by line)<br><br>Calls routines to carry out each instruction/statement | **MAX 2** | |

| 4 | (c) | | Instructions/programs stored (with data) in main memory; **A.** memory//RAM<br><br>Program run by fetching, (decoding and executing) <u>instructions</u> (from main memory)* in sequence;<br><br>Program can be replaced by loading another program into (main) memory;<br><br>Contents of a (main) memory location can be interpreted as either an instruction or data;<br><br>* = This mark can be awarded without the explicit reference to main memory if main memory has already been mentioned elsewhere in the response. Otherwise, the answer must make clear that the | **3** | |

| | | | | | |
|---|---|---|---|---|---|
| | | | instructions are coming from the main memory to get this mark. | | |

| | | | | | |
|---|---|---|---|---|---|
| **4** | **(d)** | | LOAD   21<br>STORE 23<br><br>LOAD   22<br>STORE 21<br><br>LOAD   23<br>STORE 22<br><br>1 mark for value from 21 stored into 23;<br>1 mark for value from 22 being moved to 21;<br>1 mark for value from 23 being moved to 22;<br><br>***Alternative :***<br><br>LOAD   22<br>STORE 23<br><br>LOAD   21<br>STORE 22<br><br>LOAD   23<br>STORE 21<br><br>1 mark for value from 22 stored into 23;<br>1 mark for value from 21 being moved to 22;<br>1 mark for value from 23 being moved to 21;<br><br>**DPT** if a different temporary storage area is used<br><br>**I** end of statement separators<br><br>**MAX 2 if the program does not fully work** | **3** | |

| 4 | (e) | | Robots find it hard to adapt to changes in environment // Robots are unable to adapt to changes easily;<br><br>Robots find it hard to work with 3D vision;<br><br>Robots find it hard to detect edges between similar objects// robots find it hard to perform shape detection;<br><br>Robots find it hard to get feedback when gripping items;<br><br>Robots find it hard to pick up balls // ball difficult shape to grip // balls can roll away;<br><br>Robots have limited processing power // too many variables to deal with;<br><br>Programming for vision/grip is a complex problem;<br>A child builds up experience of using touch/ vision;<br><br>**A.** Robot cannot recognise when it makes mistakes;<br>**A.** Robot can't think for themselves // can't perform lateral thinking | **MAX 3** | |
|---|---|---|---|---|---|

| 4 | (f) | (i) | (Lens focuses) light/photons onto image sensor;<br>**R.** if uses 'reflection'<br><br>Image sensor is a CMOS/CCD/photoelectric device;<br>CCD used ADC to convert measurement of light intensity into binary;<br>CMOS uses transistors to generate binary value;<br>Image sensor converts light into discrete/electrical signals/binary;<br><br>Image is captured when the shutter is pressed;<br>Large pixels collect more electrons than small pixels and so produce better quality images;<br>Firmware performs data processing to "tidy up" image;<br>(Colour) filter used to generate data separately for Red, Green, Blue colour components;<br>Aperture / shutter speed can be adjusted to cope with varying lighting conditions;<br>Image is recorded as group/array of pixels // Image sensor consists of array of pixel (sensors)//etched into the image sensor's silicon are pixels;<br><br>Image data transferred to robot;<br>Image data usually stored on solid-state disk; | **MAX 3** | |
|---|---|---|---|---|---|

| 4 | (f) | (ii) | Robot has a low powered microprocessor;<br><br>Too much image data for the robot to process quickly // smaller resolution can be processed quicker;<br><br>A high resolution image has too much image data for the robot to store // low resolution uses less storage space;<br><br>Do not need high resolution to determine colour of balls;<br><br>**NE** allows more images to be stored | **MAX 1** | |

| 5 | | | Company will need to register/purchase the domain (with an Internet registrar);<br><br>DNS records will need to be setup // IP address needs to be linked to domain name // www.learncomputing.co.uk set to point to 123.45.67.100;<br><br>(Using telnet) company will need to install web-server / ftp-server onto the server;<br>Web-server configured for root web folder;<br>These services will need to be started on the server;<br>Each service will be allocated a port to listen on;<br>The web server should be set to run on port 80 // FTP set to run on port 21/20;<br><br>Web pages written in HTML / hyperlinked pages / CSS;<br>Cascading style sheets/CSS used to control layout/presentation;<br>upload to the server files using FTP (client);<br><br>After the DNS records have propagated around Internet users will be able to access website;<br><br>Company may wish to perform some search engine optimization (SEO) to allow user to easily find site; | **MAX 6** | |

**Mark Bands and Description**

| 5-6 | *To achieve a mark in this band, candidates must meet the subject criterion (SUB) and all 5 of the quality of language criteria (QWCx).*<br>*SUB  Candidate has made at least five* |
| --- | --- |

|  |  |  |  |  | | | |
|---|---|---|---|---|---|---|---|
|  |  |  |  | subject-related points. | | | |

subject-related points.
*QWC1* Text is legible.
*QWC2* There are few, if any, errors of spelling, punctuation and grammar. Meaning is clear.
*QWC3* The candidate has selected and used a form and style of writing appropriate to the purpose and has expressed ideas clearly and fluently.
*QWC4* Sentences (and paragraphs) follow on from one another clearly and coherently.
*QWC5* Appropriate specialist vocabulary has been used.

**3-4**
*To achieve a mark in this band, candidates must meet the subject criterion (SUB) and 4 of the 5 quality of language criteria (QLx).*
*SUB* Candidate has made at least three subject-related points.
*QWC1* Text is legible.
*QWC2* There may be occasional errors of spelling, punctuation and grammar. Meaning is clear.
*QWC3* The candidate has, in the main, used a form and style of writing appropriate to the purpose, with occasional lapses. The candidate has expressed ideas clearly and reasonably fluently.
*QWC4* The candidate has used well-linked sentences (and paragraphs).
*QWC5* Appropriate specialist vocabulary has been used.

**1-2**
*To achieve a mark in this band, candidates must meet the subject criterion (SUB) and 4 of the 5 quality of language criteria (QLx).*
*SUB* Candidate has made at least one subject-related point.
*QWC1* Most of the text is legible.
*QWC2* There may be some errors of spelling, punctuation and grammar but it should still be possible to understand most of the response.
*QWC3* The candidate has used a form and style of writing which has many deficiencies. Ideas are not
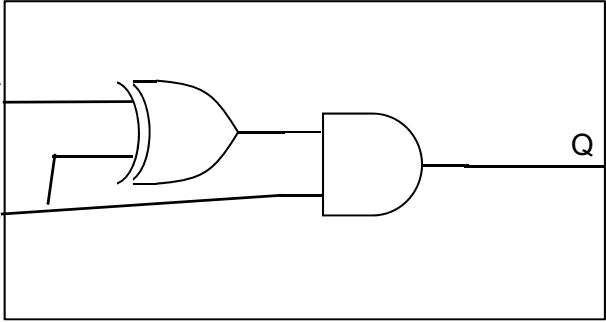
|  |  |  | always clearly expressed.<br>*QWC4*     Sentences (and paragraphs) may not always be well-connected.<br>*QWC5*     Specialist vocabulary has been used inappropriately or not at all. |  |  |
|--|--|--|--|--|--|
|  |  |  | 0    Candidate has made no relevant points. |  |  |
|  |  |  | Note: Even if English is perfect, candidates can only get marks for the points made at the top of the mark scheme for this question.<br><br>If a candidate meets the subject criterion in a band but does not meet the quality of language criteria then drop mark by one band, providing that at least 4 of the quality of language criteria are met in the lower band. If 4 criteria are not met then drop by two bands. |  |  |

| **6** | **(a)** |  | AND;<br>NOR;<br>XOR; **A.** EXOR // EOR // NEQ // exclusive OR; | **3** |  |
|--|--|--|--|--|--|

| **6** | **(b)** | **(i)** | B; | **1** |  |
|--|--|--|--|--|--|

| **6** | **(b)** | **(ii)** | B; | **1** |  |
|--|--|--|--|--|--|

| **6** | **(b)** | **(iii)** | 0;;<br><br>Award 1 mark if De Morgan's has been applied once correctly but candidate does not end up simplifying to 0<br><br>Example: $\overline{B + (\overline{A} + \overline{B})}$<br>Example: $\overline{B} . (A . B)$ | **2** |  |
|--|--|--|--|--|--|

| 6 | (c) | | <br><br>Inputs A and B connected to an XOR gate;<br><br>Input from B and output of XOR gate connected to an AND gate with output going to Q; | 2 | |

| 7 | (a) | | Data Protection (Act); | 1 | |

| 7 | (b) | | Data should be kept securely; | 1 | |

| 7 | (c) | | Data should be fairly and lawfully processed;<br>Data should be obtained for specified and lawful purposes. (**A.** Data should be processed for limited purposes);<br>Data should be adequate, relevant and not excessive;<br>Data should be accurate // kept up to date;<br>Data should not be kept longer than necessary;<br>Data should be not transferred to other countries without adequate protection;<br>Data should be processed in accordance with the rights of the data subjects. | **MAX 1** | |

| 7 | (d) | | That data is not being encrypted // data is not being sent securely // that hackers might be able to see personal data;<br><br>**A.** the protocol/it is not secure<br>**R.** website not secure<br><br>HTTPS // HyperText Transfer Protocol Secure; | 2 | |

| 7 | (e) | | Word processor : General purpose (application software);<br>Parent portal : Bespoke;<br>Web server : Special purpose (application software); | 3 | |

| 8 | (a) | (i) | Hypertext Markup Language; | 1 | |
|---|-----|-----|----------------------------|---|--|

| 8 | (a) | (ii) | Cascading Style Sheet(s); | 1 | |
|---|-----|------|---------------------------|---|--|

| 8 | (b) | | 2 – RoboEddy Homepage ;   **A.** minor typos<br>3 – font-style ;                    (must have hyphen)<br>4 - /style ;                         (must have / )<br>5 – toptitle ;                     **R.** #toptitle<br>6 – class ;<br>7 - ul  8 -- /ul ( 7 + 8 both correct );<br><br>NOTES:<br>Ignore < > for parts 4,7 and 8 | 6 | |
|---|-----|--|---|---|--|

Statistical data and information on grade boundary ranges www.aqa.org.uk/over/stat.html

UMS conversion calculator www.aqa.org.uk/umsconversion