



A-level
COMPUTER SCIENCE
(7517/2)

Paper 2

Mark scheme

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

COMPONENT NUMBER: Paper 2

COMPONENT NAME:

STATUS:

DATE: 8 Aug 2014

To Examiners:

- **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 credit worthy.

Insert a hyphen when a candidate has not attempted a question, so that eventually the Principal Examiner will be able to distinguish between the two (not attempted / nothing credit worthy) in any statistics.

- 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 responses that are not covered by the mark scheme, but which they deem 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 - 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.

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

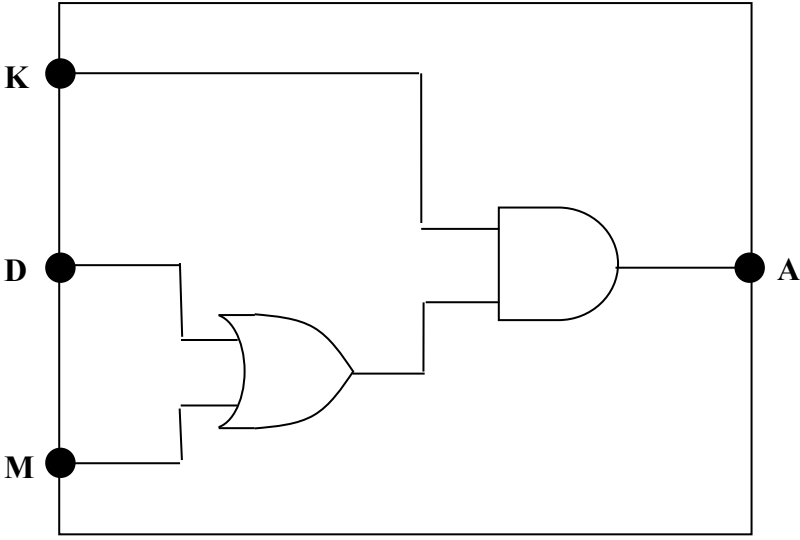
Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This 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.

1		<p>All marks AO1 (understanding)</p> <table border="1" data-bbox="416 297 948 611"> <tr> <td colspan="2" data-bbox="467 297 948 331" style="text-align: center;">Correct Name from List</td> </tr> <tr> <td data-bbox="416 331 467 398">B</td> <td data-bbox="467 331 948 398">Visual display unit;</td> </tr> <tr> <td data-bbox="416 398 467 465">C</td> <td data-bbox="467 398 948 465">Processor;</td> </tr> <tr> <td data-bbox="416 465 467 533">D</td> <td data-bbox="467 465 948 533">Main memory;</td> </tr> <tr> <td data-bbox="416 533 467 611">E</td> <td data-bbox="467 533 948 611">Keyboard;</td> </tr> </table> <p>1 mark per correct answer A. If same response used more than once</p>	Correct Name from List		B	Visual display unit;	C	Processor;	D	Main memory;	E	Keyboard;	4
Correct Name from List													
B	Visual display unit;												
C	Processor;												
D	Main memory;												
E	Keyboard;												
02	1	<p>All marks AO1 (knowledge)</p> <p>1 mark: Serial sends one bit at a time/after each other whereas parallel sends multiple bits <u>simultaneously/at same time</u>; A. "data" for "bits" in the context of parallel transmission</p> <p>1 mark: Serial uses a single wire/cable/path/line whereas parallel uses several/multiple wires/cables/paths/lines; A. serial requires fewer wires R. answers that refer to multiple channels achieved by sharing bandwidth R. unless both sides of a point are made.</p>	2										
02	2	<p>Mark is for AO1 (understanding)</p> <p>Parallel communication can only be used over short distances // distance between computer and peripheral too great to use parallel communication // data skew might occur if parallel communication used; To avoid problems of cross-talk // interference between individual wires; Hardware (for serial communication) is cheaper to manufacture; A. fast transmission rate may not be required; Max 1</p>	1										
02	3	<p>Mark is for AO1 (knowledge)</p> <p>Number of signal changes per second // rate at which signals can change; A. voltage changes for signal changes</p>	1										
02	4	<p>Mark is for AO1 (understanding)</p> <p>Each signal level/signal change represents more than one bit (of data) // channel supports more than two different signal levels/voltages // use of modulation/coding technique eg phase modulation; N.E. Send more than one bit at a time Must be clear that there are more than two signal levels</p>	1										

03	1	<p>All marks AO2 (apply)</p>  <p>1 mark: inputs D and M connected to an OR gate; 1 mark: inputs K and output of OR gate connected to AND gate plus output connected to A; A. a logically equivalent circuit</p>	2
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03	2	<p>All marks AO2 (apply)</p> <p>$A = (D + M) \cdot K$</p> <p>1 mark: D + M somewhere in expression, even if full expression incorrect 1 mark: fully correct expression A. A logically equivalent expression</p>	2
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03	3	<p>1 mark for AO1 (understanding), 1 mark for AO2 (application) and 1 mark for AO1 (knowledge)</p> <p>AO1 (understanding): 1 mark: Flip-flop will store the state of its input // Flip-flop acts as memory;</p> <p>AO2 (application): 1 mark: Insert into circuit between the output of the OR gate and the AND gate // after the AND gate;</p> <p>AO1 (knowledge): 1 mark: Clock signal // trigger // signal to indicate when the value (of the input) should be stored/read;</p>	3
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04	1	All marks AO2 (apply)		12	
		Level	Description		Mark Range
		4	A line of reasoning has been followed to produce a coherent, relevant, substantiated and logically structured response. The response covers all four areas indicated in the guidance below and in at least three of these areas there is sufficient detail to show that the student has a good level of understanding of the technologies required. A good level of understanding would be indicated by three substantiated points being made per area. To reach the top of this mark range, a good level of understanding must be shown of all four areas.		10-12
		3	A line of reasoning has been followed to produce a coherent, relevant, substantiated and logically structured response but the response may only cover three of the areas indicated in the guidance below, with two or three substantiated points being made per area.		7-9
		2	A limited attempt has been made to follow a line of reasoning by covering at least two of the topic areas in the guidance below. Overall, at least four valid points must have been made which can relate to any of the topic areas in the guidance.		4-6
1	A few relevant points have been made but there is no evidence that a line of reasoning has been followed. The points may only relate to one or two of the four areas from the guidance or may be made in a superficial way with little substantiation.	1-3			
<u>Guidance – Indicative Response</u>					

	<p>1. Fridge capturing data from food</p> <p>RFID well suited as completely automatic short-range wireless transmission so no user involvement</p> <ul style="list-style-type: none"> • tag does not contain a power source but is energised by reader in fridge • this causes wireless transmission of data stored in memory on tag to reader <p>Alternatively, scan barcode/QR code as food put into fridge</p> <p>Barcode less suitable than RFID as only identifies product not use by date and must be manually scanned</p> <p>Problem of how to deal with untagged produce – possible use of voice recognition or touch screen interface</p> <p>Can identify products and potentially track use by dates, but how to work out how much of the product is left – refrigerators redesigned with load cells to weigh items automatically?</p> <p>2. Networking technologies</p> <p>IPv4 does not have a big enough address space for the number of devices, hence introduction of Ipv6</p> <p>Higher bandwidth Internet connections required for so many devices</p> <ul style="list-style-type: none"> • copper-based transmission systems replaced with fibre optic <p>Need for a standard (application layer) protocol for devices</p> <p>Security issues with many devices connected to Internet that could be hacked</p> <p>Would data be communicated to retailers directly from each device or through a server in the home?</p> <p>Need to consider how to deal with interference between wireless devices, collisions etc with many more devices communicating</p> <p>3. The data gathered and storage</p> <p>Automatic collection of data from devices will produce vast amounts of data</p> <p>This volume of data would be classified as big data</p> <p>May also be classified as big data due to the velocity of data collection with so many devices</p> <p>Storage could be cloud based for flexibility or close to processing cores for speed</p> <p>Velocity at which data generated would make solid state storage appropriate as has fast access speeds but volume of data and lower cost per megabyte of hard disk storage may mean hard disks more likely to be used</p> <p>Need to consider how long to keep data for in context of</p> <ul style="list-style-type: none"> • Storage capacity available • Complying with relevant laws about privacy <p>4. Processing</p>	
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		<p>Volume of data means parallel processing or distributed processing architectures required</p> <p>Volume of data collected makes it unsuitable for processing by traditional relational databases</p> <p>Functional programming is one approach that could be used</p> <p>Functional programming appropriate as works well on parallel processing systems as programs do not specify order of execution</p> <p>Would software that managed contents of the fridge be run as embedded system in fridge or in the cloud / by the retailer?</p> <p>Retailers may develop a standard API to interface with devices</p>	
05	1	<p>Mark is for AO2 (apply)</p> <p>Grey Pixel: 00 White Pixel: 11; Must have both correct to achieve mark</p>	1

05	2	<p>Mark is for AO2 (apply)</p> <p>1 mark for either:</p> <table border="1" data-bbox="408 338 1173 383"> <tr> <td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td> </tr> </table> <p>or:</p> <table border="1" data-bbox="408 450 1173 495"> <tr> <td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td> </tr> </table>	1	1	1	1	0	0	1	0	0	1	0	1	1	0	1	0	0	0	1	1	1	1	1	1	0	0	0	1	1	0	1	0	0	1	0	1	0	0	1	1	1
1	1	1	1	0	0	1	0	0	1	0	1	1	0	1	0	0	0	1	1																								
1	1	1	1	0	0	0	1	1	0	1	0	0	1	0	1	0	0	1	1																								
05	3	<p>All marks AO2 (apply)</p> <p>Working 1 mark: $20 \times 10 // 2 \times 10 \times 10 // 200$; Division of a number of bits by 8 to convert to bytes (even if number is not 200);</p> <p>1 mark: 25 (bytes);</p>	2																																								
05	4	<p>Mark is for AO1 (understanding)</p> <p>1 mark (Max) for any of the items in this list, or a description of any of them:</p> <ul style="list-style-type: none"> • image width • image height • colour (bit) depth // bits per pixel • number of colour planes • colour table / palette • number of colours in palette • number of important colours • colour channel bitmasks • colour channel gamma correction • file size • image size • type of compression used • pixel density // pixels per metre (A. any other measurement unit) • offset to pixel data within file. <p>A. Any other valid answer (there are many possibilities)</p>	1																																								
05	5	<p>2 marks for AO1 (knowledge) and 1 mark for AO1 (understanding)</p> <p>AO1 (knowledge): How it works (2 marks):</p> <p>1 mark: Identifies sequences of identical data values / colour pixels;</p> <p>1 mark: Represents these as one data value / pixel colour together with a count of how many such values are in the sequence;</p>	3																																								

		<p>AO1 (understanding): Why suitable for icons (Max 1 mark):</p> <p>Images/icons often contain sequences of pixels that are the same colour; RLE is a lossless compression method, so the quality of the image will not be affected (which is important for icons);</p>	
06	1	<p>Mark is for AO1 (understanding)</p> <p>64 / 2⁶;</p>	1
06	2	<p>Mark is for AO2 (apply)</p> <p>100;</p>	1
06	3	<p>Mark is for AO2 (apply)</p> <p>110; A. The response given to question part 6.2 with 10 added on.</p>	1
06	4	<p>Mark is for AO2 (apply)</p> <p>220; A. The response given to question part 6.3 multiplied by 2.</p>	1
06	5	<p>All marks AO1 (understanding)</p> <p>So that source code cannot be accessed by users; So that it is more convenient for users to run it // users do not need to have an interpreter; So that the program will execute more quickly;</p> <p>Max 2</p>	2
06	6	<p>All marks AO1 (understanding)</p> <p>1 mark: Can't know what type of processor will be in user's computer//Internet users have range of computers/devices with different processors; A. References to just different types of computer/device rather than specifically processors 1 mark: A compiled program will only execute on a processor of specific type/family/with same instruction set//A program run using an interpreter can execute on a computer with any type of processor; R. No compiler exists</p>	2

07	1	<p>All marks AO1 (understanding)</p> <p>1 mark: The ‘Router 2’ port labelled A: 192.168.2.x where x is not 0 or 255;</p> <p>1 mark: The computer network interface card labelled B: 192.168.2.y where y is not 0 or 255 or x from the previous response;</p>	2
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07	2	<p>All marks AO1 (understanding)</p> <p>1 mark for advantage and 1 mark for reason. Must give the advantage to get the reason mark.</p> <p>1 mark: (any 1 from) Improved security; as data only travels down one link // is not sent throughout network // is not sent to all nodes; Improved reliability; as if one link fails the other links/nodes are not affected;</p> <p>1 mark: (any 1 from) Speed of link remains constant // speed not affected by number of connections/collisions // faster connection; as no collisions/links not shared;</p> <p>A. cable for link R. responses about terminal/computer failure</p>	2
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07	3	<p>2 marks for AO1 (knowledge) and 4 marks for AO1 (understanding)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Level</th> <th style="text-align: center;">Description</th> <th style="text-align: center;">Mark Range</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">3</td> <td>A detailed, coherent, description of the basic mechanism that shows a good level of understanding. To score six marks, either the description of the basic mechanism must be comprehensive, or, there may be one or two minor errors or omissions in the description of the basic mechanism but these are compensated for by also describing some aspects of CTS/RTS or the back-off mechanism.</td> <td style="text-align: center;">5-6</td> </tr> <tr> <td style="text-align: center;">2</td> <td>An adequate description, including at least three points from the lists below. Some aspects of the basic mechanism may be missed out. The description is logically organised so that it makes sense when read as a whole and therefore demonstrates a reasonable understanding of how the system works.</td> <td style="text-align: center;">3-4</td> </tr> <tr> <td style="text-align: center;">1</td> <td>A small number of relevant points</td> <td style="text-align: center;">1-2</td> </tr> </tbody> </table>	Level	Description	Mark Range	3	A detailed, coherent, description of the basic mechanism that shows a good level of understanding. To score six marks, either the description of the basic mechanism must be comprehensive, or, there may be one or two minor errors or omissions in the description of the basic mechanism but these are compensated for by also describing some aspects of CTS/RTS or the back-off mechanism.	5-6	2	An adequate description, including at least three points from the lists below. Some aspects of the basic mechanism may be missed out. The description is logically organised so that it makes sense when read as a whole and therefore demonstrates a reasonable understanding of how the system works.	3-4	1	A small number of relevant points	1-2	6
Level	Description	Mark Range													
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2	An adequate description, including at least three points from the lists below. Some aspects of the basic mechanism may be missed out. The description is logically organised so that it makes sense when read as a whole and therefore demonstrates a reasonable understanding of how the system works.	3-4													
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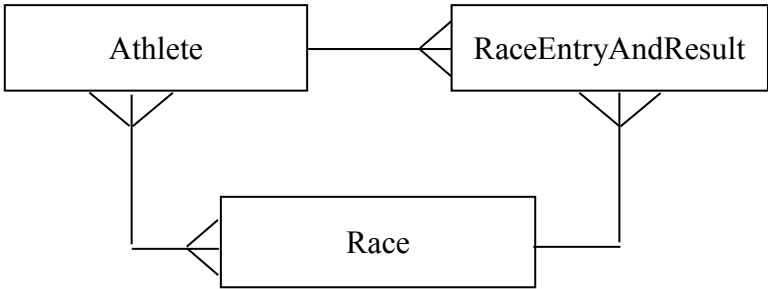
		<p>have been recalled (in this case award one mark per point, up to a maximum of two from lists below). However, the structure of the response, or lack of it, fails to demonstrate an understanding of the mechanism used</p>	
		<p>Basic mechanism:</p> <ul style="list-style-type: none"> • computer monitors/listens for (data signal) • if (data) signal present/another transmission in progress then continue to wait • when no (data) signal present start to transmit • wait to receive acknowledgement packet (to confirm data received and not corrupted) • if no acknowledgement received (within reasonable time period) then: <ul style="list-style-type: none"> ○ wait a random time period ○ then retransmit. <p>CTS/RTS (if implemented):</p> <ul style="list-style-type: none"> • before starting to transmit, computer sends a Request to Send (RTS) to access point • access point will respond with a Clear to Send (CTS) signal to only one computer at a time • only the computer that receives the CTS signal will transmit. <p>Back-off mechanism:</p> <ul style="list-style-type: none"> • waiting period is random to reduce likelihood of two computers transmitting at the same time again // to reduce likelihood of another collision • if a collision occurs again then wait a longer random time before attempting to transmit again • use of exponential back-off algorithm to determine wait time. 	
07	4	<p>1 mark for AO1 (knowledge) and 2 marks for AO1 (understanding)</p> <p>AO1 (knowledge): 1 mark: Checksum (is a number/value which) is calculated from // is a hash of the data in the packet (before it is transmitted);</p> <p>AO1 (understanding): 1 mark: Checksum recalculated when packet is received;</p> <p>AO1 (understanding): 1 mark: If checksum received in packet matches recalculated checksum then data received correctly // If</p>	3

		checksum received in packet differs from recalculated checksum then data has been corrupted;	
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08	1	<p>All marks AO1 (understanding)</p> <p>1 mark per correct response:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">Value description</th> <th style="text-align: center;">Correct letter (A-D)</th> </tr> </thead> <tbody> <tr> <td>A positive normalised value.</td> <td style="text-align: center;">A</td> </tr> <tr> <td>The most negative value that can be represented.</td> <td style="text-align: center;">C</td> </tr> <tr> <td>A value that is not valid in the representation because it is not normalised.</td> <td style="text-align: center;">B</td> </tr> </tbody> </table> <p>If a letter is used more than once then mark as correct in the position where it is correct (if any).</p>	Value description	Correct letter (A-D)	A positive normalised value.	A	The most negative value that can be represented.	C	A value that is not valid in the representation because it is not normalised.	B	3
Value description	Correct letter (A-D)										
A positive normalised value.	A										
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A value that is not valid in the representation because it is not normalised.	B										

08	2	<p>All marks AO2 (apply)</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="border: 1px solid black; padding: 2px;">0</td> <td style="border: 1px solid black; padding: 2px;">● 1</td> <td style="border: 1px solid black; padding: 2px;">0</td> <td style="border: 1px solid black; padding: 2px;">1</td> <td style="border: 1px solid black; padding: 2px;">1</td> <td style="border: 1px solid black; padding: 2px;">0</td> <td style="border: 1px solid black; padding: 2px;">0</td> <td style="border: 1px solid black; padding: 2px;">0</td> <td style="margin: 0 20px;"></td> <td style="border: 1px solid black; padding: 2px;">0</td> <td style="border: 1px solid black; padding: 2px;">1</td> <td style="border: 1px solid black; padding: 2px;">0</td> <td style="border: 1px solid black; padding: 2px;">1</td> </tr> <tr> <td colspan="8" style="text-align: center;">Mantissa</td> <td colspan="4" style="text-align: center;">Exponent</td> </tr> </table> <p>1 method mark for either:</p> <ul style="list-style-type: none"> • showing correct value of both mantissa and exponent in denary (Mantissa = 0.6875 // 11/16, Exponent = 5) • showing binary point shifted 5 places to right in binary number • indicating that final answer calculated using answer = mantissa x 2^{exponent} <p>1 mark for correct answer</p> <p>Answer = 22</p> <p>If answer is correct and some working has been shown, award two marks, even if working would not have gained credit on its own.</p>	0	● 1	0	1	1	0	0	0		0	1	0	1	Mantissa								Exponent				2
0	● 1	0	1	1	0	0	0		0	1	0	1																
Mantissa								Exponent																				

08	3	<p>All marks AO2 (apply)</p> <p>2 marks for working:</p> <p>Correct representation of 6.75 in fixed point binary: 110.11; A. leading 0s. Correct representation of -6.75 in two's complement fixed point binary: 1001.01; A. leading 1s. Showing the correct value of the exponent in denary (3) or binary (11) // showing the binary point being shifted 3 places;</p> <p>Max 2</p> <p>1 mark for correct mantissa and exponent together:</p> <table border="1" data-bbox="406 763 895 824"> <tr> <td>1</td> <td>●</td> <td>0</td> <td>0</td> <td>1</td> <td>0</td> <td>1</td> <td>0</td> <td>0</td> </tr> </table> <p style="text-align: center;">Mantissa</p> <table border="1" data-bbox="406 887 652 947"> <tr> <td>0</td> <td>0</td> <td>1</td> <td>1</td> </tr> </table> <p style="text-align: center;">Exponent</p> <p>If answer is correct and some working has been shown, award three marks, even if working would not have gained credit on its own.</p> <p>Working marks can be awarded for work seen in the final answer eg correct exponent.</p>	1	●	0	0	1	0	1	0	0	0	0	1	1	3
1	●	0	0	1	0	1	0	0								
0	0	1	1													
08	4	<p>All marks AO1 (understanding)</p> <p>1 mark: Reduced precision; 1 mark: Increased range; A. can represent larger/smaller numbers</p>	2													

09	1	<p>Mark is for AO2 (apply)</p> <p>RaceEntryAndResult(<u>RaceNumber</u>, <u>AthleteNumber</u>, TimeSet) 1 mark for underlining both RaceNumber and AthleteNumber.</p>	1
09	2	<p>All marks AO1 (knowledge)</p> <p>Any 2 from: Data is atomic // no repeating groups (of attributes); R. No repeated columns/attributes/data/values No partial (key) dependencies // No (non-key) attribute depends on part of the primary key but not the whole of it // all non-prime attributes are (functionally) dependent on the whole of every candidate key // (non-key) attributes depend on the whole key; No non-key dependencies // No transitive dependencies // (non-key) attributes depend on nothing but the key; Every (non-key) attribute is dependent upon the key; Every determinant is a candidate key; A. 'field' for 'attribute' A. 'part' for 'partial' MAX 2</p>	2
09	3	<p>All marks AO2 (analyse)</p> <p>1 mark for any one correctly drawn relationship OR 2 marks for all three relationships drawn correctly</p>  <pre> classDiagram Athlete --> RaceEntryAndResult RaceEntryAndResult --> Race Athlete --> Race </pre>	2

09	4	<p>All marks AO3 (programming)</p> <p>Method 1:</p> <pre>INSERT INTO RaceEntryAndResult VALUES (6,27,"00:00.00")</pre> <p>Method 2:</p> <pre>INSERT INTO RaceEntryAndResult (RaceNumber, AthleteNumber, TimeSet) VALUES (6,27,"00:00.00")</pre> <p>Method 3 (Default Time Assumed):</p> <pre>INSERT INTO RaceEntryAndResult (RaceNumber, AthleteNumber) VALUES (6, 27)</pre> <p>1 mark for correct <code>INSERT INTO</code> clause 1 mark for correct <code>VALUES</code> clause</p> <p>A. default time delimited by any type of quotation mark or hashes or no delimiter A. any sensible variation on the default time eg "0:00", "00:00:00", or just 0 A. the values 6 and 27 if they are delimited by any type of quotation mark A. list of fields in any order for method 2, but to get the <code>VALUES</code> mark in method 2, order of fields list in <code>INSERT INTO</code> must match order of values in <code>VALUES</code></p>	2
09	5	<p>1 mark for AO2 (analyse) and 2 marks for AO3 (programming)</p> <p><u>Mark Scheme</u></p> <p>AO2 (analyse) – 1 mark:</p> <p>1 mark for correctly identifying the table in the data model that needs to be updated (<code>RaceEntryAndResult</code>) and the conditions that should be used to identify the correct record to in the table to update – with both conditions linked by the correct logical operator</p> <p>Note: The AO2 mark for understanding the data model should be awarded regardless of whether correct SQL syntax is used or not as they are for data modelling, not syntactically correct SQL programming</p> <p>AO3 (programming) – 2 marks:</p>	3

	<p>1 mark for correct SQL syntax in two of the three clauses (UPDATE, SET, WHERE)</p> <p style="text-align: center;">OR</p> <p>2 marks for correct SQL syntax in all three clauses – to get two marks, there must be fully correct SQL syntax and all three clauses must be present, but it might be possible that the AO2 mark was not awarded eg if OR was used instead of AND</p> <p><u>Example Solution</u></p> <pre>UPDATE RaceEntryAndResult SET TimeSet = "00:18.76" WHERE AthleteNumber = 27 AND RaceNumber = 6</pre> <p><u>Additional Guidance</u></p> <p>AO3 marks:</p> <ul style="list-style-type: none"> A. any type of quotation marks or hashes for delimiters for TimeSet or no delimiters A. the values 27 and 6 if they are delimited by any type of quotation mark A. any sensible format for the time data eg "18.76", "18:76", "0:18:76" etc. 	
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09	6	<p>3 marks for AO2 (analyse) and 2 marks for AO3 (programming)</p> <p><u>Mark Scheme</u> AO2 (analyse) – 3 marks:</p> <p>1 mark for correctly understanding the data model and identifying the tables that data needs to be extracted from and the fields that need to be extracted, and including these and no other tables or fields in the query 1 mark for correctly identifying how the data in the required tables should be combined to produce the desired result (the linking condition) 1 mark for identifying the correct conditions to use within the model for the RaceNumber and TimeSet fields to retrieve the required data and for using the correct logical operators between all of the conditions</p> <p>Note: The AO2 marks for understanding the data model should be awarded regardless of whether correct SQL syntax is used or not as they are for data modelling, not syntactically correct SQL programming</p> <p>AO3 (programming) – 2 marks:</p> <p>1 mark for correct SQL syntax in two of the four clauses (SELECT, FROM, WHERE, ORDER BY) OR 2 marks for correct SQL syntax in all four clauses – to get two marks, there must be fully correct SQL syntax and all four clauses must be present, but there could be mistakes in the marks awarded for AO2 e.g. an incorrect or missing condition</p> <p><u>Example Solutions</u></p> <p>Example 1</p> <pre>SELECT AthleteNumber, Forename, Surname, TimeSet FROM Athlete, RaceEntryAndResult WHERE RaceNumber = 6 AND TimeSet <> "00:00.00" AND Athlete.AthleteNumber = RaceEntryAndResult.AthleteNumber ORDER BY TimeSet</pre> <p>Example 2</p> <pre>SELECT AthleteNumber, Forename, Surname, TimeSet FROM Athlete INNER JOIN RaceEntryAndResult ON Athlete.AthleteNumber =</pre>	5
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		<p style="text-align: center;"><code>RaceEntryAndResult.AthleteNumber</code></p> <p><code>WHERE RaceNumber = 6</code> <code>AND TimeSet <> "00:00.00"</code> <code>ORDER BY TimeSet</code></p> <p><u>Additional Guidance</u></p> <p>AO2 marks:</p> <p>Mark(s) can be awarded for the correct logical conditions even if the required tables are not identified as being used by the query Accept alternatives for not equal to that are correct in the context of the data model eg <code>></code> or <code>!=</code> Accept any sensible variation on the default time eg <code>"0:00"</code>, <code>"00:00:00"</code>, or just <code>0</code> Ignore unnecessary clause <code>Race.RaceNumber = RaceEntryAndResult.RaceNumber</code></p> <p>AO3 marks:</p> <p>Accept table names before fieldnames. Accept use of <code>Alias/AS</code> command eg <code>FROM Athlete AS A</code> or <code>FROM Athlete A</code> then use of <code>A</code> as table name. Accept <code>INNER JOIN</code> written as one word i.e. <code>INNERJOIN</code>. Accept <code>ORDER BY</code> written as one word i.e. <code>ORDERBY</code>. Accept <code>ASC</code> at end of <code>ORDER BY</code> clause. Accept insertion of spaces into fieldnames. Accept use of <code>"</code>, <code>'</code> or <code>#</code> as delimiters for times. Accept use of <code>"</code> or <code>'</code> as delimiters for around number 6. Ignore unnecessary brackets. DPT for unnecessary punctuation – allow one semicolon at the very end of the statement, but not at the end of each clause. DPT for fieldname before table name.</p> <p>Refer responses using nested SQL queries to team leaders.</p>	
09	7	<p>All marks AO1 (understanding)</p> <p>Problem Conditions (1 mark):</p> <p>When two users try to update the <u>same record</u> simultaneously;</p> <p>How dealt with (2 marks):</p> <p><u>Alternative 1 - Record Locks</u></p> <p>Maintain information about which records are currently being accessed; When a user tries to access a record, consult this information and only permit access if record is not currently being used // only permit read access to a record that is already open;</p>	3

		<p><u>Alternative 2 - Transaction Queuing</u></p> <p>Updates / database changes are (grouped as transactions and) queued; Database software processes transactions in FIFO order from queue;</p> <p>Award 1 mark for 'use of record locks' if no other marks awarded for how dealt with.</p>	
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10	1	<p>All marks AO1 (understanding)</p> <p>1 mark: A will encrypt the message using B's public; key.</p> <p>1 mark: The message will be decrypted by B using B's private; key.</p>	2
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10	2	<p>All marks AO1 (understanding)</p> <p>1 mark: Detect (unauthorised) changes to message;</p> <p>1 mark: Authenticate sender's identity // confirm who sent it;</p>	2
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11	1	<p>All marks AO1 (understanding)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Equation</th> <th style="text-align: center;">Correct? (Shade three)</th> </tr> </thead> <tbody> <tr> <td>$A \cdot \bar{A} = 1$</td> <td style="text-align: center;"></td> </tr> <tr> <td>$A + B = \overline{\bar{A} \cdot \bar{B}}$</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>$A + 1 = 1$</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>$A \cdot (A + B) = A$</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>$A + (A \cdot B) = B$</td> <td style="text-align: center;"></td> </tr> <tr> <td>$A \cdot 1 = 1$</td> <td style="text-align: center;"></td> </tr> </tbody> </table> <p>If more than three lozenges shaded then take the number of incorrect answers from the number of correct answers to arrive at the total mark</p>	Equation	Correct? (Shade three)	$A \cdot \bar{A} = 1$		$A + B = \overline{\bar{A} \cdot \bar{B}}$	✓	$A + 1 = 1$	✓	$A \cdot (A + B) = A$	✓	$A + (A \cdot B) = B$		$A \cdot 1 = 1$		3
Equation	Correct? (Shade three)																
$A \cdot \bar{A} = 1$																	
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$A \cdot (A + B) = A$	✓																
$A + (A \cdot B) = B$																	
$A \cdot 1 = 1$																	

11	2	<p>All marks AO2 (apply)</p> <p>Example solution:</p> $\overline{\bar{A} + \bar{B}} + B \cdot \bar{A}$ $= A \cdot B + B \cdot \bar{A}$ $= B \cdot (A + \bar{A})$ $= B \cdot 1$ $= B$ <p>In any attempted solution award:</p> <p>1 mark for an application of DeMorgan's law</p> <p>1 mark for an application of a Boolean identity or expanding the brackets</p> <p>1 mark for correct answer</p>	3
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		A. alternative methods of solution but must use Boolean algebra not truth table	
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12	1	<p>Marks is for AO1 (understanding)</p> <table border="1" data-bbox="411 349 962 472"> <tr> <td data-bbox="411 349 544 412">Head</td> <td data-bbox="544 349 962 412">1</td> </tr> <tr> <td data-bbox="411 412 544 472">Tail</td> <td data-bbox="544 412 962 472">[2, 3, 4]</td> </tr> </table> <p>1 mark for both head and tail correct. 1. if brackets are missing in tail.</p>	Head	1	Tail	[2, 3, 4]	1
Head	1						
Tail	[2, 3, 4]						
12	2	<p>Mark is for AO2 (apply)</p> <p>[2, 4, 6, 8];</p> <p>1. if brackets are missing in tail.</p>	1				
12	3	<p>All marks AO1 (understanding)</p> <p>1 mark: Explaining that map applies the function double to each list element;</p> <p>1 mark: Explaining that map applies double to the head of the list;</p> <p>1 mark: and then a recursive call is made on the tail of the list;</p>	3				

