



# **2013 Computing**

## **Higher**

### **Finalised Marking Instructions**

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## **Part One: General Marking Principles for COMPUTING HIGHER**

This information is provided to help you understand the general principles you must apply when marking candidate responses to questions in this Paper. These principles must be read in conjunction with the specific Marking Instructions for each question.

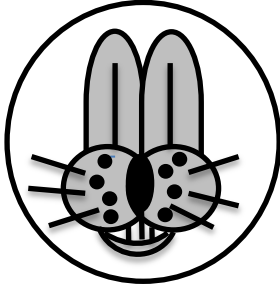
- (a)** Marks for each candidate response must always be assigned in line with these general marking principles and the specific Marking Instructions for the relevant question. If a specific candidate response does not seem to be covered by either the principles or detailed Marking Instructions, and you are uncertain how to assess it, you must seek guidance from your Team Leader/Principal Assessor.
- (b)** Marking should always be positive ie, marks should be awarded for what is correct and not deducted for errors or omissions.

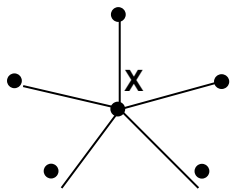
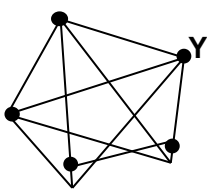
### **GENERAL MARKING ADVICE: COMPUTING HIGHER**

The marking schemes are written to assist in determining the “minimal acceptable answer” rather than listing every possible correct and incorrect answer. The following notes are offered to support Markers in making judgements on candidates’ evidence, and apply to marking both end of unit assessments and course assessments.

Part Two: Marking Instructions for each Question

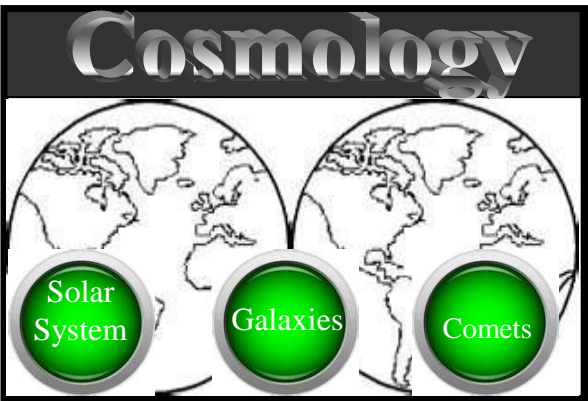
SECTION I

Question		Expected Answer/s	Max Mark
1		<p>Characters can be stored using either <i>Unicode</i> or <i>ASCII</i>. State one advantage and one disadvantage of using Unicode when compared to ASCII.</p> <p>Adv: Unicode allows larger range of characters/character set/more alphabets to be represented. (1)</p> <p>Dis: Unicode requires larger memory/backing store size (as it uses 16 bits per char). (1)</p>	2KU
2		<p>State the minimum number of bits needed to represent the range of positive whole numbers from 0 to 16777215.</p> <p>24 (bits)</p>	1PS
3		<p>The image shown was created using a <i>bitmapped</i> graphics package.</p>  <p>Describe how bitmapped graphics are stored.</p> <ul style="list-style-type: none"> <li>• (Image is stored as a) grid of pixels/2D Array of pixels</li> <li>• Number of bits represents the range of colours/bit depth</li> <li>• (unique) binary number for each colour</li> <li>• each pixel represented as a binary number/byte/bit</li> </ul> <p style="text-align: right;">Any 2</p>	2KU
4		<p>One possible threat to computers comes from <i>viruses</i>.</p>	
4	a	<p>Name the type computer virus that attaches itself to documents created in applications.</p> <p>Macro virus</p>	1KU

Question		Expected Answer/s	Max Mark
4	b	<p><b>Anti-virus software is often installed when a computer is set up. Describe one reason why the computer may still become infected.</b></p> <ul style="list-style-type: none"> <li>• Anti-virus software not kept up to date/new virus not detected by anti-virus software.</li> <li>• Anti-virus software may have been switched off/developed a fault.</li> <li>• Virus is camouflaged/dummy lines of code added to virus/lines of virus code appear in different order/polymorphic virus.</li> <li>• Any other valid response</li> </ul> <p style="text-align: right;"><b>Any 1</b></p>	1PS
5		<p><b>A school office has a networked laser printer. Name and describe a method that could be used to deal with additional print jobs when the printer's buffer is full.</b></p> <p>(Make use of) spooling/printer server (1) Any one of following for 1 mark:</p> <ul style="list-style-type: none"> <li>• Data can be saved to fast backing storage/HD/etc</li> <li>• sent to the printer as and when it is ready/RAM free to receive it.</li> </ul>	1KU 1PS
6		<p><b>Read and write are two control lines. Name two other control lines.</b></p> <p>Reset/Interrupt/NMI/Clock/other valid response.</p>	2KU
7		<p><b>Two network topologies are shown below. Describe the effect on the network of the failure of:</b></p> <ul style="list-style-type: none"> <li>• node X in Diagram A</li> <li>• node Y in Diagram B</li> </ul> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p><b>Diagram A</b></p> </div> <div style="text-align: center;">  <p><b>Diagram B</b></p> </div> </div> <p><b>Key :</b> • Node      — Channel</p> <p>Diagram A: The network cannot operate (1) Diagram B: No effect on the network/Nodes communicate via other paths (1)</p>	2PS

Question	Expected Answer/s	Max Mark
8	<p>The steps involved in a <i>write</i> to memory operation are given below. State the two missing steps.</p> <ol style="list-style-type: none"> <li>1. ....</li> <li>2. <b>Data bus is set up with the data to be written</b></li> <li>3. ....</li> <li>4. <b>Data from data bus is placed into specified memory location.</b></li> </ol> <p>Step 1 – Address bus set up (with location to be written to) <b>(1)</b>  Step 3 – write (control) line is activated <b>(1)</b></p>	2KU
9	<p><b>State why <i>data flow</i> should be included in an algorithm.</b></p> <ul style="list-style-type: none"> <li>• Identifies the data to be used by/passed into and out of subroutines/ subprocesses/procedures/functions.</li> <li>• Data flow identifies parameters (order, type, value, reference, IN, OUT, IN/ OUT).</li> </ul> <p style="text-align: right;"><b>Any 1</b></p>	1KU
10	<p>The variable <code>firstTerm</code> contains “super” and the variable <code>secondTerm</code> contains “symmetry”. The variable <code>physicsTerm</code> is assigned the value “supersymmetry”. All three are <i>string</i> variables.</p> <div style="display: flex; justify-content: space-around; align-items: center; margin: 10px 0;"> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <b>firstTerm</b>  super </div> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <b>secondTerm</b>  symmetry </div> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <b>physicsTerm</b>  supersymmetry </div> </div> <p><b>Using a programming language of your choice, show how <i>concatenation</i> is used to assign the value “supersymmetry” to the variable <code>physicsTerm</code>.</b></p> <p>TrueBasic: LET physicsTerm\$ = firstTerm\$ &amp; secondTerm\$  Visual Basic: physicsTerm = firstTerm &amp; secondTerm  Java: physicsTerm: = firstTerm + secondTerm  LiveCode: PUT firstTerm &amp; secondTerm INTO physicsTerm  (or any other valid syntax)</p> <p><b>(1mark for assignment to <code>physicsTerm</code>, 1 mark for correct concatenation)</b></p>	2PS
11	<p><b>In the case of both a <i>local</i> variable and a <i>global</i> variable, explain what is meant by the term <i>scope</i>.</b></p> <ul style="list-style-type: none"> <li>• The scope of a global variable is the entire program. <b>(1)</b></li> <li>• The scope of a local variable is one subroutine. <b>(1)</b></li> </ul>	2KU

Question		Expected Answer/s	Max Mark
12		<p><b>Describe two characteristics of a 1-D array.</b></p> <ul style="list-style-type: none"> <li>• stores list of values</li> <li>• each element has the same data type</li> <li>• uses a single identifier</li> <li>• uses indexing</li> <li>• has fixed number of elements.</li> </ul> <p style="text-align: right;"><b>Any 2</b></p>	2KU
13		<p><b>State two benefits of a <i>scripting</i> language.</b></p> <ul style="list-style-type: none"> <li>• Allows new functions to be added to existing software.</li> <li>• Enables the automation of complex/repeated operations.</li> <li>• Allows customisation of interface/menus/package.</li> <li>• Allows access to low level functions.</li> </ul> <p style="text-align: right;"><b>Any 2</b></p>	2KU
14		<p><b>State one reason why an <i>independent test group</i> may be used to test software.</b></p> <ul style="list-style-type: none"> <li>• ITG has no bias (towards the client group or the software house) during testing.</li> <li>• The developers may be reluctant to choose test data which highlights shortfalls in their own work, unlike the ITG.</li> </ul> <p style="text-align: right;"><b>Any 1</b></p>	1KU
15		<p><b>Describe what is meant when a computer program is described as <i>portable</i>.</b></p> <ul style="list-style-type: none"> <li>• The program will work on computer systems other than the one it was designed on/using alternative OS <b>(1)</b></li> <li>• with little or no change. <b>(1)</b></li> </ul>	2KU
16		<p><b>The documentation for each subroutine in a <i>module library</i> will identify the name of the subroutine. State one other item of information that might be included in such documentation.</b></p> <ul style="list-style-type: none"> <li>• The purpose of the subroutine</li> <li>• The required list of parameters</li> <li>• The order of the parameters</li> <li>• Each parameter type</li> <li>• Data flow</li> </ul> <p style="text-align: right;"><b>Any 1</b></p>	1PS

Question	Expected Answer/s	Max Mark
17	<p>The main screen from software containing information about the universe is shown.</p>  <p>The original specification for the software required three buttons on the main screen. The client now requires a fourth button called Stars. State the type of <i>maintenance</i> required. Justify your answer.</p> <ul style="list-style-type: none"><li>• Perfective (1)</li><li>• This is a new requirement from the client/not in the original specification. (1)</li></ul>	2PS

**SECTION II**

Question		Expected Answer/s	Max Mark
18		Formula One cars make use of computing technology during races. Every Formula One car is equipped with an on-board computer which records information during a race.	
18	a	<p>The on-board computer makes use of <i>solid state storage</i>. Other than robustness and cost, state two reasons why “solid state” storage is used.</p> <ul style="list-style-type: none"> <li>• Small physical size</li> <li>• Large (data storage) capacity</li> <li>• Low power requirements</li> <li>• Fast access times</li> </ul> <p style="text-align: right;">Any 2</p>	2PS
18	b	<p>During a race, measurements are made from temperature sensors. These sensors are connected to the on-board computer using interfaces. Name two functions of an interface that will be needed to transfer these measurements to the on-board computer and describe the operation of each during the transfer.</p> <ul style="list-style-type: none"> <li>• Data format conversion – converting temperature signals eg analogue to digital/ serial to parallel.</li> <li>• Buffering – temporary storage of data in transit between the component and the computer/compensates for differences in speed.</li> <li>• Handling of status signals – to ensure data from sensors are received correctly</li> <li>• Voltage conversion – to change voltage level of sensor to relevant value for computer.</li> <li>• Protocol conversion – to ensure sensor and computer adhere to the same protocols.</li> </ul> <p>(1 mark for naming, 1 mark for description for 2 of the above)</p>	2KU 2PS
18		Wiktorija regularly visits races to take photographs of the cars. She transfers them from her camera to her computer, edits them and uploads them to her website.	
	c	<p>Wiktorija has bought a 12 Gigabyte flash card. She takes 4 inch by 6 inch photographs with a resolution of 1024 dpi and using 24-bit colour depth. Calculate the maximum number of photographs which can be stored on this card. Show all working.</p> <p>1 picture = <math>4 * 6 * 1024 * 1024 (1) * 24 (1)</math> bits</p> <p>603979776 bits = 72 Megabytes 12 Gigabytes = <math>1024 * 12</math> Megabytes <b>(1 for unification of units)</b></p> <p>Max no. pictures = <math>(1024 * 12)/72 = 170</math> pictures <b>(1 for rounding down)</b></p>	



Question		Expected Answer/s	Max Mark																					
18	d	<p><b>Wiktorcia transfers all her pictures from the flash card to her hard disk. Name two functions of an operating system and describe how each will be involved in this process.</b></p> <ul style="list-style-type: none"> <li>• Input/Output (management) – coordinate transfer of blocks of data/check if devices ready for data transfer/detect transmission errors/buffer data transit.</li> <li>• File management – update FAT/locate location of data blocks for storing (updating) file/protect existing files from being overwritten.</li> <li>• Memory management – to hold the address/location of the uploaded data whilst it is in main memory/protect existing data from being overwritten.</li> <li>• Resource allocation – ensure processor time and memory are allocated to the process.</li> <li>• Interpreting user instructions – receive user commands to backup data.</li> <li>• Error reporting – report any problems encountered during the process.</li> </ul> <p><b>(1 KU each function name, 1 PS each description)</b></p>	2KU 2PS																					
18	e	<p><b>The writer of a new Formula One book discovers Wiktorcia’s website. He copies the pictures and puts them into his new book, which he then sells. Name the law which this writer has broken.</b></p> <p>Copyright, Designs &amp; Patents Act</p>	1PS																					
19		<p><b>Colin recently started to work at a university. He was given funds to select a suite of computers for his lab. The IT department gave him options to choose from.</b></p> <table border="1"> <thead> <tr> <th></th> <th>Mega PCII</th> <th>Peartron III</th> </tr> </thead> <tbody> <tr> <td>Clock Speed</td> <td>3.4 GHz</td> <td>3.6 GHz</td> </tr> <tr> <td>Installed RAM</td> <td>4 Gigabytes</td> <td>8 Gigabytes</td> </tr> <tr> <td>Maximum addressable RAM</td> <td>32 Gigabytes</td> <td>32 Gigabytes</td> </tr> <tr> <td>Hard Disc</td> <td>2 Terabytes</td> <td>2 Terabytes</td> </tr> <tr> <td>Cache Memory</td> <td>8 Megabytes</td> <td>8 Megabytes</td> </tr> <tr> <td>Data bus</td> <td>8 bit</td> <td>64 bit</td> </tr> </tbody> </table>		Mega PCII	Peartron III	Clock Speed	3.4 GHz	3.6 GHz	Installed RAM	4 Gigabytes	8 Gigabytes	Maximum addressable RAM	32 Gigabytes	32 Gigabytes	Hard Disc	2 Terabytes	2 Terabytes	Cache Memory	8 Megabytes	8 Megabytes	Data bus	8 bit	64 bit	
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19	a	<p><b>Looking at the MegaPCII, Colin spots an obvious typing mistake in the information given. Identify the mistake and explain why it is incorrect.</b></p> <p>Data bus width is incorrect (1) Any one of following (1)...</p> <ul style="list-style-type: none"> <li>• 8 bit small for modern computer (likely 64–128 bit)</li> <li>• 8 bit gives 35 bit address bus</li> <li>• 8 bytes, not bits</li> <li>• Other valid response</li> </ul>	2PS																					

Question		Expected Answer/s	Max Mark
19	b	<p><b>Calculate the width of the address bus for the Peartron III.</b></p> <p><math>2^{AB} * 8 = 34359738368</math> (1)  so <math>2^{AB} = 4294967296 = 2^{32}</math>, (1)  Address bus width = 32bits (1)  <b>OR</b>  <math>2^{AB} * 8 = 32</math> Gigabytes (1)  <math>2^{AB} = 32 * 2^{30}/8 = 4 * 2^{30} = 2^{32}</math> (1)  Address bus width = 32 bits (1)  <b>OR</b>  <math>2^{AB} = 32</math> Gb/64bits (1)  <math>2^{AB} = 4294967296</math> (1)  Address bus width = 32 bits (1)</p>	3PS
19	c	<p><b>Both systems have <i>cache memory</i>. Explain how cache memory improves system performance.</b></p> <ul style="list-style-type: none"> <li>• Cache has faster access time than main memory (1) /shortens fetch time. (1)</li> <li>• Holds frequently used instructions (1) /short fetch time. (1)</li> <li>• Wider internal bus (1) therefore faster transfer. (1)</li> <li>• Cache is on the processor (1) /shorter fetch time (faster transfer). (1)</li> </ul> <p style="text-align: right;"><b>2 marks for any one valid bullet</b></p>	2KU
19	d	<p><b>In order to make his choice, Colin uses the results of <i>application based tests</i>. State two reasons why Colin chose to use application based tests.</b></p> <ul style="list-style-type: none"> <li>• Application based tests measure performance in real-life tasks</li> <li>• Take account of the whole system</li> <li>• Are more independent of architecture</li> <li>• and therefore give a more realistic view of performance.</li> </ul> <p style="text-align: right;"><b>Any 2</b></p>	2PS
19		<p><b>Computer systems in the university are networked in a <i>client/server network</i>.</b></p>	
19	e	<p><b>Explain one reason why a peer-to-peer network may not be suitable for the university.</b></p> <ul style="list-style-type: none"> <li>• Security of data/access (1) harder to control without a centralised server (1)</li> <li>• Centralised storage of data needed (1) to allow users access from varying machines (1)</li> <li>• Cannot perform centralised backup easily (1) since data is stored on different systems (1)</li> <li>• Large number of peers (1) would lead to problems with backup/hard to locate distributed files (1)</li> <li>• Different levels of access required (1) harder to set up in peer-to-peer (through shared folders) (1)</li> </ul> <p style="text-align: right;"><b>2 marks for any one valid bullet</b></p>	2PS

Question		Expected Answer/s	Max Mark
19	f	<p><b>Hubs and switches are used in the university network. Explain one difference between a hub and a switch.</b></p> <ul style="list-style-type: none"> <li>• Data sent to a single node with switch <b>(1)</b> hub broadcasts to all nodes <b>(1)</b></li> <li>• Each connected node on a switch receives full bandwidth <b>(1)</b> nodes on a hub share the bandwidth <b>(1)</b></li> <li>• Hub broadcasts increasing traffic <b>(1)</b> point-to-point switch leading to reduced chance of collisions <b>(1)</b></li> </ul> <p><b>1 for reference to switch, 1 for reference to hub</b></p>	2KU
19	g	<p><b>All university computers have <i>anti-virus</i> software installed. Anti-virus is classed as <i>utility software</i>. State two other utility programs which are likely to be installed.</b></p> <ul style="list-style-type: none"> <li>• disk editor</li> <li>• disk cleanup</li> <li>• disk defragmenter</li> <li>• compression software</li> <li>• firewall</li> <li>• any other valid response</li> </ul> <p style="text-align: right;"><b>Any 2</b></p>	2KU
20		<p><b>DeskCom create mathematics software for schools. A systems analyst from DeskCom has been sent to visit an interested school.</b></p>	
20	a	<p><b>Describe two methods the systems analyst may use to gain knowledge of the school's current system for teaching mathematics.</b></p> <ul style="list-style-type: none"> <li>• Observe/shadow a pupil/teacher as they go from class to class and take notes on their activities.</li> <li>• Look at any current materials/course documents used by class teachers.</li> <li>• Interview staff and/or pupils.</li> <li>• Use questionnaires.</li> </ul> <p style="text-align: right;"><b>Any 2</b></p>	2KU

Question		Expected Answer/s	Max Mark
20	b	<p>After the school visit, the systems analyst produces the <i>software specification</i> for creating new mathematics software for the school. State two purposes of this document.</p> <ul style="list-style-type: none"> <li>To act as part of a legally binding contract between the client and the developers.</li> <li>To act as the main guide to the remaining stages of the software development process.</li> <li>To <u>identify exactly/detail/specify precisely</u> what new maths software will do.</li> <li>Identify scope and boundaries of problem.</li> <li>Validate final program against software specification.</li> <li>Any other valid response.</li> </ul> <p style="text-align: right;">Any 2</p>	2KU
20	c	<p>The initial design for the new mathematics software was created using a <i>graphical design notation</i>. Name one graphical design notation.</p> <p>Flow chart, structure diagram/chart, semantic net, etc</p> <p style="text-align: right;">Any 1</p>	1KU
20	d	<p><i>Top down design and stepwise refinement</i> will also be used in the design of the mathematics software. Explain the terms “top down design” and “stepwise refinement”.</p> <p>Top down breaks down problem into simpler steps (1) Stepwise refinement continues this process until coding becomes trivial. (1)</p>	2KU
20	e	<p>DeskCom programmers will consider many factors when deciding which programming language to use to code the new software. Describe one factor they should consider when choosing a programming language.</p> <ul style="list-style-type: none"> <li>The nature of the problem to be solved</li> <li>Type of language (event-driven, etc)</li> <li>Type of user interface</li> <li>Type of hardware/OS</li> <li>The current skills of the programming team</li> <li>Features of the language (data types/functions/etc)</li> <li>Portability of language</li> <li>Any other valid</li> </ul> <p style="text-align: right;">1 mark for one acceptable response</p>	1PS

Question		Expected Answer/s	Max Mark								
20	f	<p>It is important that the new mathematics software is <i>efficient</i>. Describe two items of evidence that could be gathered to support measurement of the efficiency of code.</p> <p>Brief description of test/document/process that evidences:</p> <ul style="list-style-type: none"> <li>• Speed of execution/use of the processor</li> <li>• Amount of RAM/memory used</li> <li>• Use of cache memory/registers/disk accesses</li> <li>• Benchmarking tests</li> <li>• Efficient use of loops/data structures/parameters/etc or examples of these</li> </ul> <p style="text-align: right;"><b>Any 2</b></p>	2PS								
21		<p>ModernCorp manufacture tablet computers. Their recent sales initiative is shown.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Tablet Computer Price</th> <th>Discount Rate %</th> </tr> </thead> <tbody> <tr> <td>&lt; = £500</td> <td>10</td> </tr> <tr> <td>&gt; £500 and &lt; £1000</td> <td>12</td> </tr> <tr> <td>&gt; = £1000</td> <td>15</td> </tr> </tbody> </table> <p>A program is to be created to calculate the <b>discount rate</b> due.</p>	Tablet Computer Price	Discount Rate %	< = £500	10	> £500 and < £1000	12	> = £1000	15	
Tablet Computer Price	Discount Rate %										
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21	a	<p>The price of a tablet computer is held in the variable price. The discount to be applied is stored in the variable discountRate. Use pseudocode to design an algorithm, which uses a <b>CASE</b> statement (or equivalent) to assign the correct discount rate.</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%; vertical-align: top;"> <p>CASE price</p> <p>when &lt;= 500 then   discountRate = 10</p> <p>when &lt; 1000 then   discountRate = 12</p> <p>when &gt;= 1000 then   discountRate = 15</p> <p>End CASE</p> </td> <td style="width: 60%; vertical-align: top; border-left: 1px solid black; padding-left: 10px;"> <p>1 mark for correct start with variable name price and end of CASE or equivalent.</p> <p>1 mark for <b>three</b> correct conditions (accept (&gt;500 AND))</p> <p>1 mark for <b>three</b> correct assignments</p> </td> </tr> </table>	<p>CASE price</p> <p>when &lt;= 500 then   discountRate = 10</p> <p>when &lt; 1000 then   discountRate = 12</p> <p>when &gt;= 1000 then   discountRate = 15</p> <p>End CASE</p>	<p>1 mark for correct start with variable name price and end of CASE or equivalent.</p> <p>1 mark for <b>three</b> correct conditions (accept (&gt;500 AND))</p> <p>1 mark for <b>three</b> correct assignments</p>	3PS						
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21		<p>MoodyZak is software which comes free with a ModernCorp tablet computer. MoodyZak creates a song list from stored music based on data entered about the user's mood. Mood data is entered into MoodyZak, through a touch screen, on a list of check boxes.</p> <div style="display: flex; justify-content: center; gap: 20px; margin-top: 10px;"> <div style="text-align: center;"><input type="checkbox"/> Dark</div> <div style="text-align: center;"><input type="checkbox"/> Sad</div> <div style="text-align: center;"><input type="checkbox"/> Bored</div> <div style="text-align: center;"><input type="checkbox"/> Quiet</div> <div style="text-align: center;"><input type="checkbox"/> Bright</div> <div style="text-align: center;"><input type="checkbox"/> Happy</div> </div>									

Question		Expected Answer/s	Max Mark
21	b	<p><b>State a <i>data structure</i> and <i>data type</i> that could be used to record the mood list for a single song.</b></p> <p>An array (1) of Booleans/strings (1).</p>	2PS
21	c	<p><b>The use of a <i>declarative</i> programming language was considered for the creation of MoodyZak. Explain why a declarative programming language might be suitable in this case.</b></p> <ul style="list-style-type: none"> <li>• Uses a stored set/list of facts and rules (about music and mood)</li> <li>• Pattern matching used to apply these rules to user's mood</li> <li>• Queries can be used (to interrogate the knowledge base)</li> <li>• Justification facility might explain music choice</li> <li>• Lists can be processed</li> <li>• Any other valid response</li> </ul> <p style="text-align: right;"><b>Any 2</b></p>	2PS
21	d	<p><b>The use of check boxes as the input for MoodyZak is an <i>event driven</i> feature. State the meaning of the term "<i>event driven</i>".</b></p> <ul style="list-style-type: none"> <li>• The order that program code is executed is dependent on which check boxes the user selects</li> <li>• Code is attached to on-screen objects (such as buttons) which are selected by the user</li> <li>• Code blocks are activated by user actions (such as clicking on buttons)</li> <li>• Any other valid response</li> </ul> <p style="text-align: right;"><b>Any 1</b></p>	1KU
21	e	<p><b>The author of the MoodyZak code did not provide any supporting documentation. Only the compiled program, the program listing and a software licence were provided. Describe two examples of problems that this missing documentation could cause.</b></p> <ul style="list-style-type: none"> <li>• If maintenance is required, code would need to be re-entered from listing or the machine code edited.</li> <li>• No test record for the program will make maintenance more difficult.</li> <li>• No user guide may cause problems for novice users.</li> <li>• No technical guide may cause installation problems.</li> <li>• Many other valid answers are possible.</li> </ul> <p style="text-align: right;"><b>Any 2</b></p>	2PS


Question			Expected Answer/s	Max Mark					
22			<b>A horse race produced the set of results shown below. The names and times are held as two lists.</b>						
			<b>Name</b>		Mister McGee	Kelly's Hero	Fred's Folly	The Tool Inns	Fizzy Lizzie
			<b>Time:</b>		8.15	7.12	8.65	9.15	7.08
			<i>Minutes</i>						
22	a	i	<p><b>Use pseudocode to design an algorithm that would store the time of the winning horse in the variable Fastest.</b></p> <p>Fastest = HorseTimes(1) <span style="float: right;"><b>1 mark for correct initialisation (accept assignment of large value)</b></span></p> <p>Loop from 2 to 5 <span style="float: right;"><b>1 mark for correct loop structure (accept 1 to 5/loop terminator)</b></span></p> <p>If HorseTimes (current) &lt; Fastest <span style="float: right;"><b>1 mark for correct conditional structure</b></span></p> <p>then</p> <p>    Set Fastest = HorseTimes (current) <span style="float: right;"><b>1 mark for correct assignment</b></span></p> <p>End of if statement</p> <p>Return to start of loop</p>	<b>4PS</b>					
22	a	ii	<p><b>The time for the Slowest horse is also to be identified. Other than the change of variable name, state one change that would have to be made to your algorithm for part (i) to achieve this.</b></p> <ul style="list-style-type: none"> <li>• Change the &lt; sign to &gt; (can also accept &gt; =).</li> <li>• Change the initialisation value if appropriate eg slowest = 0.</li> </ul>	<b>1PS</b>					
22	a	iii	<p><b>The number of horses who have a race time greater than 8 minutes is also to be identified. State the name of a <i>standard algorithm</i> that could achieve this.</b></p> <p>Counting occurrences.</p>	<b>1PS</b>					
22	b		<p><b>Explain why a <i>compiler</i> makes more efficient use of the processor when compared to an <i>interpreter</i> during translation/execution of a loop.</b></p> <ul style="list-style-type: none"> <li>• A compiler will translate the contents of a loop only once.</li> <li>• An interpreter will translate the contents of a loop every time it repeats.</li> <li>• A compiler does not use processor time retranslating.</li> </ul> <p style="text-align: right;"><b>Any 2</b></p>	<b>2PS</b>					

Question			Expected Answer/s	Max Mark
22	c		<b>Systematic and comprehensive testing can be used to test programs.</b>	
22	c	i	<p><b>State the meaning of “systematic” testing.</b></p> <ul style="list-style-type: none"> <li>• Systematic testing will test each subroutine, subsystem and then the whole system independently</li> <li>• Testing will take place in a logical/ordered/planned way <b>OR</b> following an agreed plan</li> <li>• Other valid</li> </ul> <p style="text-align: right;"><b>Any 1</b></p>	1KU
22	c	ii	<p><b>Explain the meaning of “comprehensive” testing.</b></p> <ul style="list-style-type: none"> <li>• Comprehensive testing will use normal, extreme and exceptional test cases</li> <li>• Test the full range of inputs/across all combinations</li> </ul> <p style="text-align: right;"><b>Any 1</b></p>	1KU



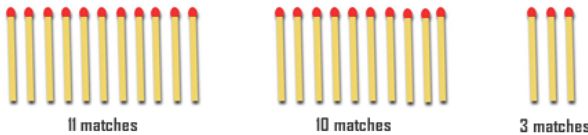
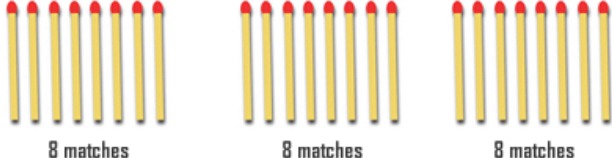
**SECTION III**

**Part A –Artificial intelligence**


Question			Expected Answer/s	Max Mark
23			<p>Computers have had success playing games against human opponents. Chess is an example of one such game.</p> 	
23	a		<p><b>State one characteristic of chess that makes it suitable for computers to play.</b></p> <ul style="list-style-type: none"> <li>• Cannot go on forever – rules do not allow it</li> <li>• Clearly defined rules/moves</li> <li>• Clearly define start and end conditions</li> <li>• No element of chance</li> <li>• Closed world</li> <li>• Limited/restricted domain</li> <li>• You have complete information – no aspects of the game are hidden unlike many other games</li> <li>• It can be expanded using search trees because all possible moves can be evaluated</li> <li>• Any other reasonable response</li> </ul> <p style="text-align: right;"><b>Any 1</b></p>	<b>1PS</b>
23	b		<p><b>Some people would argue that a chess computer is an example of <i>artificial intelligence</i>.</b></p>	
23	b	i	<p><b>State one definition of artificial intelligence.</b></p> <p>The ability of a <u>machine</u> to do things thought to require intelligence when done by people.</p>	<b>1KU</b>

Question			Expected Answer/s	Max Mark
23	b	ii	<p><b>State one argument to support the view that the chess computer exhibits artificial intelligence.</b></p> <ul style="list-style-type: none"> <li>• Chess computer is problem solving – an aspect of intelligence</li> <li>• Chess computer can beat people that have intelligence so must be intelligent</li> <li>• Chess computer would know if board is set up wrongly</li> <li>• Demonstrate other aspects of intelligence – learn/cognitive ability/recall</li> <li>• Any other suitable response</li> </ul> <p style="text-align: right;"><b>Any 1</b></p>	1PS
23	b	iii	<p><b>State one argument against the view that the chess computer is artificially intelligent.</b></p> <ul style="list-style-type: none"> <li>• Chess computer has no actual understanding of the game or the situation</li> <li>• Chess computer is an example of a machine displaying the programmer's intelligence</li> <li>• Chess computer cannot learn</li> <li>• Limited aspects of intelligence are involved</li> </ul> <p style="text-align: right;"><b>Any 1</b></p>	1PS
23	c		<p><b>In chess, white plays first and can make one of twenty possible moves; black can then make one of twenty possible moves.</b></p> <p><b>Explain how the term <i>combinatorial explosion</i> applies to the game of chess.</b></p> <p>After a few moves the number of nodes will grow massively <b>(1)</b> /few moves ahead will have a huge number of nodes when/evaluating a small number of nodes ahead eg 6 moves = <math>20^6=64\ 000\ 000</math>.</p>	1PS
23	d		<p><b>A search technique uses an evaluation function in order to identify more promising nodes.</b></p>	
23	d	i	<p><b>State the search technique being used.</b></p> <p>Heuristic</p>	1KU
23	d	ii	<p><b>Describe one advantage of this search technique over other search techniques.</b></p> <ul style="list-style-type: none"> <li>• Reduces search time <b>(1)</b> by not evaluating/examining/expanding poor moves (and their evaluation functions)/by expanding better moves <b>(1)</b></li> <li>• Reduces search space <b>(1)</b> by not evaluating/examining/expanding poor moves (and their evaluation functions)/by expanding better moves <b>(1)</b></li> </ul>	2PS

Question			Expected Answer/s	Max Mark
24			<p>The paragraph below contains some information about spiders.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Spiders have eight legs. They have both silk and venom.            Black Widow and Huntsman are types of spider.            Huntsman spiders have eight eyes</p> </div> <p>This knowledge is represented graphically as:</p> <pre> graph TD     spiders((spiders)) -- have --&gt; eight_legs((eight_legs))     spiders -- have --&gt; silk((silk))     spiders -- have --&gt; venom((venom))     black_widow((black_widow)) -- are --&gt; spiders     huntsman((huntsman)) -- are --&gt; spiders     huntsman -- have --&gt; eight_eyes((eight_eyes))           </pre>	
24	a	i	<p>State the name of this graphical technique for representing knowledge.</p> <p>Semantic net</p>	1KU
24	a	ii	<p>State one reason why this knowledge representation technique aids the implementation in a declarative language.</p> <ul style="list-style-type: none"> <li>• Each line represents a fact.</li> <li>• Each line informs/decides the predicate.</li> <li>• The nodes inform/decide the arguments of a Prolog fact.</li> <li>• The arrow direction decides the order of the arguments.</li> </ul> <p style="text-align: right;"><b>1 mark for any valid response</b></p>	1PS
24	b	i	<p>Use the information in the diagram to state one fact using Prolog or similar.</p> <ul style="list-style-type: none"> <li>• have(spiders, eight_legs)</li> <li>• have(spiders, silk)</li> <li>• are(black_widow, spiders)</li> <li>• any other suitable response</li> </ul> <p><b>1 mark for correct predicate, 1 mark for arguments in the correct order</b></p>	2PS

Question			Expected Answer/s	Max Mark
24	b	ii	<p><b>Both the Hunstman and the Black Widow have eight legs. Write one rule so that they <i>inherit</i> this property.</b></p> <p>have(X,Y):- are(X,Z) , have(Z,Y)  Accept :  have(X,eight_legs):- are(X,spider) , have(spider, eight_legs)  OR  have(X,eight_legs):- are(X,Z) , have(Z, eight_legs)</p> <p><b>1 mark correct form of head of rule, 1 mark <u>are</u> and <u>have</u>, 1 mark correct use of variables (as capital letters).</b></p>	3PS
24	b	iii	<p><b>State one benefit of using an <i>inheritance</i> rule.</b></p> <ul style="list-style-type: none"> <li>• Reduces the need for stating multiple/numerous/additional facts.</li> <li>• Allows all members of a group to have the same attributes without having to write each out.</li> </ul> <p style="text-align: right;"><b>Any 1</b></p>	1PS
25			<p><b>Matches is a puzzle where twenty-four matches are arranged into three bundles of eleven, ten and three.</b></p>  <p style="text-align: center;">11 matches                      10 matches                      3 matches</p> <p><b>The object of the puzzle is to create the goal state of three equal bundles of eight matches.</b></p>  <p style="text-align: center;">8 matches                      8 matches                      8 matches</p> <p><b>Matches must be transferred from one bundle to another so that</b></p> <ul style="list-style-type: none"> <li>• the number of matches in the receiving bundle is doubled</li> <li>• there is at least one match in the original bundle.</li> </ul>	
25	a		<p><b>The initial state of the puzzle could be represented as (11, 10, 3). Use this notation to write down the <i>goal state</i>.</b></p> <p>(8, 8, 8)</p>	1PS



Question		Expected Answer/s	Max Mark
26		<p>A knowledge base contains the following information on Scottish mountains.</p>  <p>1 munro (benmacdhui, cairngorms, 1309). Ben MacDhui is a Munro in the Cairngorms. It is 1309 metres high.</p> <p>2 munro (cairntoul, cairngorms, 1291).</p> <p>3 munro (bennevis, grampians, 1344).</p> <p>4 munro (blaven, cuillins, 928).</p> <p>5 higher (X,Y) IF munro(A, __, P) AND munro(B, __, R) AND P&gt;R. Munro A is higher than Munro B if Munro A is of height P and Munro B is of height R and P is greater than R. We ignore the variable at the underscore.</p>	
26	a	<p>State the solution to the following query:</p> <p>? munro(A, cuillins, B).</p> <p>A=blaven B=928 Must have A= , B=</p>	2PS
26	b	<p>Use the line numbers to trace the solution to the following query as far as the first solution.</p> <p>? higher (A, B).</p> <p>In your answer you will be given credit for the correct use of the term <i>backtrack</i>.</p> <p>Matches at 5, <u>sub-goal munro(A, __, P)</u> Matches at 1, A instantiates benmacdhui, P to 1309, <u>new sub goal munro(B, __, R)</u> Matches at 1, B instantiates benmacdhui, R to 1309, <u>new sub goal 1309&gt;1309 fails</u> <u>Backtracks to line 1/line 2</u> , match at 2, instantiates B=cairntoul, R to 1291, <u>new sub goal 1309&gt;1291 succeeds</u> <u>Outputs A=benmacdhui B=cairntoul</u></p>	6PS

Question			Expected Answer/s	Max Mark
26	c		<p><b>Explain what is meant by <i>instantiation</i> when evaluating a query.</b></p> <ul style="list-style-type: none"> <li>• variable temporarily adopts a value (which is true)</li> <li>• variable adopts a current value</li> <li>• instance of a variable (which is currently true)</li> </ul>	1KU
27			<p><b>An expert system is used to diagnose different diseases of a patient's respiratory system.</b>  <b>The expert system contains rules. Part of one rule is shown below:</b></p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>IF the severity of obstruction of the airways IS greater than or equal to mild AND the degree of diffusion defect of the patient IS greater the TLC observed/predicted of the patient : the observed/predicted difference in P THEN there is evidence that the sub'</p> </div>	
27	a	i	<p><b>State the component of the expert system in which this rule would be found.</b></p> <p>Knowledge base</p>	1KU
27	a	ii	<p><b>Describe two ways in which justification could be used in a consultation.</b></p> <ul style="list-style-type: none"> <li>• Why a question is being asked.</li> <li>• How a conclusion is reached.</li> </ul>	2KU
27	a	iii	<p><b>State one benefit of including a <i>justification</i> facility.</b></p> <ul style="list-style-type: none"> <li>• User confidence in advice</li> <li>• Testing the expert system</li> <li>• Any other suitable response</li> </ul> <p style="text-align: right;"><b>1 mark for any one suitable response</b></p>	1PS
27	b		<p><b>One criticism of the expert system is that it has a <i>narrow domain</i>.</b></p>	
27	b	i	<p><b>Describe what is meant by the term “narrow domain”.</b></p> <p>Subject area is restricted to a small area of knowledge eg respiratory compared to medicine.</p>	1KU

Question			Expected Answer/s	Max Mark
27	b	ii	<p><b>Explain one benefit of a narrow domain.</b></p> <ul style="list-style-type: none"> <li>• Restricted number of facts/rules</li> <li>• Faster development time</li> <li>• Processing/memory requirements are reduced.</li> </ul> <p><b>1 mark for any one suitable response</b></p>	1PS
27	b	iii	<p><b>State one other disadvantage of an expert system when compared to a human expert.</b></p> <ul style="list-style-type: none"> <li>• Lack of common sense</li> <li>• Level of expertise required to set up/maintain</li> <li>• Inability to learn/acquire new knowledge</li> <li>• Inflexibility</li> <li>• Lack of empathy/human can empathise.</li> </ul>	1KU
27	c		<p><b>Users complained that the expert system is giving wrong advice in some situations. It is decided to alter some of the rules.</b></p>	
27	c	i	<p><b>State the type of <i>maintenance</i> being undertaken.</b></p> <p>Corrective</p>	1PS
27	c	ii	<p><b>Explain why the maintenance of an expert system is difficult.</b></p> <ul style="list-style-type: none"> <li>• Language/terminology of the domain will be difficult <b>(1)</b> causing difficulty when altering rules. <b>(1)</b></li> <li>• Expert would have difficulty with the formulation/expression of their own knowledge <b>(1)</b> causing difficulty when formulating rules. <b>(1)</b></li> <li>• Difficulty when testing <b>(1)</b> by having to check output with a human expert. <b>(1)</b></li> <li>• Both domain expert and knowledge engineer expertise are required when performing maintenance. <b>(1)</b></li> <li>• Any other suitable response</li> </ul> <p><b>Award one mark each from either half of any explanation.</b></p>	2PS



Question			Expected Answer/s	Max Mark
28			A journalist uses a mobile phone application to translate sentences into other languages. The journalist speaks into the phone and the sentence is displayed in English. The phone then translates the sentence into a language chosen by the journalist.	
28	a		<p>The journalist says the following sentence:</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px 0;">I don't know how mature people enjoy such a show.</div> <p>The phone displays:</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px 0;">I don't know how much your people enjoy such a show.</div>	
28	a	i	<p>Describe how <i>speech recognition</i> is used to identify the words from the digitised sound captured by the microphone.</p> <ul style="list-style-type: none"> <li>• Sound split into phonemes/blocks</li> <li>• Phonemes/blocks pattern matched against stored sounds/patterns</li> <li>• Words are identified from the phoneme/blocks</li> </ul> <p style="text-align: right;"><b>Any 2</b></p>	2KU
28	a	ii	<p>State one reason for the mistaken identification of the sentence.</p> <ul style="list-style-type: none"> <li>• The phonemes/sounds are the same/very similar for mature-much your (or similar example)</li> <li>• Accept speaker's accents</li> </ul> <p style="text-align: right;"><b>1 mark for any valid response</b></p>	1PS
28	b		<p>The phone correctly identifies the following sentence:</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px 0;">Charges dropped in submarine attack.</div> <p>Explain why the application might have difficulties interpreting this sentence.</p> <p>There is ambiguity in the sentence (1) such as</p> <ul style="list-style-type: none"> <li>• Charges as a noun has different meanings</li> <li>• Charges can be a noun and a verb</li> <li>• Dropped as a verb has more than one meaning</li> <li>• Submarine attack or attacked.</li> </ul> <p style="text-align: right;"><b>Any 1 of bullets for 2<sup>nd</sup> mark</b></p>	2PS

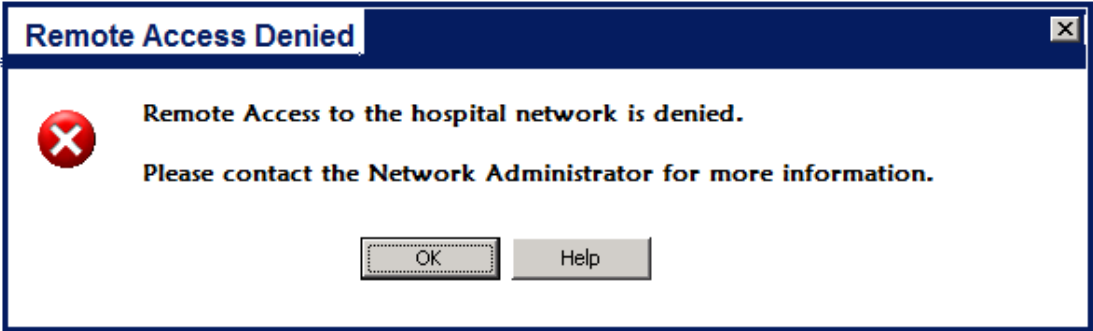
Question			Expected Answer/s	Max Mark
28	c		<p><b>The phone can also speak the translated phrase back to the journalist. Name this stage of natural language processing.</b></p> <p>Speech synthesis</p>	1KU
28	d		<p><b>Other than automatic translation, state one other application of natural language processing.</b></p> <ul style="list-style-type: none"> <li>• NL searching,</li> <li>• NL database interfaces,</li> <li>• speech driven software</li> <li>• chatterbots</li> </ul>	1PS

SECTION III

PART B - Computer Networking

Question			Expected Answer/s	Max Mark
29			Computers within a hospital are connected together using a computer network.	
29	a		<p>Hospital staff are given a username and password to allow them to securely logon to the network. Describe two other software methods of providing security for the hospital network.</p> <ul style="list-style-type: none"> <li>• Allocate different levels of user right/Ensure file &amp; folder permissions are set correctly/Allow access only to appropriate areas</li> <li>• Encrypt all data/Ensure that data is not intercepted during transmission</li> <li>• Use of a Firewall</li> <li>• Use a secure protocol such as HTTPS</li> <li>• Use Packet Switching to transfer data</li> <li>• Use a “call back” facility</li> <li>• Any other valid response.</li> </ul> <p style="text-align: right;">Any 2</p>	2PS
29	b		The hospital network operates using <i>circuit switching</i> .	
29	b	i	<p>Describe “circuit switching”.</p> <ul style="list-style-type: none"> <li>• There is a direct connection/dedicated channel between two devices</li> <li>• Established for the duration of transmission</li> <li>• All data follows the same physical path</li> </ul> <p style="text-align: right;">1 mark for any valid response, max of 2 marks</p>	2KU
29	b	ii	<p>The use of <i>packet switching</i> could provide several benefits to the hospital network. Describe one benefit of packet switching.</p> <ul style="list-style-type: none"> <li>• Packet switching usually faster than circuit (1) as it allows network hardware to decide on most efficient/fastest route (1)</li> <li>• Communication channels can be shared (1) since packets from different users can be mixed along a transmission line (1)</li> <li>• Security may be improved (1) because if line is “hacked” only individual packets will be intercepted rather than whole message/file (1)</li> </ul> <p style="text-align: right;">2 marks for a valid example with explanation</p>	2PS

Question			Expected Answer/s	Max Mark
29	b	iii	<p><b>A network uses CSMA/CD. Describe two functions of CSMA/CD.</b></p> <ul style="list-style-type: none"> <li>• Check for simultaneous transmission/line is free</li> <li>• Check to see if a collision is detected</li> <li>• Make nodes wait a random amount of time</li> <li>• Re-transmits after a collision</li> <li>• Allows many users to access network at the same time</li> </ul> <p><b>1 mark for any valid response, max of 2 marks</b></p>	2KU
29	c		<p><b>The hospital network uses TCP/IP to transfer files across the network.</b></p>	
29	c	i	<p><b>State three operations of the TCP part of this protocol.</b></p> <ul style="list-style-type: none"> <li>• TCP splits the file into packets</li> <li>• TCP adds a header</li> <li>• TCP reassembles the packets when they arrive at their destination address</li> </ul> <p><b>1 mark for any valid response, max of 3 marks</b></p>	3KU
29	c	ii	<p><b>State two operations of the IP part of this protocol.</b></p> <ul style="list-style-type: none"> <li>• IP adds its own address header to each packet.</li> <li>• IP routes the packets around the network.</li> </ul> <p><b>1 mark for any valid response, max of 2 marks</b></p>	2KU
29	c	iii	<p><b>Name one other common protocol that could be used to transfer files across the hospital network.</b></p> <ul style="list-style-type: none"> <li>• http</li> <li>• FTP</li> </ul> <p><b>Any 1</b></p>	1PS

Question		Expected Answer/s	Max Mark
29	d	<p>A nurse tries to access the hospital network from his home computer using the correct login details. The following error message is displayed.</p>  <p>State one reason why this error message would have been displayed.</p> <ul style="list-style-type: none"> <li>• The <u>firewall prevented</u> access to the network</li> <li>• Examples of firewall, eg: IP address blocking, Blocking of ports</li> <li>• Wrong access rights allocated/set</li> <li>• Incorrect recording/entry/typing of username/password</li> </ul> <p style="text-align: right;">Any 1</p>	1PS
29	e	<p>The hospital has a website. Some of the web pages can be accessed from WAP enabled devices. These web pages are written using WML. The WML code below is entered into a text editor.</p> <pre>&lt;wml&gt;   &lt;card id="Card 1" title="Doctor Details"&gt;     &lt;p&gt;Dr Smith&lt;/p&gt; &lt;/wml&gt;</pre> <p>Identify the error in the above WML code.</p> <ul style="list-style-type: none"> <li>• No closing card tag</li> <li>• &lt;/card&gt; missing</li> </ul> <p style="text-align: right;">Any 1</p>	1PS

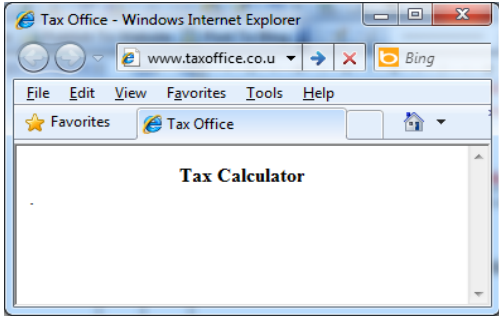
Question			Expected Answer/s	Max Mark
30			I-Play is an online games company. The I-Play website can be found using a search engine.	
30	a		Below are two descriptions of methods used by search engines to build their indexes. Name each of the methods.	
30	a	i	<p>“Finds pages by following the links in webpages and adding them to their search engine indexes.”</p> <p>Spider or Crawler Based Search Engine</p>	1KU
30	a	ii	<p>“Passes queries on to several search engines and then summarises all the results.”</p> <p>Meta-Search Engine</p>	1KU
30	b		<p>Describe the purpose of the <i>Domain Name Service (DNS)</i> when a customer tries to access the I-Play website.</p> <ul style="list-style-type: none"> <li>• Accesses a database of valid domain names/URLs</li> <li>• Translates the I-Play domain name/URL into its IP address</li> <li>• Returns correct IP address of the I-Play website to the machine requesting the website</li> </ul> <p style="text-align: right;">1 mark for any valid response, max of 2 marks</p>	2PS
30			<p>In the past, when a customer purchased a game from the I-Play website a CD-ROM was sent out by post. However, customers are now able to download games direct from the I-Play website.</p>	
30	c		<p>State one benefit of allowing customers to download the games.</p> <ul style="list-style-type: none"> <li>• Games are immediately available to the customer</li> <li>• Less manufacturing costs</li> <li>• No postage costs</li> <li>• Don't get lost in post</li> <li>• Patches/upgrades are available instantly</li> <li>• Any other valid response</li> </ul> <p style="text-align: right;">Any 1</p>	1PS


Question		Expected Answer/s	Max Mark
30	d	<p><b>A 200 megabyte game is downloaded in 3 minutes. Calculate the transfer rate used to download this game. Express your answer in megabits per second and to 1 decimal place. Show all working.</b></p> <p>Rate = Size/time</p> <ul style="list-style-type: none"> <li>• Size = 200 x 8 = 1600 Megabits</li> <li>• Rate = 1600/(3 * 60) = 8.9 Mbps</li> </ul> <p style="text-align: right;"><b>1 mark for each bullet point</b></p>	<b>2PS</b>
30	e	<p><b>Multi-player games are available to play on the website. There is a criticism that these games could make players socially isolated. Explain one reason why this might not be the case.</b></p> <ul style="list-style-type: none"> <li>• Players might be intimidated with face-to-face contact with people <b>(1)</b> but find the anonymity of a website “safe” <b>(1)</b></li> <li>• Collaboration with other players may be a prerequisite for making progress in a game <b>(1)</b> hence players are encouraged to interact with other people <b>(1)</b></li> <li>• Social interaction is required for playing multiplayer games <b>(1)</b> and encourages friendships with other players <b>(1)</b></li> <li>• Increased accessibility to other players online <b>(1)</b> by encouraging communication as part of the game <b>(1)</b></li> <li>• Any other valid response</li> </ul> <p style="text-align: right;"><b>2 marks for a valid example with explanation</b></p>	<b>2PS</b>
30	f	<p><b>I-Play is worried that its computer network may develop faults, causing its website to become inaccessible to its users. Name and describe two <i>disaster avoidance</i> techniques to help prevent its network from breaking down.</b></p> <ul style="list-style-type: none"> <li>• Use Anti-Virus Software – used to help to protect a network against virus threats.</li> <li>• Firewall – analyse data coming into network to prevent denial of service attack.</li> <li>• Use of fault tolerance components – duplicating hardware components so that if a piece of hardware fails, you will have another sitting waiting to take its place.</li> <li>• Use of uninterrupted power supplies – supplies enough electricity to a server to keep it going during a power cut.</li> <li>• Regular maintenance – Using good quality components and having regular maintenance checks can help to avoid failure of hardware components.</li> </ul> <p style="text-align: right;"><b>2 marks for each valid example with explanation</b></p>	<b>2KU 2PS</b>

Question			Expected Answer/s	Max Mark
30	g		<b>I-Play is also worried about threats to its network security, in particular <i>passive and active attacks</i>.</b>	
30	g	i	<p><b>Describe an example of a passive attack that could take place on I-Play's network.</b></p> <ul style="list-style-type: none"> <li>• Data could be intercepted (while being transmitted and copied)</li> <li>• Monitoring of data transmission</li> <li>• Any other valid response</li> </ul> <p style="text-align: right;"><b>Any 1</b></p>	1PS
30	g	ii	<p><b>Describe an example of an active attack that could take place on I-Play's network.</b></p> <ul style="list-style-type: none"> <li>• Changing/deleting data on the network</li> <li>• Deliberately bringing down the network/Denial Of Service Attack</li> <li>• Modification of the data stream/Creation of a false stream/generates false information</li> <li>• Any other valid response</li> </ul> <p style="text-align: right;"><b>Any 1</b></p>	1PS
30	g	iii	<p><b>Explain why I-Play would find it difficult to detect a passive attack.</b></p> <ul style="list-style-type: none"> <li>• A passive attack does not involve any alteration/changing of the data</li> <li>• No changes would be monitored by the software</li> <li>• Any other valid response</li> </ul> <p style="text-align: right;"><b>Any 1</b></p>	1PS
30	h		<p><b>An I-Play customer sets up a <i>WPAN</i> between some of his devices. Each device is configured and working correctly and has the required hardware and software installed. However, some of the devices will not connect to this network. State one reason why the devices might not connect.</b></p> <ul style="list-style-type: none"> <li>• Devices are too far apart</li> <li>• Interference from other devices/atmospheric interference</li> <li>• Any other valid response</li> </ul> <p style="text-align: right;"><b>Any 1</b></p>	1PS



Question			Expected Answer/s	Max Mark
30	i		<p>An I-Play customer has recently upgraded their Internet connection from ISDN to ADSL. State two benefits that the customer will gain from upgrading to an ADSL connection.</p> <ul style="list-style-type: none"> <li>• ADSL will provide faster access to the website/have higher bandwidth than ISDN</li> <li>• More multimedia content can be transmitted</li> </ul> <p style="text-align: right;"><b>Any 2</b></p>	2PS
31			A local tax office has 300 computers connected together in a Local Area Network with access to the Internet.	
31	a		The network conforms to the <i>Open Systems Interconnection (OSI) model</i> .	
31	a	i	<p>State which layer of the OSI model carries out encryption.</p> <p>Presentation</p>	1PS
31	a	ii	<p>State which layer of the OSI model carries out routing.</p> <p>Network</p>	1PS
31	b		<p>Explain which class of IP address is most appropriate for the tax office to use to network their computers.</p> <p>Class B (1) As this allows 65,534 devices to be networked/has sufficient addresses (1) <b>1 mark for correct class and 1 mark for explanation</b></p>	2PS
31	c		A former employee attempts a <i>Denial of Service (DOS)</i> attack on the tax office.	
31	c	i	<p>Name and describe one type of DOS attack that the former employee could have attempted.</p> <ul style="list-style-type: none"> <li>• Bandwidth consumption (1). This degrades the network performance by sending a large number of data packets in a short period of time (1)</li> <li>• Resource starvation (1). An attack which is intended to use resources that would bring the network down (1)</li> <li>• Programming flaws (1). This takes advantage of bugs in networking software (1)</li> <li>• Attacking the routers (1). This involves “hi-jacking” data packets and routing them to the target server, which then gets flooded with data packets, or re-directing them to false addresses (1)</li> <li>• Domain Name Server attacks (1). This involves sending a large number of DNS queries with a spoofed IP address of the target server (1)</li> </ul> <p style="text-align: right;"><b>Any 2</b></p>	2KU

Question			Expected Answer/s	Max Mark
31	c	ii	<p><b>Explain one reason why this DOS attack might succeed despite the correct installation of a firewall and anti-virus software.</b></p> <ul style="list-style-type: none"> <li>• System resources are taken up by the attempted attack (1) which prevents normal use of the network (1)</li> <li>• The former employee would know where weaknesses are in the network (1) and therefore have the knowledge to be able to bypass security (1)</li> <li>• Correctly formed packets are not picked up by the firewall or anti-virus (1) and these packets are then “flooded” onto the network (1)</li> </ul>	2PS
31	d		<p><b>Due to the DOS attack, the police are now investigating the network usage of the tax office. Explain how The Regulation of Investigatory Powers Act would help the police carry out this investigation.</b></p> <p>Allows them to...</p> <ul style="list-style-type: none"> <li>• monitor e-mails</li> <li>• monitor telephone calls</li> <li>• check Internet history</li> <li>• access decryption keys/encrypted data</li> <li>• undertake undercover surveillance</li> <li>• Any other valid response</li> </ul> <p style="text-align: right;">Any 2</p>	2KU
31	e		<p><b>The Tax Office has a website which offers advice and support to clients. One webpage contains the text “Tax Calculator”. This text is centred and is in bold.</b></p>  <p><b>Write the HTML code required for this line of text.</b></p> <ul style="list-style-type: none"> <li>• <code>&lt;center&gt; &lt;b&gt; Tax Calculator &lt;/b&gt;&lt;/center&gt;</code></li> <li>• <code>&lt;div align=center&gt; &lt;b&gt; Tax Calculator &lt;/b&gt;&lt;/div&gt;</code></li> <li>• <code>&lt;p align=“center”&gt; &lt;b&gt;Tax Calculator &lt;/b&gt;&lt;/p&gt;</code></li> </ul> <p><b>1 mark for correct open/close of &lt;b&gt; tag (accept &lt;strong&gt; as valid alternative)</b></p> <p><b>1 mark for correct open/close of &lt;center&gt; OR &lt;div align =center&gt; OR &lt;p align =“center”&gt; tag</b></p> <p><b>1 mark for correct nesting of tags <u>and</u> no additional incorrect tags such as &lt;head&gt; or &lt;title&gt; ie &lt;center&gt;&lt;b&gt;&lt;/b&gt;&lt;/center&gt;</b></p>	3PS




Question		Expected Answer/s	Max Mark
31	f	<p>This photograph is to be added to the above web page.</p>  <p><b>Explain why the web designer has chosen to store the image as a JPEG</b></p> <ul style="list-style-type: none"> <li>• Small file size <b>(1)</b> due to JPEG files being compressed <b>(1)</b></li> <li>• Fast download times <b>(1)</b> due to small file size/JPEG files being compressed <b>(1)</b></li> <li>• JPEG supports millions of colours/has large bit depth/24 bit <b>(1)</b> to allow a more realistic/better quality image <b>(1)</b></li> <li>• Standard file format <b>(1)</b> allowing the image to be opened by many programs <b>(1)</b></li> </ul> <p style="text-align: right;"><b>2 marks for any valid response, max of 2 marks</b></p>	2PS

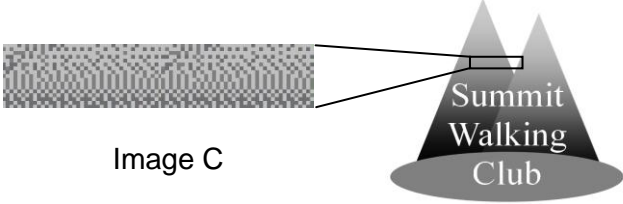
SECTION III

Part C – Multimedia Technology

Question			Expected Answer/s	Max Mark
32			<p>A task to create an interactive presentation is given as part of a multimedia course.</p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p style="text-align: center;"><b><i>Multimedia Course Task</i></b></p> <ul style="list-style-type: none"> <li>• <b>Create an interactive presentation to guide new students around the college.</b></li> <li>• <b>Your presentation must include the sound files and video clips provided.</b></li> <li>• <b>The completed presentation must be submitted as a single file.</b></li> </ul> </div>	
32	a	i	<p>Name one technique that could be used to design the presentation.</p> <p>Storyboard</p>	1KU
32	a	ii	<p>State one feature or item that should be included in the design.</p> <ul style="list-style-type: none"> <li>• Details each of the multimedia objects (and their attributes)</li> <li>• Details navigation structure</li> <li>• Details user interface</li> </ul> <p style="text-align: right;">Any 1</p>	1KU
32	b		<p>WYSIWYG allows students to see what their slides look like as they are created. State one other benefit of using WYSIWYG during the creation of slides.</p> <ul style="list-style-type: none"> <li>• Do not need different viewers/players</li> <li>• Do not have to learn authoring code (HTML etc) to create slides</li> <li>• Any other valid response</li> </ul> <p style="text-align: right;">Any 1</p>	1PS

Question			Expected Answer/s	Max Mark
32	c		<p>The presentation will make use of a computer's graphics and sound cards. Graphics and sound cards have a <i>Digital Signal Processor (DSP)</i>. State two purposes of a DSP.</p> <ul style="list-style-type: none"> <li>• To allow hardware decoding of files</li> <li>• To add effects</li> <li>• Synchronise channels for sound</li> <li>• Allow compress/decompress</li> <li>• Any other valid response</li> </ul> <p style="text-align: right;"><b>Any two</b></p>	2KU
32	d		<p>Several of the sound files provided are in the <i>MIDI file format</i>. A student decides to edit the attributes of a MIDI file.</p>	
32	d	i	<p>Describe the effect on a note of increasing the value of the <i>duration</i> attribute.</p> <p>The note would play for longer</p>	1PS
32	d	ii	<p>Describe the effect on a sound of increasing the value of the <i>tempo</i> attribute.</p> <p>The sound would play at a faster speed</p>	1PS
32	e		<p>One of the sound files has two channels but one channel is much louder and is drowning out the other. Name a technique that could be used to correct this problem.</p> <p>Normalisation</p>	1PS
32	f		<p>Name and describe one method which students could use to submit their completed presentation as a single file.</p> <ul style="list-style-type: none"> <li>• Embed files (1) – all graphics etc are included in the presentation file (1)</li> <li>• Container file (1) – allows different component files to be stored as a single file (1)</li> </ul> <p>1 mark for name of a method and 1 mark for the description</p>	2PS

Question	Expected Answer/s	Max Mark
33	<p>A new logo has been designed for the Summit Walking Club. The logo has been stored in <i>SVG, JPEG and GIF</i> file formats.</p> 	
33	<p>a</p> <p><b>Explain why SVG is a suitable file format for this logo.</b></p> <ul style="list-style-type: none"> <li>• SVG is a vector graphic file format</li> <li>• allows logo to be resized with no loss of quality</li> <li>• as it is resolution independent</li> <li>• logo includes few objects so file size likely to be small</li> </ul> <p style="text-align: right;"><b>1 mark for each of any two bullets</b></p>	<b>2PS</b>
33	<p>b</p> <p><b>The GIF and JPEG versions of the logo are placed onto a photograph to produce the images below.</b></p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Image A</p> </div> <div style="text-align: center;">  <p>Image B</p> </div> </div> <p><b>State which image uses the GIF version. State one reason for your answer.</b></p> <p>Image B (1)  GIF supports transparency/opacity (JPEG does not) (1)</p>	<b>2PS</b>

Question			Expected Answer/s	Max Mark
33	c		<p><b>Interlacing is supported by the GIF file format. Explain the effect of interlacing when an image is displayed on a web page.</b></p> <ul style="list-style-type: none"> <li>• image starts to appear in stages</li> <li>• Low resolution appears first</li> <li>• subsequently refined to display complete/full image</li> </ul> <p style="text-align: right;"><b>Any 2</b></p>	2PS
33	d		<p><b>Image C shows an enlarged area of the GIF logo and the effect of dithering.</b></p>  <p style="text-align: center;">Image C</p>	
33	d	i	<p><b>Explain the technique of dithering.</b></p> <ul style="list-style-type: none"> <li>• Combination of pixels of different colours</li> <li>• Dithering is used to give the illusion of colours/shades in an image</li> <li>• not in the palette</li> </ul> <p style="text-align: right;"><b>Any 2</b></p>	2KU
33	d	ii	<p><b>State why dithering is often used with the GIF file format.</b></p> <p>GIF only supports 256 colours/is 8 bit</p>	1PS
33	e		<p><b>The GIF file format stores a CLUT along with the image.</b></p>	
33	e	i	<p><b>State the purpose of a CLUT.</b></p> <ul style="list-style-type: none"> <li>• To define the available colours for the file</li> <li>• To attempt/allow the consistent display of colours</li> </ul> <p style="text-align: right;"><b>Any 1</b></p>	1KU

Question			Expected Answer/s	Max Mark
33	e	ii	<p><b>Describe one benefit given by the use of a CLUT.</b></p> <ul style="list-style-type: none"> <li>• Allows customisations of colour set</li> <li>• change to CLUT/palette affects entire graphic at once (rather than editing individual pixels)</li> <li>• Restricts the bit depth to restrict the file size</li> </ul> <p style="text-align: right;"><b>Any 1</b></p>	1PS
33	f		<b>Both the JPEG and GIF file formats feature <i>compression</i>.</b>	
33	f	i	<p><b>The JPEG file format uses the <i>RLE</i> technique. Describe the RLE technique.</b></p> <ul style="list-style-type: none"> <li>• Repeated pixels of the same colour</li> <li>• are stored using colour code of 1 pixel followed by the number of repeats</li> </ul> <p style="text-align: right;"><b>1 mark for each point</b></p>	2KU
33	f	ii	<p><b>The GIF file format uses the <i>LZW</i> technique. Describe the LZW technique.</b></p> <ul style="list-style-type: none"> <li>• Patterns/sequences of pixels are stored in a dictionary/table</li> <li>• Pointers are used to reference the dictionary/table</li> <li>• Shorter code replaces larger patterns of pixels</li> </ul> <p style="text-align: right;"><b>Any 2</b></p>	2KU
33	g		<b>One colour used in the logo can be represented using the <i>RGB</i> colour code (80, 80, 80).</b>	
33	g	i	<p><b>Explain how an RGB colour code represents a colour.</b></p> <p>The numbers indicate the mix of colours (red, green and blue) (needed to represent a colour)</p>	1PS
33	g	ii	<p><b>Describe the effect of editing the code to (80, 80, 190).</b></p> <p>The colour would become more blue</p>	1PS
33	g	iii	<p><b>Each part of the RGB code is represented as an 8 bit binary number. State the number of different colours which can be represented in RGB code.</b></p> <p><math>2^{24}</math> or <math>2^8 \times 2^8 \times 2^8</math> or <math>256 \times 256 \times 256</math> or 16777216</p>	1PS



Question		Expected Answer/s	Max Mark
34		<b>Jakub plays in a band. The band often uses a digital sound recorder during rehearsals.</b>	
34	a	<p><b>The uncompressed file size of a 24 bit stereo recording sampled at 88.2 KHz is 60 Mb. Calculate the time that the file plays for. Show all working. State your answer to the nearest second.</b></p> <p>File size=60 Mb = 60x8x1024x1024 bits=503316480 bits (1)  Sample size=(Sampling freqxSampling depthxChannels) (1)  Time = File size/sample size  = 503316480/(88200 x 24 x 2)  = 503316480/4233600  = 118.88... s  = 119 s (1)</p>	3PS
34	b	<p><b>State one benefit of the digital sound recorder having a <i>memory card reader</i> rather than internal <i>solid state storage</i>.</b></p> <ul style="list-style-type: none"> <li>• Don't have to connect to a computer to transfer data</li> <li>• Infinite memory available(use of large/multiple cards)</li> <li>• Can change card when full</li> </ul> <p style="text-align: right;">Any 1</p>	1PS
34	c	<p><b>Explain why the digital sound recorder requires an <i>ADC</i>.</b></p> <ul style="list-style-type: none"> <li>• Natural sound is analogue (1)</li> <li>• needs converted to digital before processing (1)</li> <li>• by digital computer (1)</li> </ul> <p style="text-align: right;">Any two of three</p>	2PS
34	d	<p><b>The digital sound recorder can store files in either <i>WAV</i> or <i>MP3</i> file format. Explain why the band may prefer to listen to recorded sound stored in the <i>WAV</i> file format rather than <i>MP3</i> file format.</b></p> <p>WAV has more natural/better quality sound (1)</p> <ul style="list-style-type: none"> <li>• MP3 uses lossy compression</li> <li>• WAV uses lossless compression</li> </ul> <p>(1 for any one bullet)</p>	2PS

Question			Expected Answer/s	Max Mark
34	e		<p><b>Jakub has a <i>surround sound</i> system at home. Explain why Jakub may notice little difference between recordings played on his surround sound system and other stereo systems.</b></p> <ul style="list-style-type: none"> <li>Recordings are 2 track/channel</li> <li>System detects stereo <b>(1)</b> (so only uses 2 channels)</li> <li>Speakers are poorly positioned so losing their effect</li> </ul> <p style="text-align: right;"><b>1 mark each for any two bullets</b></p>	<b>2PS</b>
34	f	i	<p><b>Jakub usually uses <i>WiFi</i> to transfer a video clip from his phone to the drummer's phone. State two reasons why Jakub uses WiFi for this transfer.</b></p> <ul style="list-style-type: none"> <li>No cable/it is wireless/both phones have WiFi</li> <li>Fast transfer rate</li> <li>Large range</li> </ul> <p style="text-align: right;"><b>1 mark for each</b></p>	<b>2KU</b>
34	f	ii	<p><b>While rehearsing in a games hall, Jakub has no WiFi access. State one other wireless standard that Jakub could use. Justify your choice.</b></p> <p>Bluetooth <b>(1)</b></p> <ul style="list-style-type: none"> <li>connection is <u>direct</u> between devices</li> <li>short range required</li> <li>both will have Bluetooth (if they have WiFi)</li> <li>other valid response with justification</li> </ul> <p style="text-align: right;"><b>1 mark for one valid bullet</b></p>	<b>2PS</b>
34	g		<p><b>Jakub has a video clip taken using his phone. The 60 second video was recorded at 15 fps using a bit depth of 16 bits and a resolution of 640 x 360. Calculate the uncompressed file size for this video clip to the nearest megabyte. Show all working.</b></p> <p>No. of frames = <math>60 \times 15 = 900</math> <b>(1)</b>  File size = No. of frames x No of pixels x bit depth  = <math>900 \times 640 \times 360 \times 2</math> bytes <b>(1)</b>  = 414720000 bytes = 405000 Kb = 395.5078125Mb  = 396 Mb <b>(1)</b></p>	<b>3PS</b>

Question		Expected Answer/s	Max Mark
35		<p>Ms Masters is teaching her class about using <i>vector file formats</i> to store graphics. She tells the class “Vector graphic file formats are more storage efficient than bit-mapped file formats”.</p>	
35	a	<p>Describe the type of graphic Ms Masters might use to show that the statement above is true.</p> <ul style="list-style-type: none"> <li>• A simple image containing few objects/shapes</li> <li>• Use a simple logo</li> <li>• Accept valid example</li> </ul>	1PS
35	b	<p>Describe what happens to a vector graphic in order for it to be displayed on a monitor.</p> <p>Has to be converted to a bit map (before rendering)</p>	1PS
35		<p>The class are instructed to draw a <i>3D</i> object, apply a <i>texture</i> and store it in a vector graphic file format.</p>	
35	c	<p>Explain the term “texture” when applied to a 3D object.</p> <ul style="list-style-type: none"> <li>• A 2D bitmap image mapped onto surface of 3D object (to give the impression of roughness/smoothness)</li> <li>• The application of a type of surface to a 3D image.</li> </ul> <p style="text-align: right;">Any 1</p>	1KU
35	d	<p>Name one possible <i>attribute</i> required to store a 3D object in addition to those attributes required to store a 2D object.</p> <ul style="list-style-type: none"> <li>• Depth/z coordinate</li> <li>• Shadow</li> <li>• Angle of rotation</li> <li>• Any other valid response</li> </ul> <p style="text-align: right;">Any 1</p>	1KU
35	e	<p>Name a file format suitable for storing a 3D vector graphic image.</p> <ul style="list-style-type: none"> <li>• VRML</li> <li>• WRL</li> <li>• X3D</li> </ul> <p style="text-align: right;">1 mark for any one of these (note there are others)</p>	1KU

[END OF MARKING INSTRUCTIONS]