Chhetri Academy

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GCSE COMPUTER SCIENCE

1.2

Edexcel 1CP2 | Specification point 1.2.1

Be able to follow and write algorithms (flowcharts, pseudocode*, program code) that use sequence,...

Untiered

Answers and examiner comments

5	2015-2023	Untiered
question groups	available papers	tier

Using this booklet

1. Answer numbers match the companion question booklet.
2. Follow the original question number on marking tables.
3. Examiner comments are included where available.

Name _____ **Date** _____

Some entries use full source marking material in an appendix. Any unavailable mark schemes are identified beside the relevant answer.

Original question 5

The full source mark scheme begins on page 15. Use the original paper code, tier and question number shown above.

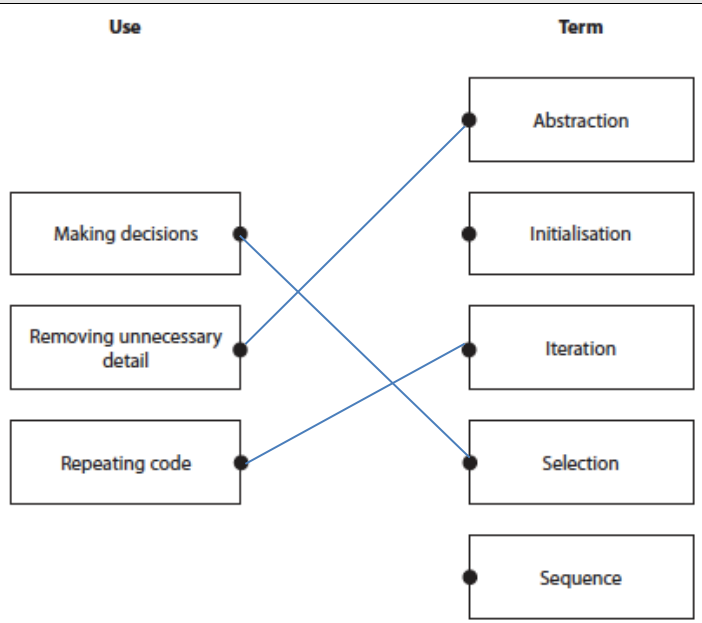
Original question 2

The full source mark scheme begins on page 49. Use the original paper code, tier and question number shown above.

Original question 8

The full source mark scheme begins on page 79. Use the original paper code, tier and question number shown above.

Question Number	Answer	Additional Guidance	Mark
3(a)	A description to include: A sequence of instructions (1) that solves a problem (1)		**2**

Question Number	Answer	Additional Guidance	Mark
3(b)			**3**

Question Number	Answer	Additional Guidance	Mark
3(c)	An explanation such as: (Inclusion) reduces the divide/disadvantage in society (1) because more people have access (1)	Mark point 1 can be awarded for reference to: legal requirements / increased sales	**2**

Question Number	Answer	Additional Guidance	Mark
3(d)	An explanation such as: • Less CO2 is produced by people travelling to work (1) because people can use the internet to work remotely (1) • More energy efficient homes (1) because smart technologies can switch the lights off when no one is in the room (1) • Endangered species can be protected (1) because GPS technologies can track their locations (1)		**2**

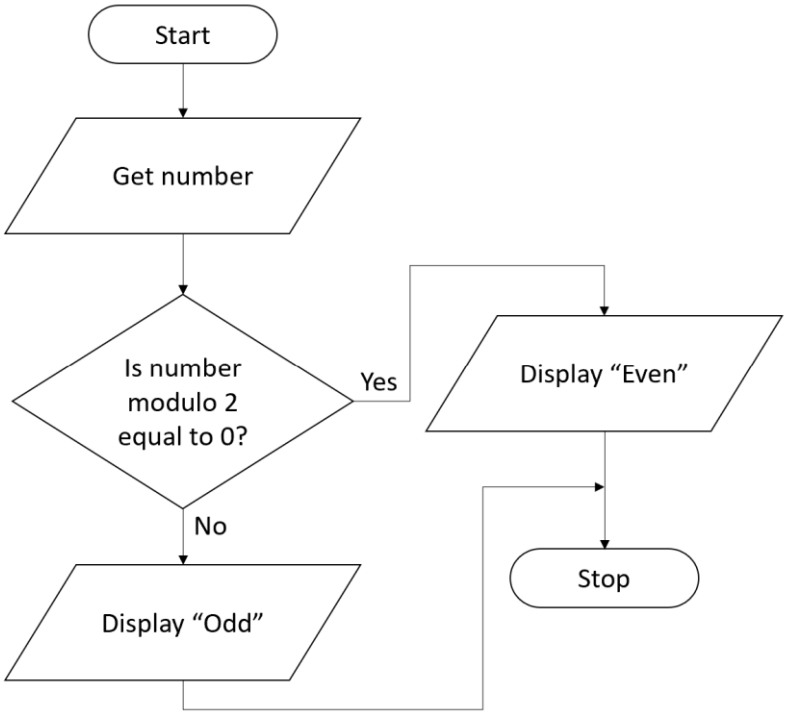
Question Number	Answer	Additional Guidance	Mark
3(e)	A description to include **two** linked points such as: Freedom to view the source code (1) and modify/distribute it (1)		**2**

Question Number	Answer	Additional Guidance	Mark
3(f)	A description to include **two** points such as: • Essential features such as colours/images/suits/numbers/values (1) can be used to		**2**

	represent a general model of a card (1) • No need to consider physical features of cards / just need to know essential features (1) e.g. suit, value, rank (1)		

Question Number	Answer	Additional Guidance	Mark
4(a)	Award up to two marks for a linked explanation, such as: • It helps the programmer visualise the steps in a program / find errors/bugs / check the algorithm gives the correct output (1) because they can see the value a variable holds at a given point in an algorithm (1)	For both marks, the expansion must associate with the statement.	(2)

Question Number	Answer	Additional Guidance	Mark
4(b)	Award up to two marks for a linked description, such as: • A list / data structure / collection of elements/fields/values (1) where each element/field/value may be a different data type / is related to the others (1)	For both marks, the expansion must associate with the statement.	(2)

Question Number	Answer	Additional Guidance	Mark
4(c)	Award one mark for each of: • Input symbol to get number from user (1) • Decision symbol (disregard test inside), with exactly two arrows and labels for yes and no (1) • Correct relational test matches labels and output messages (1) • Accurately connected (1): o outputs 'Display Even' **or** 'Display Odd', not both o no hanging symbols o connection to terminator  	Arrows must match symbols for use of symbol to be awarded Each symbol should have only a single input arrow Input/output symbols should have only a single output arrow The decision symbol must have exactly two output arrows Relational tests: • X % 2 == 0 • X MOD 2 == 0 • X modulus 2 == 0 Allow = for == in relational test	(4)

Question Number	Answer	Additional Guidance	Mark
4(d)	Award up to four marks for a linked description, such as: • Start at the first position / Iterate/Traverse (through the array) (1), compare the item with the target (1), stop when the target is matched (1), or stop when the end of the list is reached (and the item is not matched) (1)		(4)

Question Number	Answer	Additional Guidance	Mark
4(e)	Award one mark for each of: • Four unique rows for the values of S and M, indicating binary representation of 0, 1, 2, and 3 (1) • Four correct results of applying AND to the values in S and M (1) Example:	Ignore order of rows Award both marks only if completely correct Award carry through in final column, if error in S or M columns Only award: - 1/T/True/On - 0/F/False/Off	(2)

S	M	S AND M
0	0	0
0	1	0
1	0	0
1	1	1

Question Number	Answer	Additional Guidance	Mark
4(f)	Indicative content: Definition • Decomposition is breaking down into smaller parts. Problems, solutions, and algorithms can be decomposed. • Abstraction is the process of removing or hiding unnecessary detail. Benefits • It is usually easier to solve several smaller problems, such as checking if touching a wall or updating the score display, than solve one big problem, such as making a game. • Different parts of the program can be shared between the class members to speed up development, for example, one group could work on the code to control the character, while another works on creating and playing the sounds. • Once all the pieces, like sounds, movement, and score are working correctly, the smaller solutions can be combined to make a larger solution, with fewer errors. • The individual parts of the program, such as updating the score can be ignored by the group of students writing the code for moving the character with the arrows / allowing each group of students to focus only on the small problem they have been given means time is not wasted on analysis not relevant to the solution. Appear in program code • Different blocks of code logic show decomposition, such as		(6)

	moving the character and updating the score. These blocks could be shown separated by white space. • Subprograms are decompositions because they're blocks of code logic, separated from the main program. Subprograms could be used for updating the score and resetting the character back to the starting position. • Abstraction is used each time a subprogram, either built-in, in a library, or in the code file is called. Library routines in the game would include one to play the sounds and to get the keyboard input. • Subprograms are abstractions because their names hide how they work internally, even if their name is not descriptive. A subprogram to update the score should have a descriptive name, such as updateScore, but could just be called X. Either way, how it works internally is still hidden from the caller.		

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

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Mark Scheme (Results)

June 2015

Pearson Edexcel
GCSE Computer Science (1CP0/01)
Paper 1: Principles of Computer Science

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>1(a)</td><td>1 or 2 correct = 1 mark
3 or 4 correct = 2 marks
5 or 6 correct = 3 marks

<table>
<tr><th></th><th>Input</th><th>Process</th><th>Output</th><th>Neither</th></tr>
<tr><td>Actuator</td><td></td><td></td><td>x</td><td></td></tr>
<tr><td>Infrared Sensor</td><td>x</td><td></td><td></td><td></td></tr>
<tr><td>Wheel</td><td></td><td></td><td></td><td>x</td></tr>
<tr><td>Calculate Distance</td><td></td><td>x</td><td></td><td></td></tr>
<tr><td>Programming Language</td><td></td><td></td><td></td><td>x</td></tr>
<tr><td>Movement Sensor</td><td>x</td><td></td><td></td><td></td></tr>
</table>
</td><td></td><td>3</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
1(b)	• Data (1) • Instructions (1)		**2**

Question Number	Answer	Additional Guidance	Mark
1(c)(i)	• 121		**1**

Question Number	Answer	Additional Guidance	Mark
1(c)(ii)	• 122		**1**

Question Number	Answer	Additional Guidance	Mark
1(c)(iii)	• Any one of: ○ IF (statement) ○ IF….THEN…..ELSE ○ Selection ○ Conditional **If unsure, please send it to review**		**1**

Question Number	Answer	Additional Guidance	Mark
1(d)	0 0 0 0 1 1 0 0		**1**

Question Number	Answer	Additional Guidance	Mark
1(e)	1 1 1 1 0 0 1 0		**1**

Question Number	Answer	Additional Guidance	Mark
1(f)(i)	1 0 0 0 0 0 0 1		**1**

Question Number	Answer	Additional Guidance	Mark
1(f)(ii)	• The result of the calculation cannot fit into the size of the location assigned to hold it • Two 8-bit numbers added together resulted in a number that could not be stored in 8 bits • The addition resulted in a number >= 1 0000 0000 binary (note the overflow out of the destination field) • The result is >255 • The result needs 9-bits to store it	Do not accept - the number is too big - without further explanation	**1**

Question Number	Answer	Additional Guidance	Mark
1(f)(iii)	• Introduces errors in subsequent calculations • Compounds errors in subsequent calculations; snowballs • Signed numbers may change sign • Any indication that arithmetic performed on inaccurate calculated numbers results in subsequent inaccurate results	• Ignore examples	**1**

Question Number	Answer	Additional Guidance	Mark
1(g)	• Table or any other suitable notation Input | Output 0 | 1 1 | 0 • NOT (0) == 1 • NOT (1) == 0		**1**

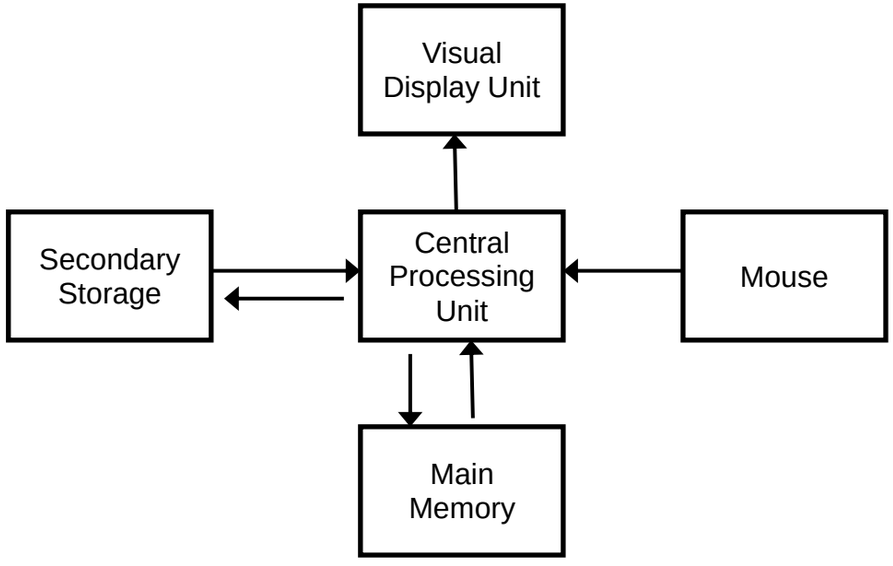
Question Number	Answer	Additional Guidance	Mark
1(h)(i)	• NOT R column correct = 1 mark • First 2 rows correct of Q = 1 mark • Last 2 rows of Q = 1 mark **NOT R** | **Q** 1 | 0 1 | 1 0 | 0 0 | 0		**3**

Question Number	Answer	Additional Guidance	Mark
1(h)(ii)	• Q=**(R OR B) AND S** • Alternative correct solutions should be awarded e.g. ○ (R AND S) OR (B AND S) ○ R AND S OR B AND S – works by order of precedence	• **Q=** not required • Accept correct transpositions • Order of precedence is (); NOT; AND; OR	**1**

Question Number	Answer	Additional Guidance	Mark
2(a)	Identifying any two (2) of the following (Maximum 2 marks): • Database • Bibliographic • Project Management • Presentation • Desktop Publishing • Word Processing • Web Browser • Image Editing • Video Editing • Email • Animation • CAD (not expected) • Programming Environment • Live Chat – Only if example confirms working context • Exclude software whose main purpose is entertainment • Any other appropriate software which could sensibly be used in a general working environment Any two (2) examples of software use (Maximum 2 marks): Answers may include • Image Editing – Cropping images for insertion into a presentation • Live Chat – For getting technical support help from a vendor support site • Web Browser – For looking up the address of a colleague at a	Do not accept spreadsheet and bee colonies Marks must be awarded 2 x 2 Identifying 4 applications cannot earn 4 marks Do not award brand names (Excel, Google, EndNote, PhotoShop, etc.) Use must follow example software given; if mismatch, then do not award example mark • Use must be appropriate for a "general" working environment • Do not award examples indicating entertainment • Use must be main purpose of application. Although word processors can crop	4

	different university • Presentation – Showing results of his research to colleagues at a conference. • Bibliographic – Keeping track of sources for his research. • Video Editing – Creating a video to put on YouTube of his lectures for his students. • CAD - molecular, synthetic, and genetic biology • Programming environment – Creating customised models	images, the more appropriate software choice would be an image/picture editor. • A programming language is not an application; an IDE, editor, or compiler is an application.	

Question Number	Answer	Additional Guidance	Mark
2(b)	Any 4 from: • Software can be redistributed • Source code is available • Source code can be modified • Modified code can be redistributed • A fee can be charged for the software • A fee is not usually charged for the software • Modified code must be made available under the same licence as original code. • Licence may require an acknowledgement of the original author to be included in the code. • Source code can be freely used, changed and shared by anyone subject to conditions specified in the license.	• Accept any other correct feature • Do not award "free" or "no cost" by itself	**4**

Question Number	Answer	Additional Guidance	Mark
2(c)	1 or 2 correct = 1 mark 3 or 4 correct = 2 marks 5 or 6 correct = 3 marks **If there are more than 6 arrows, 2 marks Max.**  **If unsure, please send it to review**	• Lines without direction cannot be awarded.	**3**

Question Number	Answer	Additional Guidance	Mark
2(d)	One mark for name and one mark for use (must match) • Control Unit (CU) ○ Sends signals to other components to coordinate the cycle • Arithmetic / Logic Unit (ALU) ○ Performs arithmetic (+,-,/,*, etc.) and logic (AND,NOT, OR, etc.) • Registers ○ Very fast storage locations which hold instructions, data, or memory addresses. • Cache (Not expected) ○ Sits between components in the microprocessor to make up for the difference in physical speed of the components • Address Bus ○ Holds the address of physical memory or the address of an input/output device that is to be read from/written to • Data Bus ○ If an instruction needs data, the data is loaded onto the data bus before being read by the CPU ○ All data/instructions moved here to go to or from Memory • Clock ○ Provides the timing for the cycle Other correct uses should be awarded.	• "Bus" or "Buses" alone is not awarded; must include qualifier. • Allow "arithmetic" or "logic" unit	**2**

Question Number	Answer	Additional Guidance	Mark
2(e)	Accept any **three** from the following. 1 mark each to a max of 3 marks: • The computer ***appears to be running*** more than one program/process at a time. • **More than one process can be loaded** into memory at one time. • Each process has its **own memory space**/partition. • Each process is given ***a small amount of time*** (time slice) to execute in the central processing unit. • Processes are held in a **queue/FIFO list**. • O/S **switches between processes** • Some processes may have **higher priority** than others may. • Higher priority processes may be **given more time** slices/processing time. • Processes can communicate by using shared memory	• Thread is accepted as equivalent to process • Program is accepted as equivalent to process There is a distinction between the assertion that "two programs ***are running*** at the same time" and that "two programs ***appear to be running*** at the same time". The first instance is an incorrect statement in the context of this question about a single microprocessor. As such, it cannot be awarded any marks. Ignore reference to multi-core processors.	**3**

Question Number	Answer	Additional Guidance	Mark
2(f)	Any two of: • Implement formulas which represent the relationships between the given data variables, such as hours of sun and quantity of honey. • Use a programming language to write a customised application to model the colony • Allow user to input initial values for data variables (food, sun) • Use graphical user interface components (boxes, sliders) to adjust input variables will show effects on outputs • Present outputs using graphs showing relationships between food and sun, etc. • Present outputs showing real number of bees and resources (yellow dots are bees; red dots are pollen) • Variables could be changed in real-time with immediate update to the screen (e.g. move a slider, the amount of pollen decreases) Any other appropriate and correct response incorporating modelling, simulation, or visualisation should be awarded.	The idea here is modelling, simulation, or visualisation of the real world context. Award positively any appropriate responses indicating that software can be used in this manner. Explicit connection to the context is required.	**2**

Question Number	Answer	Additional Guidance	Mark
3(a)(i)	• Pixel(s) • Pel(s) • Not "picture element" as it is given in the following question	• Do not penalise spelling	**1**

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	• Resolution or Pixel Density • Dots per inch, dpi • Pixels per inch, ppi • Dots per centimetre, dpcm • Pixels per centimetre, ppcm	• Do not penalise spelling	**1**

Question Number	Answer	Additional Guidance	Mark
3(a)(iii)	• Colour depth • Bit depth is awardable	• Do not penalise spelling	**1**

Question Number	Answer	Additional Guidance	Mark
3(b)	One mark for each row **Category of secondary storage** magnetic optical solid state	Do not penalise spelling Do not award examples	**3**

Question Number	Answer	Additional Guidance	Mark
3(c)	Award 1 mark for each correct answer to a max of 2 marks • Any two of the following: ○ Timestamp ○ Sequence number ○ Version ○ Protocol type ○ Data ○ Flags ○ Size ○ Routing information ○ Any other appropriate answer	Do not accept source, destination, and check sum, which are provided in the question	**2**

Question Number	Answer	Additional Guidance	Mark
3(d)	• Identifying errors (introduced during transmission)		**1**

Question Number	Answer	Additional Guidance	Mark
3(e)	Divide 4096 by 1024 4096÷1024 4096MB / (1024 MB/GB) = 4 GB	• Ignore attempts to calculate an answer	**1**

Question Number	Answer	Additional Guidance	Mark
3(f)	• Internet (Any 1 of the following): ○ Interconnected networks of networks/machines**/hardware** ○ Geographically distributed networks/machines/hardware ○ Uses protocols for communication • World Wide Web (Any 1 of the following) ○ The **information** stored on the hardware ○ Pages of information stored on servers (pages written in HTML) ○ Uses HTTP / HTTPS to send/receive pages between servers and clients Accept any other correct comparison	• Only one topic addressed earns 1 mark max	**2**

Question Number	Answer	Additional Guidance	Mark
3(g)(i)	• Line numbers 5 – 10	Accept lines 4 - 11	**1**

Question Number	Answer	Additional Guidance	Mark
3(g)(ii)	• Any one of the following: ○ The tags refer back to line number 10/the "li" style ○ The <a> tags refer back to line number 6/the "a" style ○ The tags and <a> refer back to the information in the CSS	Allow: <a:hover> equivalent to <a> Allow: Missing </> tag in any description	**1**

Question Number	Answer	Additional Guidance	Mark
3(h)(i)	Amplitude		**1**

Question Number	Answer	Additional Guidance	Mark
3(h)(ii)	Any one of the following – 1 mark • (The more samples,) the smoother the digital representation of the original audio. • (Higher sampling rates) result in less distortion of the original audio • This makes the resulting digital representation more accurately match the original audio.	• Do not award "better", "better quality", or similar	**1**

Question Number	Answer	Additional Guidance	Mark
3(i)	Must have idea of ***runs*** (1) being compressed to ***a single item + a count*** of that item (1) Example: Simple mono-chrome icon will have long sequences of bits of same colour (1) Sequences/runs of identical data are translated/stored as a single data value and a count (1)		**2**

Question Number	Answer	Additional Guidance	Mark
4(a)	Any three of the following impacts: • Pollution (water, air, noise) resulting from the manufacturing process • High energy and water volumes needed for the manufacturing process • Mineral mining contaminates ground water • Mineral (copper, gold, silver, lithium) resource depletion • High energy use to keep machines cool with air conditioning or fans • Contain toxic components which means computing devices are hazardous waste • Batteries (laptop, lithium cells) disposal is hazardous and needs specialised disposal facilities • Computing devices sent to landfills contaminate ground and water resources • Any other appropriate responses as long as they're distinct from each other Any one of the following actions: • Check national and local legislation • Some countries/states/regions require sellers to recycle own waste • Research recycling facilities to see if e-waste is acceptable • Find if local/national/regional government agencies charge for collection and disposal of e-waste • Find sellers offering exchange old for new + cost purchase options • Find charities (local, regional) which take donations of old devices • Turn off machines when not in use to save energy. • Any other appropriate response as long as it is interpretable to match an impact.	• 3 marks maximum for environmental impacts • 1 mark maximum for suggestion to reduce environmental impact • Suggestion does not have to follow impact. • Example: Mining of minerals pollutes the water and depletes valuable mineral stocks. Ground water is contaminated by sending batteries to landfill sites. Energy can be saved by turning the machines off at night. (4 marks)	4

Question Number	Answer	Additional Guidance	Mark
4(b)	Any two of the following Easier / faster to: ○ Sort ○ Search (by using queries) ○ Produce reports ○ Analyse data ○ Keep organised	Do not accept: • Primary or foreign keys • Relationships • Tables • Relational Database	**2**

Question Number	Answer	Additional Guidance	Mark
4(c)(i)	• Primary Key **Ignore additional information in the answer**	Do not accept 'Key' by itself	**1**

Question Number	Answer	Additional Guidance	Mark
4(c)(ii)	• Foreign Key **Ignore additional information in the answer**	Do not accept 'Key' by itself	**1**

Question Number	Answer	Additional Guidance	Mark
4(c)(iii)	• Any one of the following: ○ To form a relationship between the tables ○ To make connections between the tables ○ To facilitate the use of queries across tables ○ To relate the records in one table to records in another		**1**

Question Number	Answer	Additional Guidance	Mark
4(d)	One mark for **UPDATE** with correct table name One mark for **SET** with correct field name and new value One mark for **WHERE** with primary key and value Example: • UPDATE tblOutlet SET (Outlet_Address = "360 Pinnacle Place") WHERE Outlet_ID=2;	Do not penalise spelling of field names or table prefixes Do not penalise capitalisation of key words Do not penalise minutiae of syntax such as brackets, semi-colons, quotes	**3**

Question Number	Answer	Additional Guidance	Mark
4(e)	Justification expected in context of the question: ○ Can represent a larger number of characters ○ 16-bit representation is larger than 8-bit representation Example (in context of question) ○ Foreign language characters (ö, ú, ê, ç) ○ Foreign language characters used as alphabet	Not applicable to context of question (do not award) Smiley (WingDings, DingBats…) Mathematical symbols Copyright and trademark Foreign currency symbols Any other symbols supported by Unicode	**1**

Question Number	Answer	Additional Guidance	Mark
4(f)	Any one of: • 0 – 255 • 255 - 0	Do not award 256. Do not award 255.	**1**

Question Number	Answer	Additional Guidance	Mark
4(g)	Any three of the following: ○ Server can embed scripts into HTML page ○ Script is executed on the server ○ Result of execution is sent back to the client as an HTML page ○ All processing takes place on the server, not on the client ○ No software plugins to install on client machines ○ Software updates and patches only performed on server ○ Faster than client-side scripting ○ More secure than client-side scripting	○ Do not credit 'Script may interact with a database'	**3**

Question Number	Answer	Additional Guidance	Mark
5(a)	Compiler – Any of the following: • Translates all the source code as a single block • Object code is produced which can be linked to other modules • Compilers can perform optimisation on object code • Generated executable does not need compiler to execute • Executable can be moved between machines independent of compiler • Executable file runs more quickly than an interpreter with source code • Needs to be recompiled with each code change therefore development is slower. Interpreter – Any of the following: • Code is translated one line at a time and immediately executed • Code needs the interpreter to be run • Code cannot be moved between machines, unless the interpreter is moved as well • Debugging could be easier as interpreter **immediately** identifies line with error • Readable source code may need to be given to people who use the program • Runs less quickly than an executable file • Very good for creating prototypes due to quick development environments Quality of Written Communication	• A bulleted list of advantages or disadvantages is only worth 2 marks max.	**6**

	• 1-2: Some basic points from **at least one** of the categories; No recommendation or recommendation is not justified; Spelling, grammar, and punctuation **errors hinder meaning**. • 3-4: At least one relevant point **from each category**; Includes recommendation with minimal justification. Spelling, grammar, and punctuation **errors occur**, but do not hinder meaning. • 5-6: Relevant points from **both categories**; Includes well-justified recommendation. Spelling, grammar, and punctuation are **used accurately** and meaning is clear. **Example:** A compiler translates all the code at one time. The program can be run on any machine. (One category only; no recommendation; QWC ok; 2 marks max) **Example:** A compiler can perform optimisation on the code to make it more efficient. An interpreter can't because it executes one line at a time. A compiler makes a program that can be run on any machine. A compiler would be better for the pupil. (Two categories; unjustified recommendation; QWC ok; 4 marks max) **Example:** A compiler translates source code in a whole block to make an executable file. The executable file can run on any machines with the target operating system. It does not need the compiler to run. An interpreter translates each line of source code one at a time and executes it. To run the program on another machine, you need the interpreter and the source code. I recommend a compiler for the pupil because it makes		

	giving the program to another person easier, as they don't need the interpreter. (Two categories; justified recommendation; QWC ok; 6 marks max) **Example**: I recommend an interpreter because: • Translates one line at a time • Easier to see errors • Good for quick development I don't recommend a compiler because: • It's slow • Have to give away interpreter as well as code (Two categories; justified recommendation; QWC unmarkable; 2 marks max)		

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	• (Line number) 3		**1**

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	9-16, both must be provided		**1**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>5(c)</td><td>

1 mark = 0-5 sequence under column i
1 mark = 78, 83, 72, 80, 83 sequence under column anArray[i]

<table>
<tr><th>b</th><th>f</th><th>i</th><th>anArray[i]</th><th>c</th></tr>
<tr><td>75</td><td>FALSE</td><td>0</td><td></td><td>-1</td></tr>
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<tr><td></td><td></td><td>2</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>72</td><td></td></tr>
<tr><td></td><td></td><td>3</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>80</td><td></td></tr>
<tr><td></td><td></td><td>4</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>83</td><td></td></tr>
<tr><td></td><td></td><td>5</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
</table>
</td><td></td><td>2</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
5(d)	• Examples: ○ WHILE ((NOT f) AND (i < LENGTH (anArray)) DO ○ WHILE (NOT f) AND (i < 5) DO ○ WHILE (f = FALSE) AND (i < 5) DO ○ WHILE (NOT f) AND i < 5 DO ○ WHILE NOT f AND i < 5 DO ○ WHILE (i < LENGTH (anArray) DO	• Any sensible pseudocode is awardable • Brackets not required • Accept <= in place of <	1

Question Number	Answer	Additional Guidance	Mark
5(e)	Any one of: • Finding the ***location*** of a target number in an array • Finding the **position** of a number in an array	• "Finding a number in an array" is not awardable. • The idea of location is important because of the ***return*** statement value	1

Question Number	Answer	Mark

5(f)	• Flowcharts are not awarded, stated in question
	• Do not penalise pseudocode or programming language syntax errors, as long as logic is discernible
	• Many alternative solutions are possible and should be awarded
	  ○ Reading all measurements into an array and then processing, if correct, should be awarded
	  ○ STEP on FOR loop not required for mark
	  ○ Comments not required
	• For full marks, solution must be correct and work
		7

```
// Initialisation of variables
SET totalWeight TO 0

// Print prompt and get count of weights
SEND "How many weights do you want to enter?" TO DISPLAY
RECEIVE numWeights FROM (INTEGER) KEYBOARD

// Loop for count as entered
FOR i FROM 1 TO numWeights STEP 1 DO
    SEND "Enter a weight:" TO DISPLAY
    RECEIVE aFruit FROM (INTEGER) KEYBOARD

    // Add up as each weight is entered
    SET totalWeight TO totalWeight + aFruit
END FOR

// Find average and print out
SET averageWeight = (REAL) totalWeight / numWeights
SEND "Average weight is: %2d" + averageWeight TO DISPLAY
```

Initialise variables sensibly = 1 mark (**1.1.2**)
totalWeight must be set before first use, if used in calculation.

Retrieving count from keyboard = 1 mark (**2.4.1**)

Any loop control for multiple weights with correct bounds = 1 mark (**2.2.2**)

Adding up total inside loop = 1 mark (**1.1.2**)

Calculating average = 1 mark (**1.1.8**)
Output average = 1 mark (**1.1.2**)

Attempt to deal with INTEGER/REAL/STRING conversion = 1 mark, even if not correct (**1.1.2**)

Content Mapping Grid

Question	Specification	Marks
1a	4.1.3, 4.2.5	3
1b	3.1.1	2
1c(i)	4.2.3	1
1c(ii)	4.2.3	1
1c(iii)	2.2.2	1
1d	3.1.2	1
1e	3.1.2	1
1f(i)	3.1.4	1
1f(ii)	3.1.4	1
1f(iii)	3.1.4	1
1g	4.3.1	1
1h(i)	4.3.1	3
1h(ii)	4.3.2	1
2a	4.4.2	4
2b	6.1.4	4
2c	4.2.1	3
2d	4.2.2	2
2e	4.4.1	3
2f	4.4.3	2

Question	Specification	Marks
3a(i)	3.2.2	1
3a(ii)	3.2.2	1
3a(iii)	3.2.2	1
3b	4.2.4	3
3c	5.1.6	2
3d	5.1.7	1
3e	3.3.1	1
3f	5.2.1, 5.2.2	2
3g(i)	5.2.3	1
3g(ii)	5.2.3	1
3h(i)	3.2.3	1
3h(ii)	3.2.3	1
3j	3.3.3	2

Question	Specification	Marks
4a	6.1.2	4
4b	3.5.1	2
4c(i)	3.5.2	1
4c(ii)	3.5.2	1
4c(iii)	3.5.2	1
4d	3.5.3	3
4e	3.2.1	1
4f	3.2.4	1
4g	5.2.4	3
5a	4.5.2	6
5b(i)	2.2.1	1
5b(ii)	2.2.1	1
5c	2.1.6	2
5d	1.1.5	1
5e	1.1.3	1
5f	1.1.2, 2.4.1, 2.2.2, 1.1.8	7

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edexcel

Mark Scheme (Results)

Summer 2016

GCSE Computer Science (1CP0/01)
Paper 1: Principles of Computer Science

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

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Question Number	Answer	Additional Guidance	Mark
1(a)(i)	Any one of: • To allow connected machines to communicate • To provide the rules of communication between two networked devices	Any other response indicating communication	**1**

Question Number	Answer	Additional Guidance	Mark
1(a)(ii)	Any one of: • Backbone • Connecting backbone • Internet backbone • Fibre backbone • Network backbone		**1**

Question Number	Answer	Additional Guidance	Mark
1(a)(iii)	Ring		**1**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>1(a)(iv)</td><td>One mark for each correct cell.

<table>
<tr><th>LAN</th><th>WAN</th><th>PAN</th><th>VPN</th></tr>
<tr><td></td><td></td><td>X</td><td></td></tr>
<tr><td>X</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>X</td></tr>
<tr><td></td><td>X</td><td></td><td></td></tr>
</table></td><td></td><td>4</td></tr>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>1(b)(i)</td><td>Any one of:

• To keep information private/secure/secret as it is being transmitted across networks
• So that unauthorised persons will not be able to translate/understand the transmitted data</td><td>Do not accept:
• to keep secure when stored on devices, which is not the context of the question</td><td>1</td></tr>
</table>

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>1(b)(ii)</td><td>
<table>
<tr><th>Plain Text</th><th>Shift</th><th>Cipher Text</th></tr>
<tr><td>d i g i t</td><td>+3</td><td>g l j l w</td></tr>
<tr><td>b i n a r y</td><td>-2</td><td>z g l y p w</td></tr>
</table>
</td><td></td><td>2</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
1(c)(i)	1 0 0 1 0 1 0 1		**1**

Question Number	Answer	Additional Guidance	Mark
1(c)(ii)	6 E	Ignore case	**1**

Question Number	Answer	Additional Guidance	Mark
1(c)(iii)	1 1 0 0 0 1 0 0	Ignore spacing Must be 8-bits	**1**

Question Number	Answer	Additional Guidance	Mark
1(c)(iv)	Any one of: • 2^n and n=8 • 2^8 • 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2 • 2^4 x 2^4 • 2^2 x 2^2 x 2^2 x 2^2 • Any other appropriate formula giving a result of 256		**1**

Question Number	Answer	Additional Guidance	Mark
1(d)(i)	Any one of the following: • Data is permanently lost (during the compression process) • Resolution is lost in images, (usually where it will not be noticed by the human eye) • Signal is degraded in audio files, (usually not noticeable to the human ear)	Accept answers that indicate a loss of quality	**1**

Question Number	Answer	Additional Guidance	Mark
1(d)(ii)	Any one of: B = JPEG		**1**

Question Number	Answer	Additional Guidance	Mark
1(e)	One mark for each of: • X-Dimension = 2 • Y-Dimension = 3 Examples: • (2,3) • X=2, Y=3	Values of 2 and 3 alone, with no indication of ordering, cannot be awarded. Accept any other notation clearly indicating (x,y) ordering and values	**2**

(Total for Question 1 = 18 marks)

Question Number	Answer	Additional Guidance	Mark
2(a)	<table><tr><th>EU Cookie Law (e-Privacy Directive)</th><th>Computer Misuse Act</th><th>Copyright, Designs, and Patents Act</th></tr><tr><td></td><td></td><td>X</td></tr><tr><td></td><td>X</td><td></td></tr><tr><td>X</td><td></td><td></td></tr></table>		**3**

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	<table><tr><th>High-Level Programming Language</th><th>Low-Level Programming Language</th></tr><tr><td>X</td><td></td></tr><tr><td></td><td>X</td></tr><tr><td>X</td><td></td></tr><tr><td></td><td>X</td></tr></table>		**4**

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	Comment(s) / Annotation(s)	Do not penalise spelling	**1**

Question Number	Answer	Additional Guidance	Mark
2(b)(iii)	cubeNum	Do not penalise spelling Do not award if other information from function header is provided because the question asks for name only.	**1**

Question Number	Answer	Additional Guidance	Mark
2(b)(iv)	Any one of: • 18 to 22 • 18 - 22 • 18, 19, 20, 21, 22 • 18, 20, 22	Entire range must be provided Award any discernible notation	**1**

Question Number	Answer	Additional Guidance	Mark
2(b)(v)	Any one of: • 25 • 27		**1**

Question Number	Answer	Additional Guidance	Mark
2(b)(vi)	Any one of: • 10 • 19 • 21 • 23		**1**

Question Number	Answer	Additional Guidance	Mark
2(c)(i)	First box = $\frac{1}{2}$ or equivalent expression for 1 mark / 0.5 Second box = $\frac{1}{4}$ or equivalent expression for 1 mark / 0.25 Conversion = $2\frac{3}{4}$ or equivalent expression for 1 mark / 2.75		**3**

Question Number	Answer	Additional Guidance	Mark
2(c)(ii)	4		**1**

Question Number	Answer	Additional Guidance	Mark
2(c)(iii)	One mark for: • Numerator (top) calculation • Denominator (bottom) calculation Any of the following: $\frac{\left(\frac{10Kilobytes}{1}\right)\left(\frac{1024bytes}{Kilobytes}\right)\left(\frac{8\ bits}{byte}\right)}{\left(\frac{10Megabits}{Seconds}\right)\left(\frac{1000Kilobits}{Megabits}\right)\left(\frac{1000\ bits}{Kilobits}\right)}$ $\frac{10\ \times 1024\ \times 8}{10\ \times 1000\ \times 1000}$ $\frac{81920}{10000000}$ $\frac{8192}{1000000}$ Any other correct calculation where the unit conversions are discernible.		**2**

(Total for Question 2 = 18 marks)

Question Number	Answer	Additional Guidance	Mark
3(a)	One mark for each concept: Organisation of files is in a **hierarchy/tree** structure A **node** is either a folder/directory/sub-folder/sub-directory or the file itself The top node/folder/directory/drive is the **root**		**3**

Question Number	Answer	Additional Guidance	Mark
3(b)(i)	One mark for each concept: The client makes a connection / shares its IP with the server The client machine (web browser) **sends a request to the server** for a web page The server machine **sends the (requested) page back** to the client machine		**2**

Question Number	Answer	Additional Guidance	Mark
3(b)(ii)	One mark for One mark for both items in One mark for inside Example (3 marks) - Socket - Open Ended Example (2 marks) - Socket Example (1 mark) - Socket - Open Ended	Ignore formatting as long as enclosure <> and </> are correct	**3**

Question Number	Answer	Additional Guidance	Mark
3 (c)(i)	Any two of: • Library code has already been debugged, so it should not have a bug • Library code has already been tested, so it should produce the correct results • Using libraries can reduce the time needed to develop a solution • Library code is usually optimised/faster than own code • Library code can be reused many times without having to rewrite the code	Do not accept just 'saves time'	**2**

Question Number	Answer	Additional Guidance	Mark

3(c)(ii)	One mark for each of (**in this order only**):
	
	1. AND
	2. OR
	3. NOT
	4. AND
	
	==========
	1 Mon, 2 Tues, 3 Wed, 4 Thur, 5 Fri, 6 Sat, 7 Sun
	
	IF day >= 1 AND day <= 5 THEN
	SEND "weekday" TO DISPLAY
	ENDIF
	IF day = 6 OR day = 7 THEN
	SEND "weekend" TO DISPLAY
	ENDIF
	IF NOT (day >= 1 AND day <= 7) THEN
	SEND "error" TO DISPLAY
	ENDIF
			4

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>3(d)</td><td>One mark for each row (maximum 4 marks):

<table>
<tr><td>(1)</td><td>SELECT (id, description)</td><td></td></tr>
<tr><td>(1)</td><td>FROM tblProduct</td><td></td></tr>
<tr><td rowspan="2">(1)</td><td>WHERE id LIKE 'G%'</td><td>Pattern must be discernible as a string (“”), the letter G (g), and a wild card character (*,#,?)</td></tr>
<tr><td>WHERE id>=”G000” AND id <=”G999”</td><td>Pattern must be discernible as a string (“”), the letter G (g), and the operator “AND”</td></tr>
<tr><td>(1)</td><td>ORDER BY id ASC</td><td>Award ASCEND(ING)</td></tr>
</table></td><td>Do not penalise spelling</td><td>4</td></tr>
</table>

(Total for Question 3 = 18 marks)

Question Number	Answer	Additional Guidance	Mark
4(a)	Any two of: • Both the instructions and data for a program are stored in main memory • Instructions and data are stored in binary code • Instructions and data are fetched, decoded, and executed in a sequence by the CPU		**2**

Question Number	Answer	Additional Guidance	Mark
4(b)(i)	One mark for: • Software (layer) One mark for any of: • Allows the operating system on one physical computer **to simulate another computer**, usually of a different operating system. • Allows a **guest operating system** to reside on a machine • Allows **a program written for one machine to run on another** wit**hout changes (Java Virtual Machine).** • Any other appropriate and correct response.	An example (JVM or Linux on Windows) is not enough for marks	**2**

Question Number	Answer	Additional Guidance	Mark
4(b)(ii)	At least one from both sections for full marks Any four of: Sequential: • Individual instructions are executed one after another • Flow control is accomplished by jump/branch/goto instructions • Results are usually achieved less quickly than parallel processing (do not award twice) Parallel: • Individual instructions can be routed to different processors for simultaneous execution • Results are usually achieved quicker than sequential instruction (do not award twice) • Requires multi-core processors or multiple microprocessors • Tasks may be split into different parts with each part executed on a different processor • Results need to be merged back together after completion Any other appropriate and correct response.		**4**

Question Number	Answer	Additional Guidance	Mark

4(c)(i)	Coding solution **(one mark for each item):**
	• **Calli**ng code must provide an input parameter
	• `calcCircleArea` signature must take an input parameter
	• Input parameter must be used in calculation
	
	`47`
	`48 calcCircleArea (radiusOfCircle)`
	`49`
	`50 PROCEDURE calcCircleArea (radiusOfCircle)`
	`51 BEGIN PROCEDURE`
	`52 SET area TO Pi * radiusOfCircle * radiusOfCircle`
	`53 SEND area TO DISPLAY`
	`54 END PROCEDURE`
	`55`
		Ignore any reference to data types	**3**

Question Number	Answer	Additional Guidance	Mark
4(c)(ii)	One mark for each correct cell **Pupil Number Visited** | **Sub-list** 2245 | 837, 1529, 1683 1529 | 1683 1683 |		**5**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>4 (c)(iii)</td><td>One mark for each correct column

<table>
<tr><th>A</th><th>B</th><th>R = A OR B</th><th>S=NOT(A AND B)</th><th>Q=R AND S</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td></tr>
</table></td><td></td><td>3</td></tr>
</table>

(Total for Question 4 = 19 marks)

Question Number	Answer	Additional Guidance	Mark
5(a)	Characteristics – Any of the following: • Branch of computer science based on enabling computers to behave like humans/mimic aspects of human intelligence • AI is implemented in software. • Combines psychology, biology, linguistics, mathematics, neuroscience, and philosophy (ethics) • AI is not the same as the general intelligence of human beings Uses – Any of the following: • Game playing (chess, quiz, video games) • Analytics (analyse buying patterns, predicting behaviours, predictive text, financial markets) • Image processing (recognising objects/patterns) • Logistics (scheduling, order fulfilment) • Control systems (cars, manufacturing, weapons, navigation) • Expert systems (medical, mechanical, electrical diagnosis) • Neural networks (simulating neuron behaviours as in brains) • Natural languages processing (chatterbots, chatbots, speech recognition) • Robotics (dangerous situations, help aged or disabled) Ethical issues – Any of the following: • Take the work of humans, thereby affecting employment rates • Is a computer to be trusted to make decisions (life-death)?	A bulleted list of facts is only worth 2 marks max.	**6**

	• If a computer discovers something that humans can't prove, should it be accepted as truth? • Do AI machines have rights? • Will people be comfortable interacting with machines that are considered intelligent? Quality of Written Communication: • 1-2: Some basic points from **at least one** of the categories; little clarification or expansion of points; spelling, grammar, and punctuation **errors hinder meaning**. • 3-4: At least one relevant point **from two categories**; some clarification or expansion of points; spelling, grammar, and punctuation **errors occur**, but do not hinder meaning. • 5-6: Relevant points from **three categories**; comprehensive clarification or expansion of points; spelling, grammar, and punctuation are **used accurately** and meaning is clear. **Example:** Robots are machines that use artificial intelligence to do jobs that people tell them to. They are not as smart as real humans. One category only; no expansion; QWC ok; 2 marks max) **Example:** Artificial intelligence is based on getting machines to behave like humans. The cleverness of AI is really in the software. AI is used in game playing. Recently the AI software has beat humans at some games. (Two categories; Some expansion; QWC ok; 4 marks max)		

	Example: AI is a branch of computer science that tries to make software imitate human intelligence. However, we're not there yet. It is used in expert systems to diagnose problems with car engines. It can also be used to predict which products people might buy in a grocery store based on their loyalty card purchases. There are problems with AI. One is the issue of ethics. Courts may decide that AI robots have the same rights as humans. People may not like the idea of computers making life and death decisions, such as when to turn off life support systems. This may make people very uncomfortable. (Three categories; Comprehensive expansion; QWC ok; 6 marks max) **Example**: AI: • Making robots behave like humans Uses: • Used to help people with disabilities live in normal homes Ethical Issues: • They will be taking over human jobs and putting people out of work (Three categories; QWC unmarkable; 2 marks max)		

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>5(b)(i)</td><td>One mark for initialisation of variables (max 1 mark)
One mark for each complete pass of loop (max 4 marks)

<table>
<tr><th>R3</th><th>R4</th><th>R5</th><th></th></tr>
<tr><td>1</td><td>2</td><td>4</td><td>1 mark</td></tr>
<tr><td>2</td><td></td><td></td><td rowspan="2">1 mark</td></tr>
<tr><td></td><td></td><td>3</td></tr>
<tr><td>4</td><td></td><td></td><td rowspan="2">1 mark</td></tr>
<tr><td></td><td></td><td>2</td></tr>
<tr><td>8</td><td></td><td></td><td rowspan="2">1 mark</td></tr>
<tr><td></td><td></td><td>1</td></tr>
<tr><td>16</td><td></td><td></td><td rowspan="2">1 mark</td></tr>
<tr><td></td><td></td><td>0</td></tr>
</table>

Other formats for this table are acceptable. For example, each combination of 2 values may be on a single line (indicated in grey).</td><td></td><td>5</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	Calculates the number defined as one of (or equivalent statement) • $R4^{R5}$ • 16 • 2^4 • 2 x 2 x 2 x 2		**1**

Question Number	Answer	Additional Guidance	Mark
5(b)(iii)	<table><tr><th>Part</th><th>Name</th></tr><tr><td>MOV</td><td>Opcode / operation code field / operation</td></tr><tr><td>R4,#2</td><td>Operand / operand code field / operand field</td></tr></table>	• Do not penalise spelling	**2**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>5(b)(iv)</td><td>One mark for each of:
• Initialisation (R3, R4, R5)
• Correct loop construction showing blocking
• Correct two lines inside of loop blocking

<table>
<tr><td><pre>SET R3 TO 1
SET R4 TO 2
SET R5 TO 4
WHILE R5 <> 0
    SET R3 TO R3 * R4
    SET R5 TO R5 - 1
END WHILE</pre></td><td><pre>SET R3 TO 1
SET R4 TO 2
SET R5 TO 4
FOR X FROM 1 TO R5 DO
    SET R3 TO R3 * R4
    SET R5 TO R5 - 1
END FOR</pre></td></tr>
<tr><td><pre>SET R3 TO 1
SET R4 TO 2
SET R5 TO 4
REPEAT
    SET R3 TO R3 * R4
    SET R5 TO R5 - 1
UNTIL R5 = 0</pre></td><td><pre>SET R3 TO 1
SET R4 TO 2
SET R5 TO 4
FOR EACH X FROM R5 DO
    SET R3 TO R3 * R4
    SET R5 TO R5 - 1
END FOR</pre></td></tr>
</table>
</td><td>• Accept alternate solution of DO/WHILE as long as test is “R5 <> 0”
• Do not penalise pseudocode usage as long as response is blocked and discernible
• A specific language construct of a while, repeat, or for loop should be awarded if blocked and discernible</td><td>3</td></tr>
</table>

	``
	SET R3 TO 1
	SET R4 TO 2
	SET R5 TO 4
	REPEAT R5 TIMES
	    SET R3 TO R3 * R4
	    SET R5 TO R5 - 1
	END REPEAT
	``
		``
		SET R3 TO 1
		SET R4 TO 2
		SET R5 TO 4
		FOR X FROM 1 TO R5 STEP 1 DO
		    SET R3 TO R3 * R4
		    SET R5 TO R5 - 1
		END FOR
		``		

	Other solutions may be correct, as long as it includes a sensible loop with the correct test for terminating condition.			

(Total for Question 5 = 17 marks)

Total for paper = 90 marks

Content Mapping Grid

Question	Specification	Marks
1a(i)	5.1.5	1
1a(ii)	5.2.1	1
1a(iii)	5.2.9	1
1a(iv)	5.1.2	4
1b(i)	3.4.1	1
1b(ii)	3.4.2	2
1c(i)	3.1.4	1
1c(ii)	3.1.5	1
1c(iii)	3.1.5	1
1c(iv)	3.2.4	1
1d(i)	3.3.2	1
1d(ii)	3.3.2	1
1e	2.4.3 1.1.1	2
2a	6.1.3	3
2b(i)	4.5.1	4
2b(ii)	2.1.2	1
2b(iii)	2.2.1	1
2b(iv)	2.2.2	1

Question	Specification	Marks
2b(v)	2.3.5	1
2b(vi)	2.3.5	1
2c(i)	3.1.2	3
2c(ii)	3.3.1	1
2c(iii)	3.3.4	2
3a	4.4.1	3
3b(i)	5.2.4	2
3b(ii)	5.2.3	3
3c(i)	2.6.1	2
3c(ii)	4.3.2	4
3d	3.5.3	4
4a	4.2.2	2
4b(i)	4.1.1	2
4b(ii)	4.1.2	4
4c(i)	2.6.3	3
4c(ii)	1.1.8	5
4c(iii)	4.3.1	3
5a	6.1.1	6

Question	Specification	Marks
5b(i)	2.1.6	5
5b(ii)	1.1.1	1
5b(iii)	4.2.3	2
5b(iv)	2.2.2	3



Mark Scheme (Pre-Standardisation)

Summer 2018

GCSE Computer Science (1CP1/02)
Paper 2: Application of Computational Thinking

Question Number	Answer	Additional Guidance	Mark
1(a)	Any **two** from • Date of birth (1) • Employee number (1) • Permitted areas (1) • Department (1) • Salary (1) • Address (1) • Job role (1) • Badge number (1) • National Insurance number (1) • Location/depot (1) • Uniform information (1)	• Accept meaningful variable names tied to the scenario, e.g. EmployeeID, DOB, etc. • Do not accept age • Start date is in the question • Accept other examples appropriate to the scenario	**2**

Question Number	Answer	Additional Guidance	Mark
1(b)	• Calculation showing length of employment in years (1) • Subtracting 2 for the first two years (1) • Multiplying by 0.5 days per year (1) • Adding in the 10 days basic holiday entitlement (1) Example: • 10 + (((currentYear – startYear) - 2) x 0.5)	• Units not required • Brackets not required if order of precedence rules are followed (BIDMAS)	**4**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>1(c)</td><td>One mark for each cell.

<table>
<tr><th>Input(s)</th><th>Process</th><th>Output(s)</th></tr>
<tr><td>Location of card reader

Numeric code from magnetic strip</td><td>Find out if this employee can go through this door</td><td>True, if entry permitted

False, if entry not permitted</td></tr>
<tr><td>Cost of canteen meal

Numeric code from magnetic strip</td><td>Pay for canteen meal / subtract price of meal from balance / check if enough money in account</td><td>New balance, if paid

Error, if not enough in account</td></tr>
<tr><td>Top-up amount

Numeric code from magnetic strip</td><td>Add amount of top-up to make new balance</td><td>New balance</td></tr>
<tr><td>Numeric code from magnetic strip / account number</td><td>Check account balance</td><td>New balance</td></tr>
</table></td><td>• Award as long as meaning is discernible</td><td>3</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
2 (a)	In this exact order: • South depot / South (1) • North depot / North (1) • Unknown code / Unknown (1)	Ignore spelling Ignore extraneous text after a correct response	**3**

Question Number	Answer	Additional Guidance	Mark
2 (b)	One mark for each check and one for a linked example of test data that fails **the** test Type check (1) Data (1) Length check (1) Data (1) Presence check (1) Code is blank (1) Lookup check (1) Explanation of data not in pre-existing lists (1)	• Data must follow test • Quotes not required • Data must fail the indicated test and not several tests • Do not interpret blank cell as an answer to presence check	**4**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>3 (a)(i)</td><td>
<table>
<tr><th>Programming construct</th><th>Line number(s)</th></tr>
<tr><td>A condition controlled loop</td><td>One from:
• 8 (1)
• 8-18 (1)</td></tr>
<tr><td>A comment</td><td>One from:
• 2 (1)
• 7 (1)
• 20 (1)</td></tr>
<tr><td>A selection construct</td><td>One from:
• 12-17 (1)
• 12,15,17 (1)</td></tr>
<tr><td>A subprogram call</td><td>One from:
• 9 (1)
• 10 (1)
• 14 (1)
• 16 (1)
• 21 (1)
• 24 (1)</td></tr>
</table>
</td><td>• Accept words instead of numbers</td><td>4</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
3 (a)(ii)	Boolean (1)	Ignore spelling and extraneous text after a correct response	**1**

Question Number	Answer	Additional Guidance	Mark
3 (a)(iii)	One from: • Real (1) • Float (1) • Double (1)	Ignore spelling and extraneous text after a correct response	**1**

Question Number	Answer	Additional Guidance	Mark
3 (b)	One mark for each correct cell. **currentCount** | **i** | **LENGTH(weekNumber)** | **percentage** | **staffRates[i]** | **neededStaff** 300 | 2 | 6 | 1.15 | 115 | 345	• If the calculation is wrong on line 22 (percentage), award a follow through to line 23 (neededStaff = 300 * percentage) • Award equivalent expressions	**6**

Question Number	Answer	Additional Guidance	Mark
3 (c)	199 (1)		**1**

Question Number	Answer	Additional Guidance	Mark
4(a)	Logic / logical (1) Example: Logical / arithmetic (1) as logical is first Arithmetic / logical (0).	Ignore spelling and extraneous text following a correct response	**1**

Question Number	Answer	Additional Guidance	Mark
4(b)	One mark for each cell. Marks can be awarded independently.	• Accept prose description of error for Error column • Ignore any copying errors • Accept any discernible notation for correction	**4**

	Error	**Correction**
Line 11	The loop never executes (1) because found is initialised to False / because of found = True	WHILE (found = False) AND … Accept 'found = False'
Line 18	It prints the wrong item type (1) / It prints the item type one place to the right (1) of the correct one / [i + 1]	SEND typeItem[i]) TO DISPLAY

Question Number	Answer	Additional Guidance	Mark
5(a)	Line 2: inWidth, inHeight, inLength (1) – 3 meaningful variable names, order must match line 19 Line 6: inWidth * inHeight * inLength (1) – must match names from line 2, but order of calculation doesn't matter Line 8: volume (1) – only possible response Line 19: itemWidth, itemHeight, itemLength (1) – only possible names because they are used in the main program, any order See next page for an example.	• Ignore spelling mistakes and syntax as long as logic is discernible	**4**

```
FUNCTION calcVolume (inWidth, inHeight, inLength)

BEGIN FUNCTION

    volume = inWidth * inHeight * inLength

    RETURN (volume)

    END FUNCTION

SEND "Enter width" TO DISPLAY
RECEIVE itemWidth FROM (INTEGER) KEYBOARD
SEND "Enter height" TO DISPLAY
RECEIVE itemHeight FROM (INTEGER) KEYBOARD
SEND "Enter length" TO DISPLAY
RECEIVE itemLength FROM (INTEGER) KEYBOARD

SET itemVolume TO calcVolume (itemWidth, itemHeight, itemLength)

SEND "Volume is " & itemVolume TO DISPLAY
```

Question Number	Answer	Additional Guidance	Mark
5(b)	Any one of: • A function returns a value (1) • Without returning a value, it is not a function (1) • A procedure does not return a value (1)		**1**

Question Number	Answer	Additional Guidance	Mark
5(c)	volume	Ignore spelling and extraneous text after a correct response	**1**

Question Number	Answer	Additional Guidance	Mark
5(d)	Any two from: • Reduced coding time / code is quicker to write / code can be reused (1) • Reduced debugging time / library code is bug-free / reduced testing time (1) • Library may have more complex functionality (1) than the programmer has understanding or capability		**2**

Question Number	Answer	Additional Guidance	Mark
6(a)(i)	Random order (1) means that all items will have to be looked (1) at to find all occurrences Because the data is not sorted (1), the algorithm has to look at every item (1) in the list to find all occurrences.		**2**

Question Number	Answer	Additional Guidance	Mark
6(a)(ii)	The loop (1) means that all records will have to be looked at even if there are no numbers > 300 in the list (1)		**2**

Question Number	Answer	Additional Guidance	Mark

6(a)(iii)	Any one from:
	
	• Sort the list (1)
	• Direction of search (ascending, descending [implied or explicit]) matches order of sort (1) E.g.
	  ○ Ascending sort order requires the search to start from the end of the set
	  ○ Descending sort order requires the search to start from the beginning of the set.
	• Test for stopping for found item <300 (1)
			3

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>6(b)</td><td>

Appropriate and meaningful column headings (1)
Two rows of data whose type and values are sensible for the column headings (1)

<table>
<tr><td>Van ID</td><td>Monday</td><td>Tuesday</td></tr>
<tr><td>8765</td><td>310</td><td>379</td></tr>
<tr><td>212</td><td>187</td><td>231</td></tr>
</table>
</td><td>

Question requires a 2D array, so data types for lower 2 rows have to be homogeneous

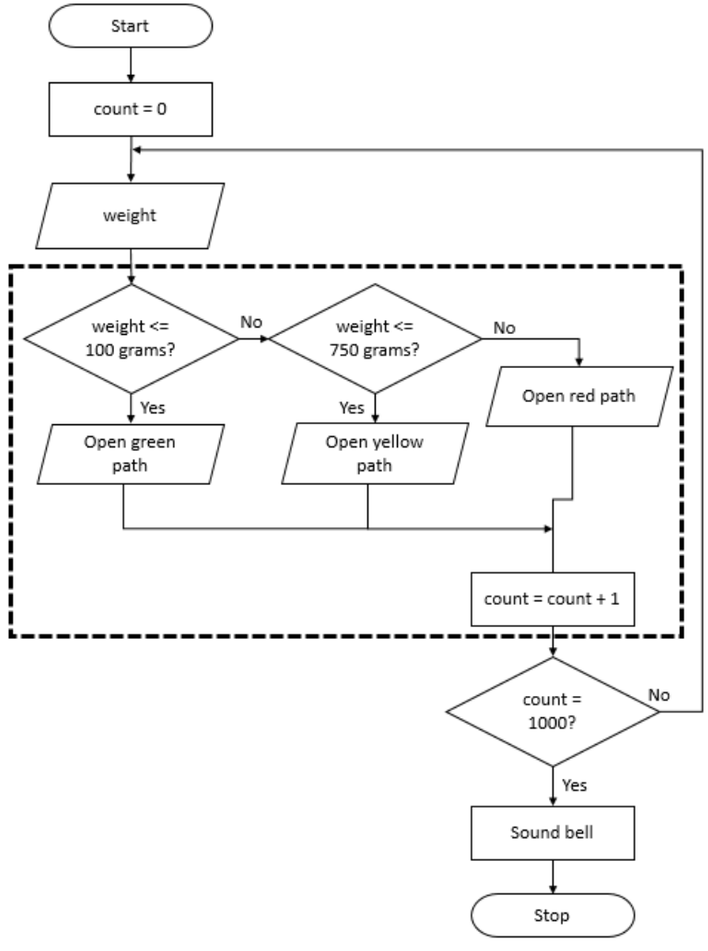
</td><td>2</td></tr>
</table>

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>6(c)</td><td>
Any two from:

1. Drivers may feel it is an invasion of privacy (1) because they could be tracked during work hours when they are not delivering items (1).
2. Drivers may not feel it is acceptable to be ranked/compensated based on tracking data (1) because unknown events (road works, etc.) will affect the tracking data (1).
3. Drivers may be tracked by customers (1) who may be annoyed by perceived delays (1).
4. Drivers may worry that their personal data (home address) may not be secure (1) and susceptible to unauthorised access (1).
5. Drivers may want to use the vans for their own purposes (1) outside of work hours and may not want this activity tracked (1).
</td><td></td><td>4</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark

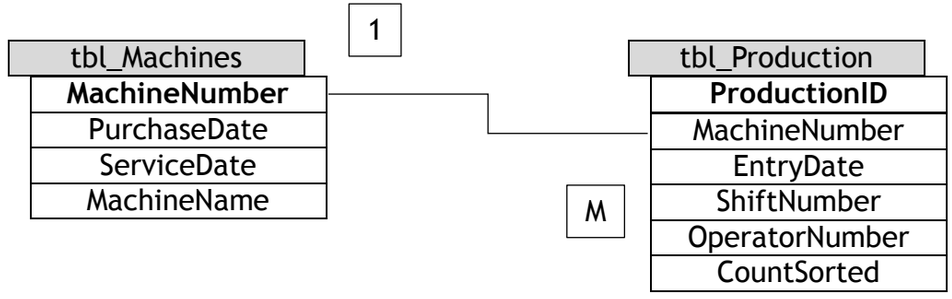
7 (a)	A completed flow chart that includes:
	• Decision diamonds (1)
	  ○ Directly follow one after the other from lowest to highest
	  ○ Label for flow between them must be 'No'
	  ○ Flow is unbroken by other instructions as this changes from if/elseif/else to sequence
	• Coloured paths
	  ○ Green path directly follows <=100 decision with label 'Yes' (1)
	  ○ Yellow path directly follows <=750 decision with label 'Yes' (1)
	  ○ Red path directly follows <=750 decision with label 'No' (1)
	• Flow
	  ○ Three distinct branches which join back into the flow of the loop construct (i.e. do not join back to each other, decision symbols, end, or additional symbols which have not been provided) (1)
	• Increment
	  ○ Single box positioned before any branches / positioned as the last process after all branches (1)
		• Different ordering and layout may be used
		• Each symbol is to be used only once (in question) and no other symbols should be used
		• Do not penalise lack of arrows on lines
		• Do not penalise inaccurate drawing of symbols
		• There should be no looping or flow which degrades what is an if/elseif/else construct to multiple if constructs
		• A process box can have more than one input (e.g. count=count+1), but not a decision box
			6

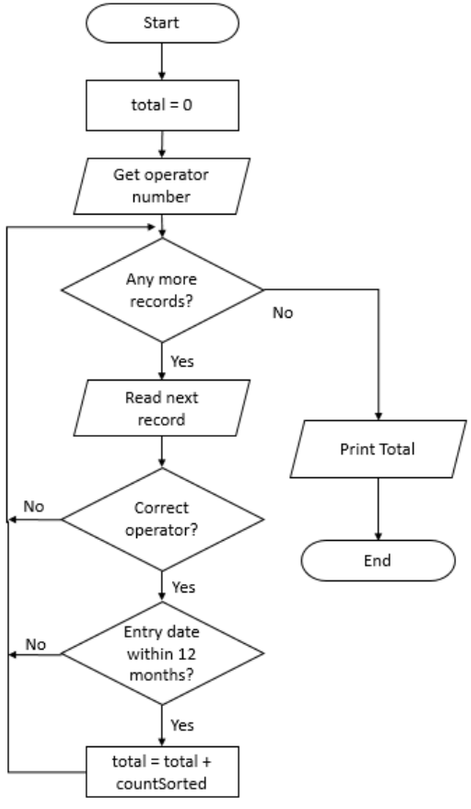

Start
count = 0
weight
weight <= 100 grams?
No
weight <= 750 grams?
No
Open red path
Yes
Open green path
Yes
Open yellow path
count = count + 1
count = 1000?
No
Yes
Sound bell
Stop

15

Question Number	Answer	Additional Guidance	Mark
7(b)(i)	• To **uniquely** identify an entity / a record in a table (1)		**1**

Question Number	Answer	Additional Guidance	Mark
7(b)(ii)	• MachineNumber (1)	Ignore spelling and extraneous text after a correct response	**1**

Question Number	Answer	Additional Guidance	Mark
7(b)(iii)	Line to connect the correct fields. (1) Correct labelling of the degree of the relationship. (1)  	• Other notation for relationships acceptable 1:Many 1:∞ Crows feet:  • Keys must be clearly connected, not just the tables	**2**

Question Number	Answer	Additional Guidance	Mark
7(b)(iv)		There are a maximum of 3 marks for functionality. There are a maximum of 3 marks for accuracy of notation. The input/output symbol can be replaced by the process symbol. There are many different solutions, but the flowchart must attempt to solve the problem Indicative content Initialisation of running total; Incrementing running total; Checking if this record is of interest; Handling end of data structure; Printing total as output.	**6**

Aspect of Solution	Marks			
	0	1	2	3
Functionality	No rewardable content	There are significant errors in logic, leading to an overall solution that is non-functional.	There are minor errors in logic, leading to an overall solution that is not completely functional.	There are no errors in logic, leading to an overall solution that is fully functional.
Accuracy of notation	No rewardable content	Notation follows a broadly unrecognisable convention that is applied inconsistently, although aspects of it are discernible.	Notation follows a recognisable convention, which is broadly discernible but is applied inconsistently.	Notation follows a recognisable convention and is applied consistently throughout.

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>8</td><td>
<table>
<tr><th rowspan="2">Aspect of Solution</th><th></th><th colspan="3">Marks</th></tr>
<tr><th>0</th><th>1</th><th>2</th><th>3</th></tr>
<tr><td>Functionality</td><td>No awardable content</td><td>There are significant errors in logic, leading to an overall solution that is non-functional.</td><td>There are minor errors in logic, leading to an overall solution that is not completely functional.</td><td>There are no errors in logic, leading to an overall solution that is fully functional.</td></tr>
<tr><td>Accuracy of Notation</td><td>No awardable content</td><td>Notation follows a broadly unrecognisable convention that is applied inconsistently, although aspects of it are discernible.</td><td>Notation follows a recognisable convention, which is broadly discernible but is applied inconsistently.</td><td>Notation follows a recognisable convention and is applied consistently throughout.</td></tr>
<tr><td>Efficiency, Appropriateness, and Accuracy of Solution</td><td>No awardable content</td><td>There are significant errors in the selection and accurate use of appropriate techniques.</td><td>Techniques have been selected and used with some accuracy, although the techniques may not be the most appropriate.</td><td>Techniques have been selected and used accurately and appropriately throughout to demonstrate an efficient solution.</td></tr>
</table>

There are a maximum of 3 marks for functionality.
There are a maximum of 3 marks for accuracy of notation.
There are a maximum of 3 marks for efficiency, appropriateness, and accuracy of solution.
Each row is awarded independently.
</td><td></td><td>9</td></tr>
</table>

Question 8 - Pseudocode Example:

```
SET count TO 0
SET maxWeight TO 0
SET minWeight = 9999

SEND "Enter the weight for the item, 0 to quit: " TO DISPLAY
RECEIVE weight (STRING) FROM KEYBOARD
WHILE (NOT (weight = 0)):
    IF (weight < 0) THEN
        SEND "Error.  No negatives allowed" TO DISPLAY
    ELSE
        SET count TO count + 1
        IF (weight > maxWeight) THEN
            SET maxWeight TO weight
        IF (weight < minWeight) THEN
            SET minWeight TO weight
        ENDIF
    ENDIF
    SEND "Enter the weight for the item, 0 to quit: " TO DISPLAY
    RECEIVE weight (STRING) FROM KEYBOARD
END WHILE
SEND "Count = " & count TO DISPLAY
SEND "Heaviest = " & maxLetterWeight TO DISPLAY
SEND "Lightest = " & minWeight TO DISPLAY
```

Initialisation of variables
minWeight should be high so that it will be set with the first value entered.

Condition controlled loop required

Validation for negative numbers

First pass through the loop means that minWeight and maxWeight will be the same number. If more than one number is entered, then an if/else would also work, but not in all cases.

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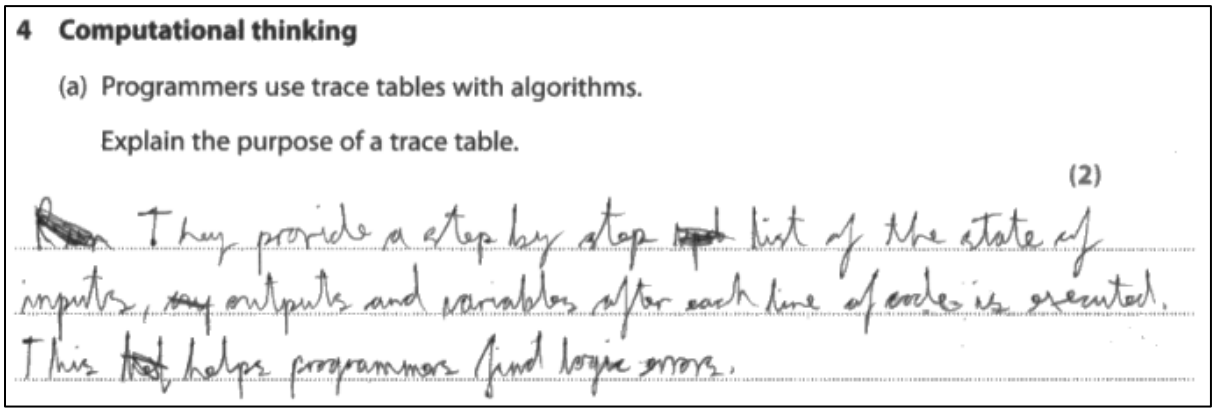
Question 4a

While some responses achieved both marks for a well-linked explanation, there were many that got trace tables confused with truth tables. Most correct responses mentioned that they are used to check the correct output, or test for bugs, but failed often to explain how, omitting the fact that a trace table tracks variables.



4 Computational thinking

(a) Programmers use trace tables with algorithms.

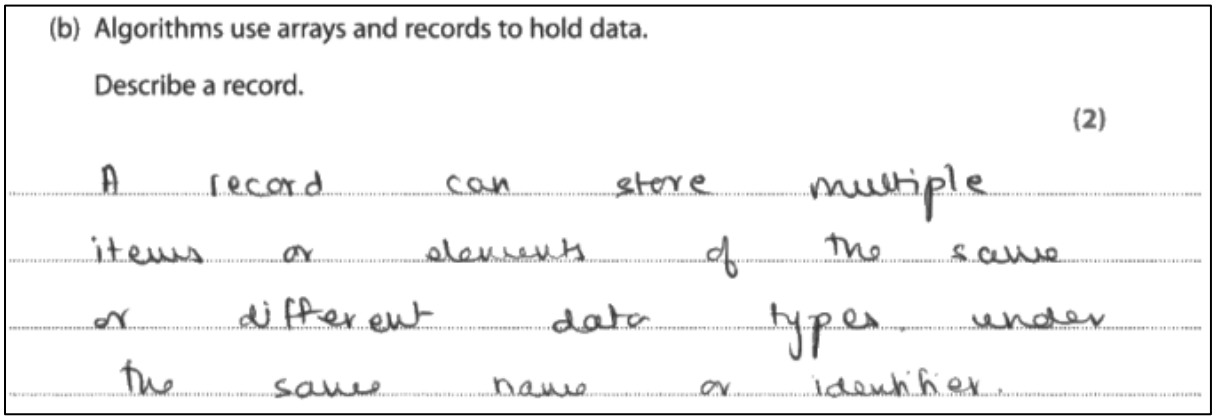
Explain the purpose of a trace table.

(2)

They provide a step by step list of the state of inputs, outputs and variables after each line of code is executed. This helps programmers find logic errors.

This response scored 2 marks. 'They provide …. the state of … variables' gained the first mark and ' helps programmers find logic errors' gained the second mark.

Lots of responses described storage or a storage method, rather than a data structure.


(b) Algorithms use arrays and records to hold data.

Describe a record.

(2)

A record can store multiple items or elements of the same or different data types, under the same name or identifier.

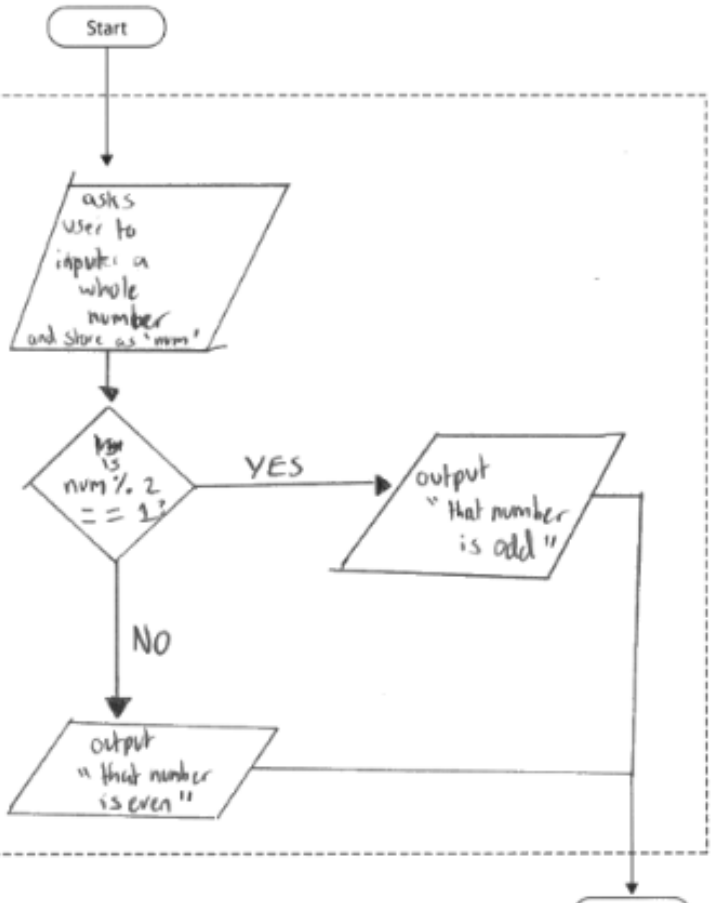
This response scored 2 marks; 1 mark for 'can store multiple items or elements' and 1 mark for 'different data types'.

Question 4c

Most responses correctly used the appropriate input symbol and had two outcomes from the decision. They understood the necessity of evaluating conditions and making choices based on them. Some students struggled to comprehend the relational test involving MOD, instead focusing on DIV, or whether the value divided by 2 had a remainder. Despite this, many students could make appropriate connections to the terminator and include at least one output message relevant to the decision outcome.
A few students used a decision shape instead of an output shape.

You may not need to use all the flowchart symbols.

(4)



This response scored all 4 marks.

Question 4d

Some responses methodically outlined the steps of the algorithm. However, the final mark point awarded for when the item is not found so the algorithm stops and the explicit point of comparing the item with the target were the most frequently missed marks. Many responses deviated from the intended focus by discussing sort algorithms.

(d) A linear search algorithm can be used on both a sorted and an unsorted array.

Describe how a linear search algorithm operates on an **unsorted** array.

(4)

It iterates on every value of an unsorted array and for every value checks if the value is equal to the value being searched for. If not, it will continue to the next variable until it does. If it reaches the end of the list and the value has not been found, it will declare that there is no such value

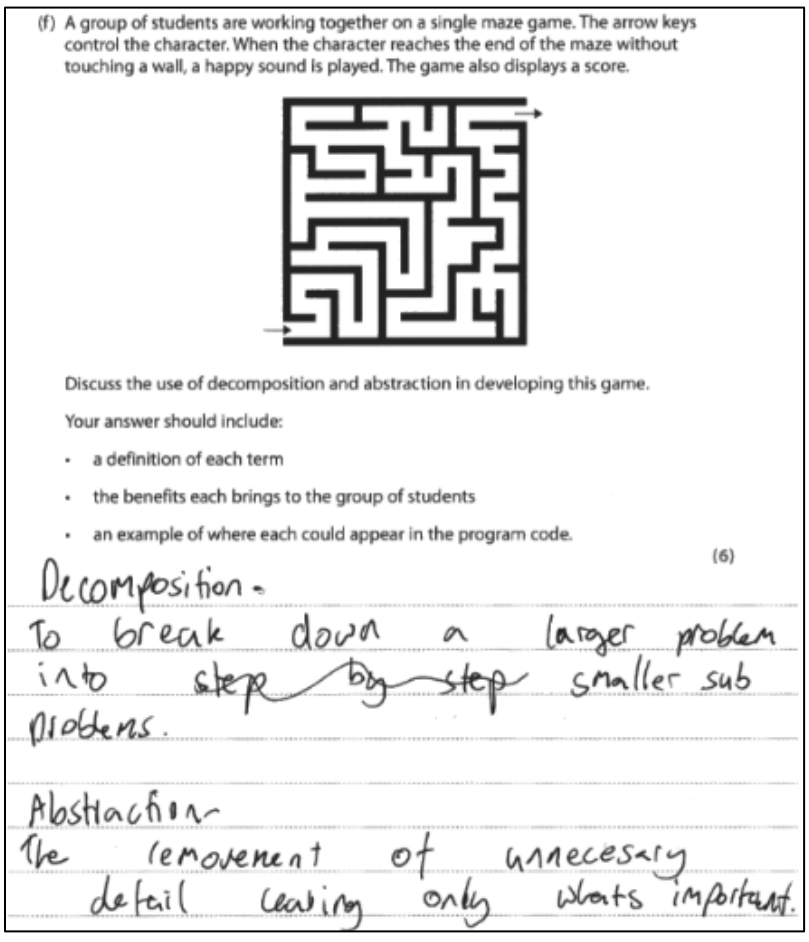
This response scored 4 marks. 'iterates' 1 mark, 'checks if the value is equal to the value being searched for' 1 mark, 'if not, it will continue until it [is equal to the value being searched for]' 1 mark and 'If it reaches the end of the list and the value has not been found' 1 mark.

Question 4e

A number of responses used ticks and crosses instead of 0, 1 etc. In general, students fully understood the logic process.

Question 4f

Despite being given bullet points to cover, many students did not use the structure of the question to compile their answer. Many cited vague benefits and although the definition for abstraction was often given, students were not clear on its benefits or its use. For example: some students thought abstraction would save on file size if a simplified character was used, while others talked about using or simplified maze, because they would be easier to navigate.



(f) A group of students are working together on a single maze game. The arrow keys control the character. When the character reaches the end of the maze without touching a wall, a happy sound is played. The game also displays a score.

Discuss the use of decomposition and abstraction in developing this game.

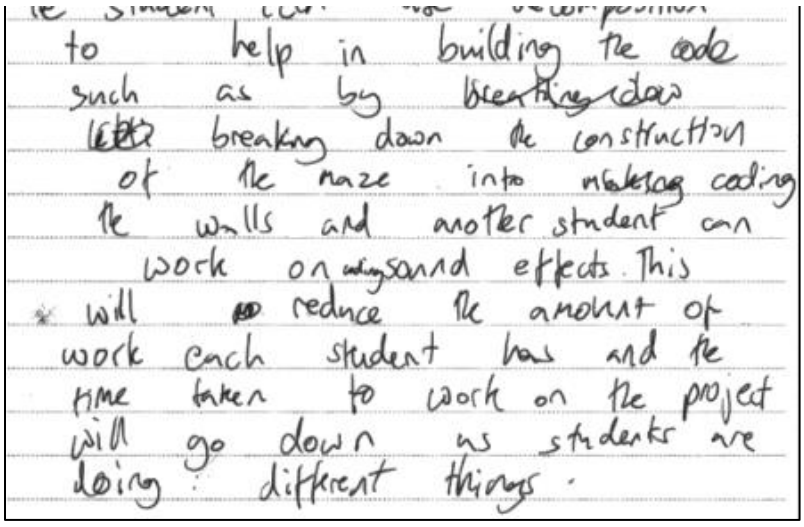
Your answer should include:

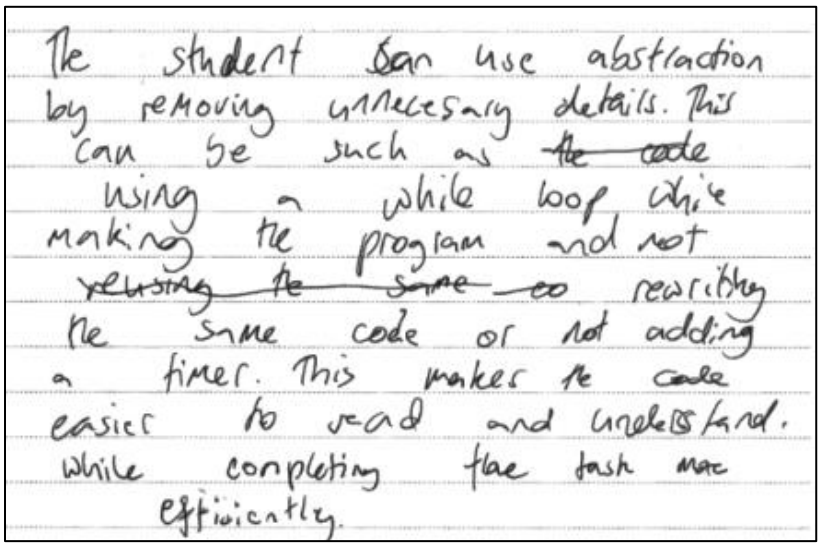
- a definition of each term
- the benefits each brings to the group of students
- an example of where each could appear in the program code.

(6)

Decomposition -
To break down a larger problem into step by step smaller sub problems.

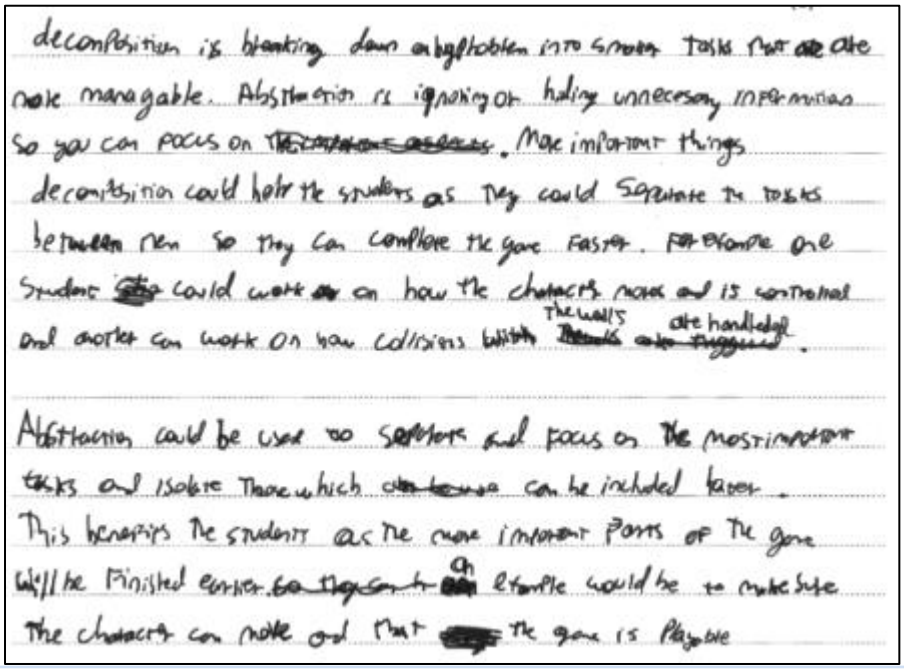
Abstraction -
The removement of unnecesary detail leaving only whats important.


to help in building the code such as by breaking down the construction of the maze into making coding the walls and another student can work on adding sound effects. This will reduce the amount of work each student has and the time taken to work on the project will go down as students are doing different things.

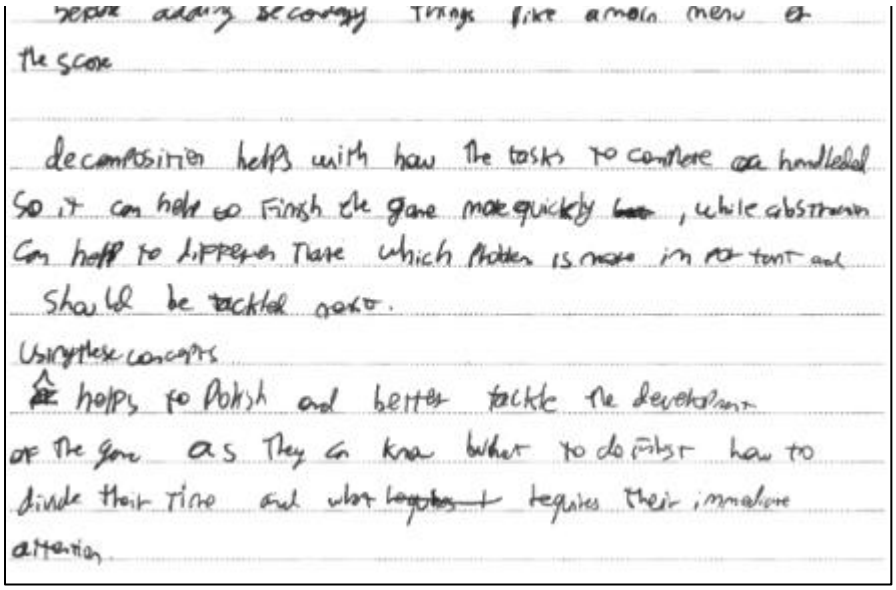

The student can use abstraction by removing unnecessary details. This can be such as the code using a while loop while making the program and not repeating the same code or not adding a timer. This makes the code easier to read and understand. While completing the task more efficiently.

This response scored 3 marks. Both aspects are defined, and links are made to the benefits of decomposition. The benefits of abstraction are unclear.

Responses did not have to give the benefits of both, but if only one, the benefits of that one needed to be well-developed.


decomposition is breaking down a big problem into smaller tasks that are more manageable. Abstraction is ignoring or hiding unnecessary information so you can focus on the important things. decomposition could help the students as they could separate the tasks between them so they can complete the game faster. For example one student could work on how the characters move and is controlled and another can work on how collisions with the walls are handled.

Abstraction could be used to simplify and focus on the most important tasks and isolate those which can be included later. This benefits the students as the more important parts of the game will be finished easier. An example would be to make sure the character can move and that the game is playable



before adding secondary things like a main menu or the score

decomposition helps with how the tasks to complete are handleded so it can help to finish the game more quickly ~~but~~, while abstraction can help to differen Tiate which problem is more important and should be tackled next.

Using these concepts helps to polish and better tackle the development of the game as they can know what to do first how to divide their time and what ~~requires~~ requires their immediate attention.

This response scored 4 marks. The response defines decomposition and abstraction and mentions some benefits to the group of students. However, there is some repetition of points made and no reference to the program code.

If a response only defined the terms, it can be no more than Level 1. For Level 2, the response had to provide benefits to the students - the definitions may have been implied.

For Level 3, a response had to provide at least one example of where decomposition or abstraction can appear in the program code. It is likely that a good example of either was enough to gain full marks, as long as the [possibly implied] definitions and benefits were also there.