



GCE

Computer Science

H446/02: Algorithms and programming

A Level

Mark Scheme for June 2025

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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MARKING INSTRUCTIONS

PREPARATION FOR MARKING

RM ASSESSOR

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM Assessor Assessor Online Training*; *OCR Essential Guide to Marking*.
2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are posted on the RM Cambridge Assessment Support Portal <http://www.rm.com/support/ca>
3. Log-in to RM Assessor and mark the **required number** of practice responses (“scripts”) and the **number of required** standardisation responses.

YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

MARKING

1. Mark strictly to the mark scheme.
2. Marks awarded must relate directly to the marking criteria.
3. The schedule of dates is very important. It is essential that you meet the RM Assessor 50% and 100% (traditional 40% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone or the RM Assessor messaging system, or by email.
5. **Crossed Out Responses**
Where a candidate has crossed out a response and provided a clear alternative then the crossed out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed out response where legible.

Rubric Error Responses – Optional Questions

Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM assessor, which will select the highest mark from those awarded. *(The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)*

Multiple Choice Question Responses

When a multiple choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate).

When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.

Contradictory Responses

When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

Short Answer Questions (requiring only a list by way of a response, usually worth only **one mark per response**)

Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

Short Answer Questions (requiring a more developed response, worth **two or more marks**)

If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space.)

Longer Answer Questions (requiring a developed response)

Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there, then add a tick to confirm that the work has been seen.

7. There is a NR (**No Response**) option. Award NR (No Response):

- if there is nothing written at all in the answer space
- OR if there is a comment which does not in any way relate to the question (e.g., 'can't do', 'don't know')
- OR if there is a mark (e.g., a dash, a question mark) which is not an attempt at the question.

Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).

8. The RM Assessor **comments box** is used by your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**

9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. For answers marked by levels of response:

- a. **To determine the level** – start at the highest level and work down until you reach the level that matches the answer
- b. **To determine the mark within the level**, consider the following

Descriptor	Award mark
On the borderline of this level and the one below	At bottom of level
Just enough achievement on balance for this level	Above bottom and either below middle or at middle of level (depending on number of marks available)
Meets the criteria but with some slight inconsistency	Above middle and either below top of level or at middle of level (depending on number of marks available)
Consistently meets the criteria for this level	At top of level

11. Annotations

<i>Annotation</i>	<i>Meaning</i>
	Omission mark
BOD	Benefit of the doubt
	Incorrect point
FT	Follow through
NAQ	Not answered question
NBOD	No benefit of doubt given
REP	Repeat
	Correct point
TV	Too vague
0	Zero (big)
BP	Blank Page – this annotation must be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.
L1	Level 1
L2	Level 2
L3	Level 3

12. Subject Specific Marking Instructions

Question			Answer	Mark	Guidance
1	(a)	(i)	1 mark each to max 5 • Set a flag/Boolean value • Compare the first pair / adjacent two items • If the items are in the correct order no swap is needed • If the items are in the wrong order, then swap them around... • ...using a temporary variable • ...change the flag/Boolean value • Repeat comparison of pairs of items until end of pass... • ...until all items sorted/max number of passes reached	5	BP2 comparison can be implicit e.g. if first item is greater than the second item BP3 must explicitly state 'no swap' if two items are in the correct order. BP8 is dependent on BP7, BP8 cannot be awarded unless it is clear multiple passes are performed. BP8 swap flag solution will be until no swaps occur in a pass as equivalent to all sorted
1	(a)	(ii)	1 mark each to max 2 • May have set a flag/Boolean value... •that can be used to indicate if a swap has been made • Checks if there are no swaps made (in the last pass) • ... and stops the loop from continuing	2	Responses must work for two passes, which means a swap flag/equivalent must be referenced.

1	(b)		1 mark each to max 5 • Insertion sort uses a 'sorted' and 'unsorted' list • Initially the unsorted list is [20,8,15,36] • In the first pass, 20 is taken from the unsorted list and placed into the sorted list // sorted becomes [20] and unsorted becomes [8,15,36] • In the next pass the next item 8, is inserted into its correct position in the sorted list // sorted becomes [8, 20] and unsorted becomes [15,36] • In the next pass the next item 15, is inserted into its correct position in the sorted list // sorted becomes [8, 15, 20] and unsorted becomes [36] • In the final pass 36 is inserted into the correct position // sorted becomes [8, 15, 20, 36]	5	Allow annotated diagrams Sorted Unsorted <pre> 20 8 15 36 20 8 15 36 8 20 15 36 8 15 20 36 8 15 20 36 </pre> MP1 may be shown implicitly by lists being separated. Responses must apply to the data set given. Do not credit generic responses. Max 4 if descending order.
1	(c)	(i)	1 mark for name quickSort // quickSort() 1 mark for both lines 21 and 22	2	Ignore case Allow sight of quicksort
1	(c)	(ii)	Count controlled // for loop	1	Allow 'definite'

1	(c)	(iii)	1 mark each to max 3 • Select a pivot • Compare each value to the pivot • values less than the pivot are placed to the left of it • values greater than the pivot are placed to the right of it	3	Allow the reverse for BP3 and BP4 i.e. items greater are placed to the left and items smaller are placed to the right (for descending sort)
1	(c)	(iv)	1 mark for line number 05 // 5 1 mark for the amended line: <code>if array[count] > pivot then</code>	2	Allow <code>>=</code> instead of <code>></code> Full line of code must be given
1	(c)	(v)	1 mark each to max 2 • Breaks down the problem into smaller sub problems • Finds a solution to each smaller sub problem separately • Combines the solutions from the sub problems together • Returns the combined solutions	2	Allow responses that apply to the sorting of the lists/data in quicksort.

Question			Answer	Mark	Guidance
2	(a)		Mark Band 3 – High level (7-9 marks) The candidate demonstrates a thorough knowledge and understanding of binary and linear search; the material is generally accurate and detailed. The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation. The candidate provides a thorough discussion which is well balanced. Evaluative comments are consistently relevant and well-considered. There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated. Mark Band 2 – Mid level (4-6 marks) The candidate demonstrates reasonable knowledge and understanding of binary and linear search; the material is generally accurate but at times underdeveloped. The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed. Evidence/examples are for the most part implicitly relevant to the explanation.	9	Answers may include, but are not limited to, some of the points below: AO1: Knowledge • Linear search checks each item from the first to the last in sequence • Binary search requires data to be in order • ...finds middle value and compares • ...if data is less than middle repeat with values less • ...if data is greater than middle repeat with value greater • Linear worst-time and average is linear • ...grows at same rate as number of elements grows • Binary worst-time and average are logarithmic • ...grows logarithmically to number of elements • Both have same worst-case space of constant as the data is not changing during the search.

Question			Answer	Mark	Guidance
			The candidate provides a reasonable discussion, the majority of which is focused. Evaluative comments are, for the most part appropriate, although one or two opportunities for development are missed. There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence. Mark Band 1 – Low Level (1-3 marks) The candidate demonstrates a basic knowledge of binary and linear search with limited understanding shown; the material is basic and contains some inaccuracies. The candidate makes a limited attempt to apply acquired knowledge and understanding to the context provided. The candidate provides a limited discussion which is narrow in focus. Judgements if made are weak and unsubstantiated. <i>The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</i> 0 marks No attempt to answer the question or response is not worthy of credit.		AO2: Application • File has large number of items to search • ...linear this will be longer worst-case than binary • Linear average for large number of items is longer than average for binary • Data is already in order, so no additional time required for binary to sort AO3: Evaluation • Binary is more appropriate • Data is already in order • Large number of items means both worst and average time are more efficient than the linear search

Question			Answer	Mark	Guidance
2	(b)	i	1 mark each to max 3 - Analysing/converting large quantities of data... ...into useful information - To find patterns / trends / anomalies in data - To find information / relationships / facts not obvious to the user	3	
		ii	1 mark each to max 2 e.g. Identification - Identify patterns / trends / anomalies in their searches - Identify patterns / trends / anomalies in their purchases Linked example ...for example the age group purchasing specific items ...use this to identify adverts to give to specific customers ...use this to identify which items to purchase more of ...use this to identify the features to promote on website	2	1 mark for identification; 1 mark for linked example Allow other answers that are suitable for the scenario stated in the question.

3	(a)	1 mark for stack contents 1 mark for pointer value <table><tr><td></td></tr><tr><td>"s"</td></tr><tr><td>"t"</td></tr><tr><td>"l"</td></tr><tr><td>"n"</td></tr><tr><td>"k"</td></tr></table> pointer = 4		"s"	"t"	"l"	"n"	"k"	2	Allow the absence of quotation marks around the values in the stack Allow I or L if difficult to determine letter/case etc.
"s"										
"t"										
"l"										
"n"										
"k"										
3	(b)	1 mark for each completed statement to max 4 function push(data) if pointer == 19 then return false else pointer = pointer + 1 theStack[pointer] = data return true endif endfunction	4	Allow len(theStack) - 1 or theStack.length - 1 as equivalent to 19						

3	(c)	1 mark each to max 6 • Function pop() declaration • Checking if stack is empty ... • ...and returning "false" • (otherwise) accessing the data at pointer • Decrementing pointer before returning • Returning the data accessed e.g. <pre>function pop() if pointer == -1 return "false" else dataToReturn = theStack[pointer] pointer = pointer - 1 return dataToReturn endif endfunction</pre>	6 BP1 ignore any parameters Allow equivalent check in BP2 e.g. <code>if pointer < 0</code> BP3 is strictly dependent on MP2 being met BP3 allow Boolean false instead of string "false" Allow BP4 and BP5 to be in the opposite order with appropriate logic. BP4 and BP6 can be combined Allow reversal of logic and other equivalent solutions e.g. <pre>function pop() if pointer > -1 pointer = pointer - 1 return theStack[pointer+1] else return "false" endif endfunction</pre>
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3	(d)	1 mark each to max 5 • Loop 10 times... • ...to take inputs... • ...calling push() with each value input • Calling pop() for each pushed value... • ...and outputting each value in the correct order e.g. <pre>for count = 0 to 9 push(input("Enter a string")) next count</pre> <pre>for count = 0 to 9 print(pop()) next count</pre>	5	Award follow through if incorrect number of items input/output Loop constructs must be valid for MP2 i.e. a fully working for or while loop or equivalent. If Python syntax is used it must be clear that a for loop executes 10 times e.g. for i in range(0,10)
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Question			Answer	Mark	Guidance
4			Mark Band 3 – High level (7-9 marks) The candidate demonstrates a thorough knowledge and understanding of pipelining; the material is generally accurate and detailed. The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation. The candidate provides a thorough discussion which is well balanced. Evaluative comments are consistently relevant and well-considered. There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.	9	Answers may include, but are not limited to, some of the points below: AO1: Knowledge • The division of instructions into a series of steps • A different part of each series of steps for a different instruction can be run by the processor at the same time • An instruction can be fetched whilst another is decoded whilst another is executed AO2: Application • In the first time interval instruction 1 is fetched • 2nd time interval instruction 1 is decoded and instruction 2 is fetched • 3rd time interval instruction 1 is executed, instruction 2 is decoded, instruction 3 is fetched • 4th time interval instruction 2 is executed, instruction 3 is decoded and instruction 4 is fetched • 5th time interval instruction 3 is executed, instruction 4 is decoded
			Mark Band 2 – Mid level (4-6 marks) The candidate demonstrates reasonable knowledge and understanding of pipelining; the material is generally accurate but at times underdeveloped. The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed. Evidence/examples are for the most part implicitly relevant to the explanation. The candidate provides a reasonable discussion, the majority of which is focused. Evaluative comments are, for the most		

Question			Answer	Mark	Guidance
			part appropriate, although one or two opportunities for development are missed. <i>There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence.</i> Mark Band 1 – Low Level (1-3 marks) The candidate demonstrates a basic knowledge of pipelining with limited understanding shown; the material is basic and contains some inaccuracies. The candidates makes a limited attempt to apply acquired knowledge and understanding to the context provided. The candidate provides a limited discussion which is narrow in focus. Judgements if made are weak and unsubstantiated. <i>The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</i> 0 marks No attempt to answer the question or response is not worthy of credit.		AO3: Evaluation • As there are millions of instructions, the use of pipelining will make more efficient use of processor • ...because it reduces/removes latency • ... the CPU is not idle while waiting for next instruction • Next instruction is fetched while current one is decoded/executed • ...more instructions executed per second • All parts of the processor can be used at any instance in time. • Pipelining efficiency reliant on programs (mostly) executing sequentially ... efficiency reduced by jump instructions requiring pipeline to be reset...cost/overhead to be accounted for.

5	(a)	1 mark each to max 2 - It is a graphical representation - By using objects/symbols - The problem is simplified - To make the problem easier to understand	2	Allow mapping of examples from graph for both marks e.g. - edges are used to represent routes - nodes represent planets - shows relative planet positions - shows costs between connected planets Do not accept abstraction, unless examples are abstracted visualizations from the given graph																																	
5	(b)	1 mark for final path A B E D F G H 1 mark for final distance 31 1 mark for each section in table <table><tr><th>Node</th><th>Distance travelled</th><th>Previous node</th><th>Marks</th></tr><tr><td>A</td><td>0</td><td>N/A / - / blank</td><td>1</td></tr><tr><td>B</td><td>10</td><td>A</td><td>1</td></tr><tr><td>C</td><td>15</td><td>B</td><td rowspan="2">1</td></tr><tr><td>D</td><td>16</td><td>E</td></tr><tr><td>E</td><td>11</td><td>B</td><td rowspan="2">1</td></tr><tr><td>F</td><td>21</td><td>D</td></tr><tr><td>G</td><td>28</td><td>F</td><td rowspan="2">1</td></tr><tr><td>H</td><td>31</td><td>G</td></tr></table>	Node	Distance travelled	Previous node	Marks	A	0	N/A / - / blank	1	B	10	A	1	C	15	B	1	D	16	E	E	11	B	1	F	21	D	G	28	F	1	H	31	G	7	Ignore additional rows and crossed out values. Candidate may show additional rows such as D, 17 from C that are calculated but do not overwrite the current shortest path.
Node	Distance travelled	Previous node	Marks																																		
A	0	N/A / - / blank	1																																		
B	10	A	1																																		
C	15	B	1																																		
D	16	E																																			
E	11	B	1																																		
F	21	D																																			
G	28	F	1																																		
H	31	G																																			

5	(c)		1 mark each to max 2 • Heuristic is an estimated cost of each distance • Heuristic is added to distance to identify least cost next step • It does not revisit routes already visited • It does not visit every single possibility... • ...as it focuses on nodes that are promising • It ignores some areas to speed up finding a solution	2	
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6	(a)		1 mark for feature 1 mark for expansion to max 6 e.g. • Breakpoints • Stops the program at set positions to check the flow/variable contents • Stepping/step through/into/over • Run the code one line at a time to check the flow/variable contents • Variable Watch window • View the variable/data structure contents as the program runs • Error diagnostics • To locate/report/give details about errors	6	The features must be relevant to debugging code. Allow other suitable examples e.g. highlighting syntax errors must be justified in terms of giving error diagnostics. Mark the row as a whole. A row may contain multiple identifications/expansions. Do not allow pretty printing or auto-complete
6	(b)	(i)	1 mark each to max 2 • Global variables are accessible throughout the program • Local variable only exist within the scope that they are declared in	2	Examples of specific scope may be given such as function, subroutine, procedure, module etc.

6	(b)	(ii)	1 mark each to max 2 • Global variable exists throughout the run-time of the program... • ...wastes memory • Makes it difficult to maintain... • ...as it's difficult to understand where variables are changed • Reduces integrity / accuracy of data... • ...as a change in one part can impact on another • Makes it difficult to test/test a single block... • ...as the whole code may need to be run to setup the global variables • Reduces modularity / joins modules... • ...therefore modules no longer standalone	2	First mark for identification and second mark for linked expansion
6	(b)	(iii)	1 mark each to max 2 • Data can only be accessed within the subroutine where it is declared... • ...you have to pass data as parameters • ...you have to handle return values • Programming can be more complex/time consuming... • ...you have to pass data as parameters • ...you have to handle return values	2	First mark for identification and second mark for linked expansion BP4 can be a valid expansion to BP1 and vice-versa.

6	(c)		1 mark each to max 2 • The function receives a copy of the variable • Changes are made to the copy • Changes don't overwrite the original value • The copy is deleted/no longer available when the function ends	2	
6	(d)		1 mark for each error line and correction. • Line 05 numbersFound = 0 • Line 06 for x = 0 to myArray.length - 1 • Line 08 for y = 0 to checked.length - 1 • Line 09 if Checked[y,0] == myArray[x] then • Line 14 if found == false then • Line 16 Checked[numbersFound,1] = 1 or Checked[numbersFound,1] += 1 • Line 19 next x	4	Allow equivalent logic for correction of line 14 e.g if found != true then

Question			Answer	Mark	Guidance
7	(a)		1 mark for 2 correctly inserted 2 marks for 4 correctly inserted 3 marks for all 5 correctly inserted	3	It must be clear whether a value is a left or right child of the parent i.e. do not accept vertical lines
7	(b)		1 mark each to max 2 e.g. • Takes longer to search for a value • Takes $O(n)$ steps in worst case compared to $O(\log n)$ for a balanced tree • More iterations are required / more depth levels to process	2	
7	(c)		1 mark for starting with correct value on each traversal (max 2) 1 mark for full correct traversal (max 2) Depth: <u>20</u> 80 75 35 220 450 602 600 402 100 Breadth: <u>100</u> 35 402 20 75 220 600 80 450 602	4	

Question			Answer	Mark	Guidance
8	(a)		1 mark each to max 3 • A start/head pointer pointing to the first node in the list • Each node contains a data item and a pointer to the next node • Data can only be accessed following the pointer to the next node • The last node has a null pointer to indicate the end of the list • It is a dynamic structure • Allows data to be prepended, appended or inserted at any position • Data accessed in the order they are located in the list • Data items cannot be directly accessed/indexed	3	Accept other valid features such as linked lists are mutable, a tail pointer can be used to keep track of the tail of the list, nodes can be deleted at any position in the list.
8	(b)	(i)	1 mark each to max 2 • Method header getNextNode with no parameters • Returns attribute nextNode e.g. <pre>function getNextNode() return nextNode endfunction</pre>	2	Allow coded solutions. Must return class attribute nextNode, do not allow an input or over-written value

8	(b)	(ii)	1 mark each to max 3 • Method header setValue • ...taking one parameter • Assigning parameter to attribute value e.g. <pre>procedure setValue(newValue) value = newValue endprocedure</pre>	3	Allow coded solutions
8	(c)	(i)	1 mark each • Constructor header taking no parameter • Assigning an appropriate null/none value to headNode e.g. <pre>procedure new() headNode = null endprocedure</pre>	2	Allow coded solutions Appropriate null values do not include integers – the list stores integers.

8	(c)	(ii)	1 mark for each completed statement to max 5 <pre> function outputList() returnValue = "" start = headNode while start != null returnValue = returnValue + start.getValue() + " " start = start.getNextNode() endwhile return returnValue endfunction </pre>	5	Exact answers only, do not accept incorrectly formed relational operators such as != Instead of != Accept <> instead of != Accept self.__headNode if Python has been used
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8	(d)	1 mark each to max 5 • Creation of new object of type linkedList assigned to a variable • Using insertNode to correctly insert each node... • ... with all 3 data values inserted in correct order • Calling outputList for the object ... • ...and outputting the return value e.g. <pre>createList = new linkedList() createList.insertNode(10) createList.insertNode(25) createList.insertNode(39) print(createList.outputList())</pre>	5	Allow <code>createList = linkedList()</code> for instantiation or other valid program syntax
8	(e)	1 mark each to max 5 • Description of accessing node at head pointer • ...and comparing to the parameter • If it is not equal, accessing node head pointer points to • Repeated steps until found or until end of list • When node to delete is found the pointer of previous node should be set to point at next node	5	For BP4 allow nodes traversed until item found/end of list

8	(f)	1 mark each e.g. • Problem recognition • Problem decomposition • Abstraction • Backtracking • Data mining • Heuristics • Performance modelling • Pipelining • Visualisation	3 Allow alternatives such as pattern matching; algorithmic thinking; automation; logical reasoning Allow thinking abstractly, thinking ahead, thinking procedurally, thinking logically, thinking concurrently. Allow OOP modelling techniques such as inheritance, polymorphism etc. Do not accept programming constructs such as sequence, selection and iteration.
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8	(g)	Mark Band 3 – High level (9-12 marks) The candidate demonstrates a thorough knowledge and understanding of OOP and arrays; the material is generally accurate and detailed. The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation. The candidate provides a thorough discussion which is well balanced. Evaluative comments are consistently relevant and well-considered. There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated. Mark Band 2 – Mid level (5-8 marks) The candidate demonstrates reasonable knowledge and understanding of OOP and arrays; the material is generally accurate but at times underdeveloped. The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed. Evidence/examples are for the most part implicitly relevant to the explanation.	12 Answers may include, but are not limited to, some of the points below: AO1: Knowledge • OOP allows any number of elements • ...new object created each time • ...do not need to declare number of elements • Array need to know number of elements • OOP can be reused in other programs for other lists without having to make significant changes • Array would need more changes for other programs such as size of array • Array needs a way to indicate which elements have been used and which are empty AO2: Application • OOP allow use of dynamic memory • ...can work for any number of elements • ...do not need to know before hand • Array has static memory allocation • ...need to know maximum number • ...memory wastage if not all used • ...can run out of memory • Array can be more complicated to assign new elements as use of free list is needed to identify/track where data can be stored
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		The candidate provides a reasonable discussion, the majority of which is focused. Evaluative comments are, for the most part appropriate, although one or two opportunities for development are missed. <i>There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence.</i> Mark Band 1 – Low Level (1-4 marks) The candidate demonstrates a basic knowledge of OOP and arrays with limited understanding shown; the material is basic and contains some inaccuracies. The candidates makes a limited attempt to apply acquired knowledge and understanding to the context provided. The candidate provides a limited discussion which is narrow in focus. Judgements if made are weak and unsubstantiated. <i>The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</i> 0 marks No attempt to answer the question or response is not worthy of credit.		AO3: Evaluation • Allow either approach as long as justified E.g. OOP is more appropriate because a linked list would only need to be created once as a class and can then be used in other programs with small adaptations. It is a more efficient use of memory because a node is created when needed and deleted when not needed so space in memory does not need to be reserved.
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