Mark Scheme (Results)

June 2019

Pearson BTEC Level 3 - Computing

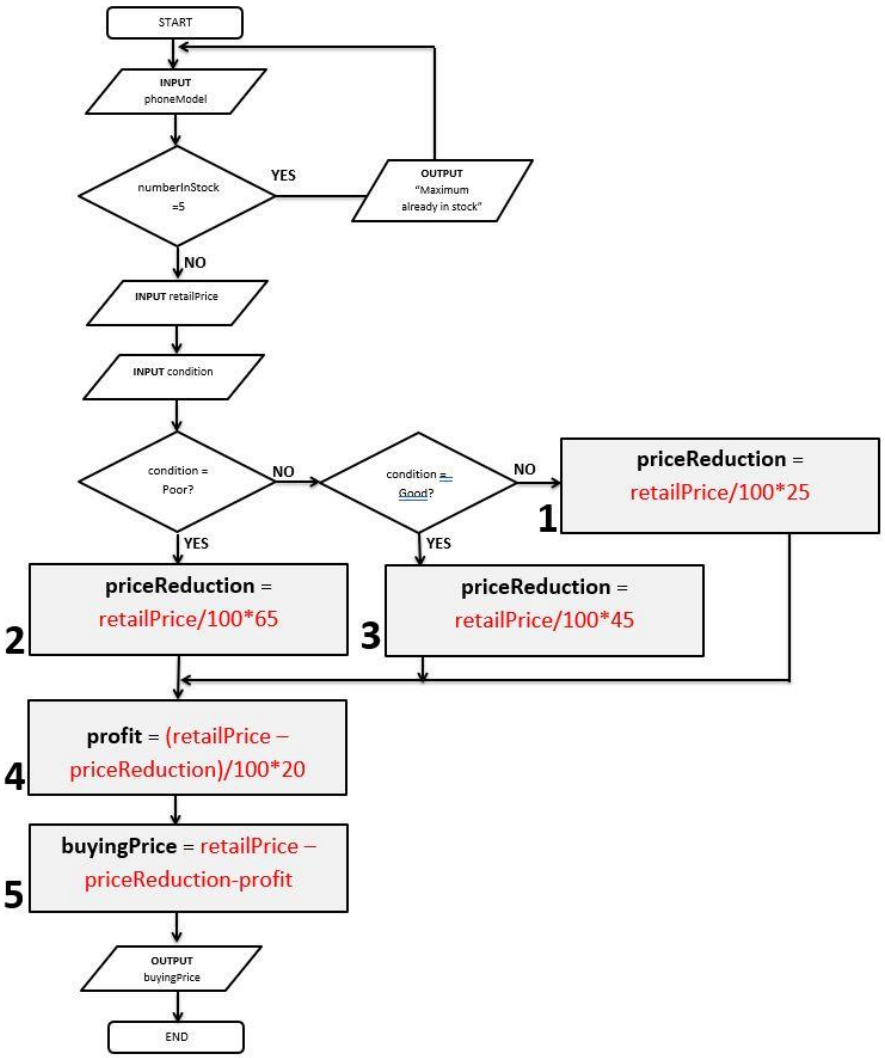
Unit 1: Principles of Computer Science (31768H)

Question Number	Answer	Mark
1a	Any **three** from: • So that problems can be broken down • Makes the problem easier to solve/understand • Identify individual steps/parts/processes • Recognise patterns / see where code can be reused • To split the different tasks between different programmers • Plan time more effectively • Understand the size of the task • Makes the task more manageable • Help communicate the problem to others **Additional guidance** Do not accept 'simplifies the problem'.	3

Question Number	Answer	Mark
1b	Award **one** mark for identification and **one** additional mark for appropriate expansion up to 2 marks. Starts a (specific) block of code/process (1) based on a user action / criteria (1) **Additional guidance** Allow examples of user action	2

Question Number	Answer	Mark
1c		5

SOLUTION:



	One mark for each of the following up to a maximum of 5 marks: • **Process Symbol 1** - retailPrice/100*25 • **Process Symbol 2** - retailPrice/100*65 • **Process Symbol 3** - retailPrice/100*45 • **Process Symbol 4** - (retailPrice – priceReduction)/100*20 • **Process Symbol 5** - retailPrice –priceReduction-profit OR retailprice –(price reductions+profit **Additional guidance** For Process symbols 1, 2 and 3, award 1 mark for follow through if the learner has repeated the same incorrect formula. Accept Process symbols 1, 2 and 3 with or without brackets e.g. (retailPrice/100)*25. Process symbol 4 must have brackets. Alternative response for Process symbol 5 must have brackets. Accept any logically correct calculations that will produce the correct answer	5

Question Number	Answer	Mark
1d	Award **one** mark for each of: • testing the variable phoneCondition • checks that data entered matches one of the three options (poor, good, excellent) • correctly printing "Accepted" for valid data • correctly printing "Error" for invalid data **Additional Guidance** Allow different syntax/solutions if response is logically correct and would result in correct outcomes Accept any recognised variations of phoneCondition.	4

Question Number	Answer	Mark
1e	An explanation to contain any **three** from: • FOR loop fixed number of times • the number iterations is unknown (1) • the phoneModel must be checked at least once (1) • the loop should not exit until the condition is true (1) • a FOR loop (may)repeatedly ask even after valid data is entered • avoid passing an invalid value to another part of the program (1)	3

Question Number	Answer	Mark
1f	Any **three** from: • To automate the process / no need for user interaction (1) • To run in the background /**the system** runs multiple tasks at the same time (1) • To listen for a request (1) • To allow different **processes** to communicate (1) • To allow different **programs** to communicate (1) • To improve data integrity (1) • To improve efficiency (1) **Additional guidance** For mark points 4 and 5, allow "linked" for communicate	3

Question Number	Answer	Mark
2a	**SOLUTION:** First name:Ruhail_Surname:Rauf_Reason:Beh One mark for each of the following: • Concatenating the First name label with the associated data (First name:Ruhail) • Concatenating the Surname label with the associated data (_Surname:Rauf) • Concatenating the Score label with the associated **truncated** data (_Reason:Beh) / (_Reason:Beha)	3

Question Number	Answer	Mark
2b	A description to award any **one** from up to a maximum of four marks: • it uses a FOR loop (1) • the loop iterates over the same small amount of code (1) • (figure 2a) would load fewer lines of code into memory (1) • the number of lines of code (in 2a) is constant irrespective of the number of students (1) • figure 2b places the code in a function (1) • function has to be called separately each time it's used (1) **Additional guidance** Allow reverse arguments that describe why figure 2b is less efficient	4

Question Number	Answer	Mark
2c	An explanation to contain any **four** from: • Last In First Out (LIFO) / First In Last Out (FILO)(1) • data added to the top of the stack (1) • most recent test score will be at the top of the stack (1) • don't have to search for the most recent test score (1) • can output/pop/peek the value on top of the stack (1)	4

Question Number	Answer	Mark
2d	Award **one** mark for identification and **one** additional mark for appropriate expansion up to 2 marks. • A list can be sorted (1) however a set may not maintain the order of values (1) • The same test score may appear several times (1) however a set does not allow duplicate values to be stored (1) • Lists are dynamic (1) whereas sets will remain static (1) • Calculations are more appropriate in a list (1) because the set would require an additional action before calculations could be carried out (1)	4

Question Number	Answer	Mark
2e	One mark for each of the following up to a maximum of 3 marks: • 38 • 55 • 62 **Additional Guidance** - Marks should be awarded for correctly identifying the middle boundaries. Therefore, if the previous boundary is incorrect (e.g. 38) but the candidate has followed through and applied their error correctly on the next middle boundary then marks should be awarded.	3

Question Number	Answer	Mark
2f	**Indicative content:** • An **equals operator** is used to set the position of the lower boundary as 0 (low = 0). • An **equals operator** is used to set the position of the high boundary to the length of the array (high = studentarray.Length) • An **equals operator** is used to set the middle boundary as 0 which is then adapted to the middle of the array by **subtracting** the low position from the high positon and then **dividing** this by 2. • **Equals** is used to compare the search value to the middle boundary. If not a **less than operator** is then used to determine if the search value is lower than the middle boundary. • If yes an **equals operator** is used to set the new high boundary to position 1 **less** than the current middle boundary. • If no an **equals operator** is used to set the new high boundary to position 1 **above** than the current middle boundary.	6

Level	Mark	Description
0	0	
1	1-2	Demonstrates isolated knowledge and understanding, there will be major gaps or omissions Breaks the situation down into component parts and a few of the points made will be relevant to the context in the question Limited analysis which contains generic assertions rather than interrelationships or linkages
2	3-4	Demonstrates some accurate knowledge and understanding, with few minor omissions/any gaps or omissions are minor Breaks the situation down into component parts and some of the points made will be relevant to the context in the question Displays a partially developed analysis which considers some interrelationships or linkages but not always sustained.
3	5-6	Demonstrates mostly accurate and thorough/detailed knowledge and understanding Breaks the situation down into component parts and most of the points made will be relevant to the context in the question Displays a well-developed and logical analysis which clearly considers interrelationships or linkages in a sustained manner

Question Number	**Answer**	**Mark**
3a	**Example Responses:** **Input:** • An input function has been used to allow the user to enter the customer surname (requirement 1), the number of walls that needs to be painted (requirement 2) and the height and width of each wall (requirement 3). **Range:** • Range has been used ineffectively within the FOR loop. The FOR loop should repeat the code and ask the user for the height and width of each wall that needs painting (requirement 3). However as the range starts at 1 and not 0, this will mean that the measurements for 1 wall will be missed. **Length:** • The length function has been used to count the number of characters in the	8

	customer surname. This this allows it to be used in a while loop to ensure the surname length is no 0 (requirement 1). • Although used on the customer surname, this could also have been used for all user inputs (e.g. height and width) otherwise the program will not be able to carry out accurate calculations. • More appropriate methods could have been used to determine presence of the customer surname such as a Boolean check. **Integer to String Conversion** • The user input will automatically be stored as a string data type. In order to calculate the number of square feet (height x width) (requirement 4) the data entered needs to be converted to an integer. • Madison has created the program code to accept inputs from the user and store them as a variable and then convert them to integers separately. A more efficient way to do this would be to convert the input to an integer and then save them as a variable to reduce the amount of code needed. **String to Integer Conversion / Printing:** • In order to output the number of litres required and how many of each tin is required these integers are converted into strings so that they can be concatenated with labels. • Print is then used to print the concatenated statements onto the screen (requirement 9). For example the total number of litres required is printed followed by the amount of each tin.	

Level	Mark	Description
0	0	
1	1-3	Demonstrates isolated knowledge and understanding, there will be major gaps or omissions Breaks the situation down into component parts and a few of the points made will be relevant to the context in the question Limited analysis which contains generic assertions rather than interrelationships or linkages
2	4-6	Demonstrates some accurate knowledge and understanding, with few minor omissions/any gaps or omissions are minor

		Breaks the situation down into component parts and some of the points made will be relevant to the context in the question Displays a partially developed analysis which considers some interrelationships or linkages but not always sustained.
3	7-8	Demonstrates mostly accurate and thorough/detailed knowledge and understanding Breaks the situation down into component parts and most of the points made will be relevant to the context in the question Displays a well-developed and logical analysis which clearly considers interrelationships or linkages in a sustained manner

Question Number	Answer	Mark
3b	**Indicative content:** • Madison needs the program code to calculate how many litres of paint a customer will need. This is calculated on lines 20-22, however this variable is then used in the function as a global variable to calculate how many of each paint tin is required. In order to achieve this, the value in the variable is reduced. • When the variable is printed on line 42 the value shown is incorrect as the value will always be 0 or a negative value. If the value had been printed when it was calculated, then an accurate value would have been printed. • The program code also defines a function on line 26. The use of a global variable within the function will therefore make testing more problematic. • Madison will need run the entire code to test the function as the code will need to setup the global variable that the function expects to see before it can be tested. • If Madison wants to expand her program code in the future, the use of global variables makes this difficult because it's harder to see where the variables are being updated which increases the chances of errors being made.	6

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0	0	
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2	3-4	Demonstrates some accurate knowledge and understanding, with few minor omissions/any gaps or omissions are minor Breaks the situation down into component parts and some of the points made will be relevant to the context in the question Displays a partially developed analysis which considers some interrelationships or linkages but not always sustained.

3	5-6	Demonstrates mostly accurate and thorough/detailed knowledge and understanding Breaks the situation down into component parts and most of the points made will be relevant to the context in the question Displays a well-developed and logical analysis which clearly considers interrelationships or linkages in a sustained manner

Question Number	Answer	Mark
3c	**Indicative content** • The litresRequired variable is calculated in two parts. The first part will take the totalSquareFeet (**e.g. 126**) that has been calculated in the previous block and then divide this value by 10 (**e.g. 126/10=12.6**). • When dividing, there will often have a remainder (**e.g. 0.6**). Therefore the // operator has been used to round this value down to the nearest whole number (**e.g. 12**). However, this could mean that the litresRequired that is calculated is not enough to cover the job (**e.g. the paint will be short by 0.6 litres**). • Madison requires the litresRequired to always be rounded up. Therefore, she has made use of the modulo operator to divide the totalSquareFeet divided by 10 to see if there is a remainder (**e.g. 0.6**). If so 1 is added onto the litresRequired (**e.g. 12+1 = 13**). This will ensure there is enough paint to cover the job. • Therefore, if there is no remainder the litresRequired will stay the same. However, if there is a remainder then 1 is added onto the value.	6

Level	Mark	Description
0	0	
1	1-2	Demonstrates isolated knowledge and understanding, there will be major gaps or omissions Breaks the situation down into component parts and a few of the points made will be relevant to the context in the question Limited analysis which contains generic assertions rather than interrelationships or linkages

2	3-4	Demonstrates some accurate knowledge and understanding, with few minor omissions/any gaps or omissions are minor Breaks the situation down into component parts and some of the points made will be relevant to the context in the question Displays a partially developed analysis which considers some interrelationships or linkages but not always sustained.
3	5-6	Demonstrates mostly accurate and thorough/detailed knowledge and understanding Breaks the situation down into component parts and most of the points made will be relevant to the context in the question Displays a well-developed and logical analysis which clearly considers interrelationships or linkages in a sustained manner

Question Number	Answer	Mark
4a	A description to contain any **four** from: • use validation • check data entered meets set criteria • provide meaningful error messages • provide meaningful prompts • provide GUI features (e.g. dropdown, radio buttons) **Additional guidance** Accept examples of validation checks for mark point 1. Accept examples of criteria for mark point 2 such as 'value is between 1 and 4'.	4

Question Number	Answer	Mark

4b	**Example Solution:**
	
	count = 0
	
	INPUT name
	INPUT day
	FOR each element in day **THEN**
	count = count +1
	ENDFOR
	IF count >= 4 **THEN**
	PRINT "No spaces left"
	ELSE:
	IF vetRegistered = "Yes" **THEN**
	IF updatedVaccinations = "Yes" **THEN**
	IF dogBehaviour =< 3 **THEN**
		10

```
                day.append (name)
                booking = TRUE
                PRINT "Booking successful"
            ELSE:
                PRINT "Dog behaviour too high"
            ENDIF
        ELSE:
            PRINT "Vaccinations not up-to-date"
        ENDIF
    ELSE:
        PRINT "Dog not vet registered"
    ENDIF
ENDIF
END
```

Level	Mark	Descriptor
Level 0	0	No rewardable material.
1	1-3	Structure of the algorithm uses some appropriate hierarchies/subdivision but clarity and/or readability is limited. Variable/object/process names are inappropriate and/or inconsistent Use of logical operations and sequence/structure of processes demonstrate limited accuracy. There is limited use of accepted conventions A partial and/or highly inefficient solution has been achieved.
2	4-7	Structure of the algorithm uses mostly appropriate hierarchies/subdivision to provide some clarity and readability. Variable/object/process names are mostly appropriate but there is some inconsistency Use of logical operations and sequences/structure are mostly accurate with only minor errors. Accepted conventions have been applied but there are some inconsistencies. An almost complete/inefficient solution has been achieved.
3	8-10	Structure of the algorithm uses appropriate and consistent hierarchies/subdivision providing clarity and readability. Variable/object/process names are appropriate and used consistently Use of logical operations and sequences/structures are accurate throughout. Accepted conventions have been used consistently A full and efficient solution been achieved.

Question Number	Answer	Mark
4c	**Indicative content** • Callum could use the (long) time and date and concatenate them together into a single string/field. This is a very simple method with a minimal amount of code and cannot be repeated. However, it could potentially create a long ID which could lead to errors when being entered again in the future. It would also be more difficult to validate. It may also appear unprofessional to the customer. • Callum could use a count occurrences search that will count the number of dogs / records / lines that are currently stored. Then the program code could add an extra 1 to create a unique value. This will create a shorter ID which will be easier to remember for the customer / reduce errors / will be easier to validate when entering it again in the future. However, if dogs are removed from the program at a later date then there is a chance that the same ID could be generated again and therefore another additional check would be needed. • Callum could use a random built-in function that will automatically generate a random number. He could then use a linear search to search all previous ID numbers to check if the new random number already exists. If not then this can be used as the new ID. Again this will generate a smaller number that is easy to remember / input and validate when it's input. However, as the business expands the linear search may perform slower as it will have to check more values. • Callum could store a set of unique values in a text file that are generated and stored when the code is developed. Then	12

	when new dog details are entered the code can pull a unique value from the text file and then append the text file to remove the ID number so that it cannot be used again. • Callum could import code from a code library. Another developer may have already have generated code that will generate unique values that Callum can use. This will therefore save development time but Callum would still need to ensure it is secure and works with the rest of his code. **ADDITIONAL GUIDANCE:** • Allow specific language specific terminology. For example rand () used in C++ or random () / import random used in python.	

Level	Mark	Descriptor
Level 0	0	No rewardable material.
1	1-4	Demonstrates isolated elements of knowledge and understanding, there will be major gaps or omissions Few of the points made will be relevant to the context in the question. Limited discussion which contains generic assertions rather than considering different aspects and the relationship between them.
2	5-8	Demonstrates some accurate knowledge and understanding, with only minor gaps or omissions Some of the points made will be relevant to the context in the question, but the link will not always be clear Displays a partially developed discussion which considers some different aspects and some consideration of how they interrelate, but not always in a sustained way.
3	9-12	Demonstrates mostly accurate and detailed knowledge and understanding Most of the points made will be relevant to the context in the question, and there will be clear links. Displays a well-developed and logical discussion which clearly considers a range of different aspects and considers how they interrelate, in a sustained way.

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