L3 Lead Examiner Report 1806

Summer 2018

Level 3 National in Computing

Unit 1: Principles of Computer Science (31768H)

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Grade Boundaries

What is a grade boundary?
A grade boundary is where we set the level of achievement required to obtain a certain grade for the externally assessed unit. We set grade boundaries for each grade, Distinction, Merit and Pass.

Setting grade boundaries
When we set grade boundaries, we look at the performance of every learner who took the external assessment. When we can see the full picture of performance, our experts are then able to decide where best to place the grade boundaries – this means that they decide what the lowest possible mark should be for a particular grade.

When our experts set the grade boundaries, they make sure that learners receive grades which reflect their ability. Awarding grade boundaries is conducted to ensure learners achieve the grade they deserve to achieve, irrespective of variation in the external assessment.

Variations in external assessments
Each external assessment we set asks different questions and may assess different parts of the unit content outlined in the specification. It would be unfair to learners if we set the same grade boundaries for each test, because then it would not take into account that a test might be slightly easier or more difficult than any other.

Grade boundaries for this, and all other papers, are on the website via this link:
http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

Unit 1: Principles of Computer Science (31768H)

Grade	Unclassified		Level 3		
		U	P	M	D
Boundary Mark	0	14	24	38	53

Introduction

This was the third examination season for Level 3 BTEC Computing Unit 1 Principles of Computer Science 31768. It was pleasing to see that the number of entries has more than doubled for this exam season.

This unit is assessed through a single written examination which is two hours in length and the number of marks available is 90.

This unit is a mandatory unit for all learners studying the extended certificate, foundation diploma, all diplomas and the extended diploma.

The examination for this unit will always contain four sections and each section will have a scenario that will be used throughout the whole of that section. The scenario will be clearly stated at the beginning of each section.

Each section is broken down into sub-questions which will then test learners on different areas of the specification and learners should be expected to apply their knowledge to the scenario.

Learners will be given an information booklet. They will be instructed to look at individual parts / sections of this during the examination in order to answer questions. The information booklet **may** give learners:

1. Information about problems that they need to solve.
2. Programming code for them to interpret, analyse or evaluate.
3. Requirements or designs for a new program that is needed.
4. An algorithm for them to interpret, analyse or evaluate.

At no point during the examination will learners be expected to write code in a particular language. Learners will only be given small pieces code to interpret, analyse or evaluate. Any code given to learners in the examination or information booklet will be written in C Family, Visual Basic, Python 3.4 or HTML 5.

All sections of the examination paper provide differentiation at all attainment levels and the paper is designed to be ramped in difficulty so that a larger percentage of higher grade marks are allocated to the later stages of the paper.

Introduction to the Overall Performance of the Unit

The overall performance of learners has increased since the last examination season for this unit. The average mark per candidate has risen which shows that centres are better preparing learners for the rigor of this exam. However, there is still evidence to suggest that there are still a lot of learners who are not fully prepared to take this examination. It is worth noting that the recommended Guided Learning Hours (GLH) for this unit is 120. It is recommended that centres ensure that this amount of time is used to ensure that learners are equipped with the knowledge to allow them to answer a range of different questions covering the whole specification.

While some questions performed poorly, on the whole the performance on the shorter response questions has improved with many learners picking up some marks on each short answer question. The performance on the extended questions has also improved with the average score per learner increasing in comparison to the previous exam season. However a lot of learners are still struggling to understand the demands of the higher order command words such as discuss, analyse and evaluate. Learners were not able to meet the demands of these higher order command verbs which resulted in many learners achieving lower marks on the extended questions.

It was also pleasing to see that the average mark for the algorithm question has increased since the previous exam seasons. It was obvious that learners have had practice at constructing algorithms and the logic and structure of the algorithms has improved. However, learners generally tended to meet the simpler requirements given and not the more complex ones.

Common Misconceptions:
Below is a list of common misconceptions that lots of learners have and it is therefore advised that learners address these misconceptions during their exam preparation. These should also be read in conjunction with those stated in previous lead examiner reports for this unit.

- Many learners seemed to get confused between processes and outputs which therefore led students to stating outputs when the question demanded processes to be given.
- While learners generally had good knowledge of while loops, many learners thought that a FOR loop would only repeat once rather than it repeating a set number of times.
- Many learners thought that an array index started at 1 rather than starting at 0. This therefore led learners to picking out incorrect data from a given array.
- Many learners incorrectly thought that truncation rounds values up or down instead of truncation being a function that removes characters from a string.

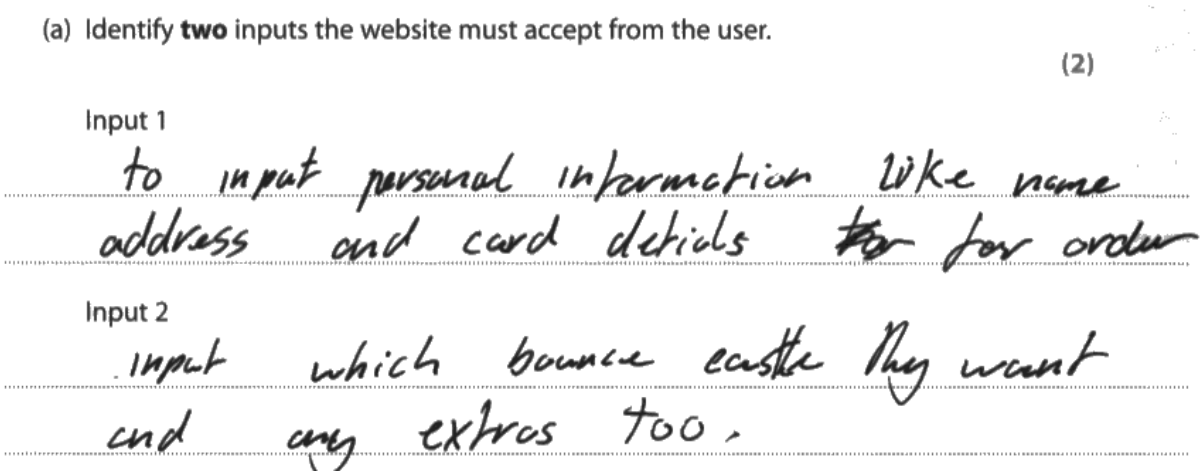
Individual Questions

The following section considers each question on the paper, providing examples of learner responses and a brief commentary of why the responses gained the marks they did. This section should be considered with the live external assessment and corresponding mark scheme.

Question 1a (2 Marks)

The majority of learners gained 2 marks. Most learners were able to use the requirements given within the information booklet to identify the inputs. Some learners did state other possible inputs such as 'payment details' however these could not be given credit because they were not part of the website requirements stated in the information booklet.

Example response 1:



(a) Identify **two** inputs the website must accept from the user.

(2)

Input 1

to input personal information like name address and card details ~~for~~ for order

Input 2

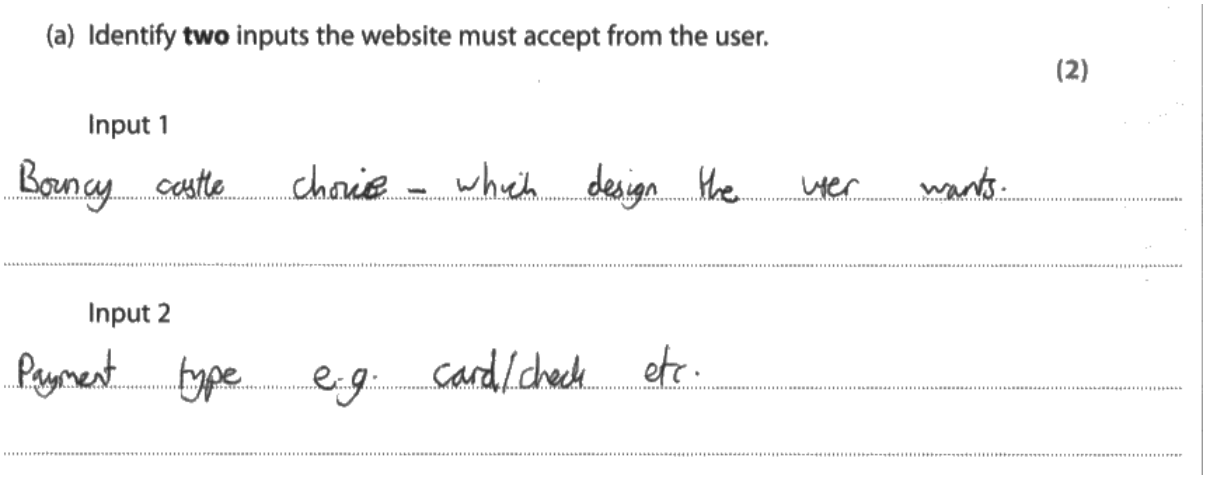
input which bounce castle they want and any extras too.

2 marks awarded for:

- 'which bounce castle they want' (1) - there is enough understanding here that the customer has to select from different types / designs
- 'any additional extras too' (1)

Examiners are reminded to look for answers holistically across the whole of the question. The inputs given under 'input 1' are incorrect, however the learner has stated two inputs under 'input 2' and therefore can be given full marks.

Example response 2:


(a) Identify **two** inputs the website must accept from the user.

(2)

Input 1

Bouncy castle choice - which design the user wants.

Input 2

Payment type e.g. card/check etc.

1 mark awarded for:

- 'which design the user wants' (1)

'payment type e.g. card / check etc.' - although this is a possibility, this is not stated in the requirements given in figure 1a of the information booklet.

Question 1b

This question performed reasonably well with many candidates gaining 2 marks. The question required learners to state two processes the website code would perform. Some candidates stated inputs and outputs rather than processes. Some learners also lost marks for giving generic answers such as ‘calculating’ and ‘searching’ without providing specific examples.

Common Misconception: Many learners seemed to get confused between the difference between a process and an output. This therefore led students to stating outputs when the question demanded processes to be given.

Example response 1:

(b) Identify **two** processes the website code should perform.

(2)

Process 1

Filtering the availability of bouncy castles by date

Process 2

Calculate subtotal of bouncy castle and any extras.

2 marks awarded for:

- 'filtering the availability of bouncy castles by date' (1) - the learner has shown understanding that the only available bouncy castles are shown.
- 'calculate subtotal' (1)

Example response 2:

(b) Identify **two** processes the website code should perform.

(2)

Process 1

Calculate the total cost for the event

Process 2

display cost to the user

1 mark awarded for:

- 'calculate the total cost for the event' (1)

'display cost to the user' - this answer cannot be given credit because its an output and not a process carried out by the code.

Question 1c

Many learners managed to score at least 1 mark on this question. The question required learners to look at the algorithm given in the exam paper and then to describe how the algorithm could be made more readable. Many candidates stated vague and generic answers such as 'make it easier to read' and 'make it clearer' however did not state specific ways in which it could be made more readable.

Example response 1:

(c) Describe how Arnold could improve the readability of this algorithm.

(3)

Arnold could indent the code under the elements of the while/ IF statements. This would make it easier to read as you can see what sections the code belongs to.
Comments should also be added to the pseudocode describing what the code is doing and is there for. This makes it easier to read and understand making it easier to maintain for the programmers.

3 marks awarded for:

- 'indent the code' (1)
- 'under the elements of the while/if statement (1)
- to make it easier to read as you can see what sections the code belongs to (1) the learner has shown understanding that by using indentation, it's easier to see which statements belong to which iterative / selection condition.

Example response 2:

(c) Describe how Arnold could improve the readability of this algorithm.

(3)

Arnold can indent his code in pseudocode to make the code much more clear to read ~~(unclear)~~. While it ~~(unclear)~~ isn't important or essential to indent in pseudocode; it makes the code easier to understand.

1 mark awarded for:

- 'Arnold could indent his code' (1)

'to make the code more easier to read' - This answer is too vague to be given credit. Learners need to expand their answers with how it makes the code more readable / easier to read.

Question 1d

This question was answered reasonably well with many candidates gaining at least two marks. The question required learners to explain why a WHILE loop would have been used instead of a FOR loop. Most learners gained marks for stating that a WHILE loop will repeat until a condition is met and that a FOR loop will repeat a set number of times. However few learners were able to take this further and explain why the WHILE loop is used when accepting data input.

Common Misconception: While learners generally had good knowledge of WHILE loops, many learners thought that a FOR loop would only repeat once rather than it repeating a set number of times.

Example response 1:

(d) Explain why Arnold has used a **WHILE** loop instead of a **FOR** loop in his algorithm.

(3)

A while loop has been used to ensure that the algorithm will continue to cycle until valid entries have been made. A for loop would operate for a set amount. Each time data is entered, a different number of attempts may occur each time - making while more suited

3 marks awarded for:

- 'a while loop has been used to ensure that the algorithm will continue to cycle until valid entries have been made' (1) - learner has shown understanding that a WHILE loop will ensure the program will not continue until the required data is entered.
- 'a for loop would operate for a set amount' (1) - learner has shown understanding that the number of iterations is stated within a for loop.
- 'each time data is entered, a different number of attempts may occur (1) - the learner has shown understanding that the number of attempts different customers may need is unknown.

Example response 2:

(d) Explain why Arnold has used a **WHILE** loop instead of a **FOR** loop in his algorithm.

(3)

Arnold has used a WHILE loop instead of a FOR loop because a WHILE loop will continually look through the code until a value is found whereas a FOR loop will only loop through a limited number of times.

2 marks awarded for:

- 'a for loop will loop through a limited number of times' (1) - the learner has shown understanding that the number of iterations is stated with a for loop.
- 'a while loop will continually look through the code until a value is found' (1) Just enough here to show understanding that the WHILE loop will continually keep checking the data input.

Question 1e

This question was generally answered poorly. The question required learners to state a protocol that would be used and then give an explanation as to why this would be used. Some learners were able to state the correct HTTPS protocol and a lot of learners had understanding that this made the data transfer more secure due to encryption. Most learners had an understanding that data needed to be made secure however were not able to describe how the HTTPS protocol did this. Some learners gave generic reasons why the data needed to be made secure such as the requirements by law.

Example response 1:

(e) Arnold is going to use the orders page to receive payment details.

State the protocol Arnold should use and explain why this is needed.

(4)

Protocol

Secure socket layer (SSL)

Explanation

SSL is needed to verify that Arnold's website is legitimate. SSL is also necessary to use encryption and encrypting payment transaction details is almost essential. A letter could be sent to Arnold's address for him to sign to verify him.

3 marks awarded for:

- 'Secure socket layer' (1)
- 'verify that Arnolds website is legitimate' (1) - the learner has shown understanding that the business have to prove their identity (1)
- 'use encryption' (1) - the learner has shown understanding that encryption is used.

Example response 2:

(e) Arnold is going to use the orders page to receive payment details.

State the protocol Arnold should use and explain why this is needed.

(4)

Protocol

~~SHTTP~~ HTTP

Explanation

This type of protocol will make sure the data will be transferred securly using ~~esing~~ cryptography, this will keep user data secure and will not allow the data to be lost.

2 marks awarded for:

- 'data will be transferred securely' (1) - the learner has shown understanding that the security will be increased.
- 'using cryptography' (1) - the learner has shown understanding that encryption is used.

'HTTP' is inaccurate as learners must state HTTPS. Examiners are reminded that credit should still be given for the explanation, even though the initial point / protocol is not stated correctly or missing.

Question 1f

This question was answered exceptionally well with many candidates gaining between three and four marks. A lot of learners also gained full marks on this question. The question required learners to look at the website formatting requirements stated within the information booklet and then identify two lines of the HTML code that did not meet these formatting requirements. Most learners were able to state the correct lines of code and then expand this with at least 1 point that stated the problem. It was also pleasing to see that many candidates managed to rewrite the lines of code correctly using the correct tags.

Example response 1:

Figure 1c shows the HTML code for the page.

Identify **two** lines of the code that do not meet the formatting requirements and describe how the code can be corrected.

(6)

ONE

Line number

14

Correction

Can be corrected by using the key word in HTML, this would make it emphasised rather than saying "slide castle" in a normal text format way.

TWO

Line number

19

Correction

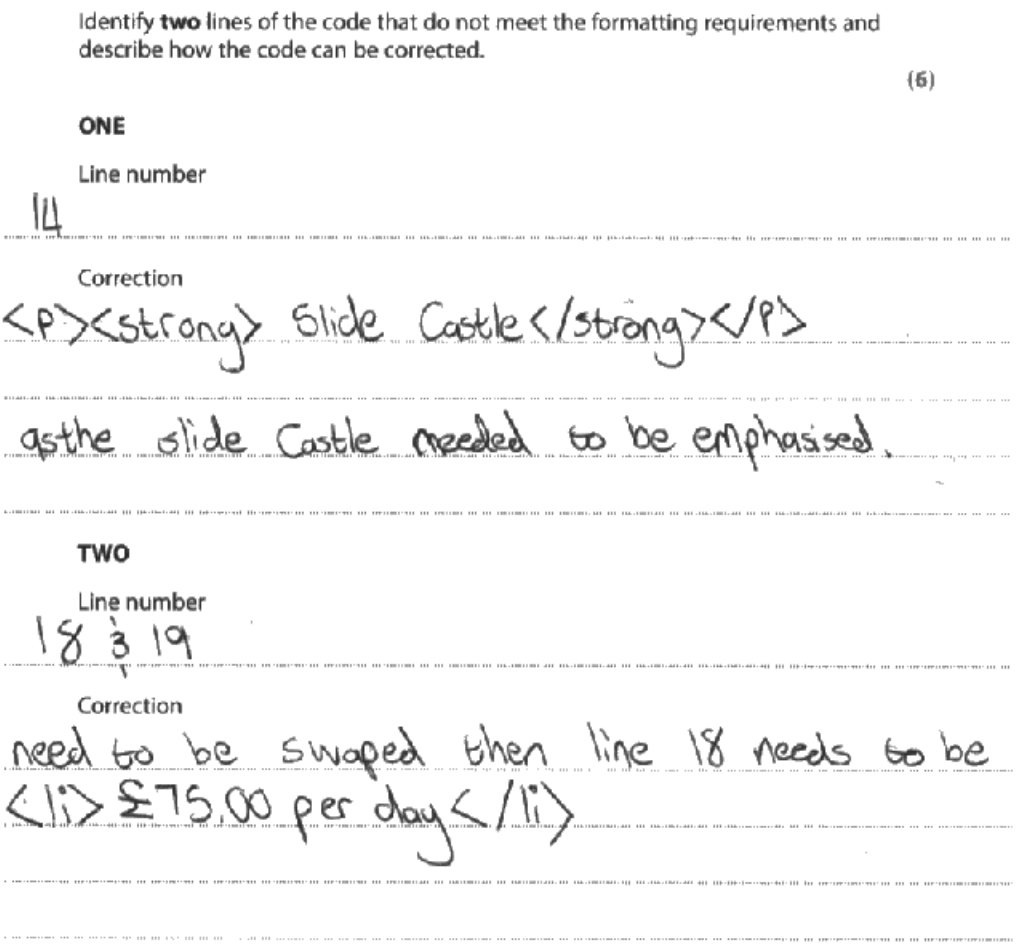
Can be corrected by putting it into the list above using <li> at the start and keeping it in the <UL> block, due to the line being out of this block it's just stated in a paragraph where as it should be bullet pointed with the other two statements.

(Total for Question 1 = 20 marks)

6 marks awarded for:

- 14 (1)
- 'can be corrected by using the word is HTML' (1) - learner has shown understanding that the strong tag is missing.
- 'This would make it emphasised' (1) - the learner has shown understanding that the strong tag will make the text emphasised.
- 19 (1)
- 'can be corrected by putting it into the list above using ' (1) - the learner has shown understanding that the list tag is missing.
- 'should be bullet pointed with the other two statements' (1) - the learner has shown understanding that the list tag will create bullet points.

Example response 2:



Identify **two** lines of the code that do not meet the formatting requirements and describe how the code can be corrected.

(6)

ONE

Line number

14

Correction

 Slide Castle

asthe slide Castle needed to be emphasised.

TWO

Line number

18 & 19

Correction

need to be swaped then line 18 needs to be £75.00 per day

5 marks awarded for:

- 14 (1)
- Slide Castle (1) - the learner has corrected the code
- 'as the slide castle needed to be emphasised' (1) - the learner has shown understanding that the text is not emphasised.
- 18 and 19(1)
- £75.00 per day (1) - the learner has corrected the code.

Question 2a

This question was answered reasonably well with many candidates gaining at least one mark. Many learners managed to gain a mark for stating '17' as the output for the first print statement. However, few learners scored a second mark for stating '15' for the second print statement.

Common Misconception: Many learners incorrectly stated the outputs 10 and 20. This is because when learners worked out their answer to this question, they started the array index at 1 rather than the array index starting at 0.

Example response 1:

(a) Martha uses an array to store the temperatures. The array is shown here.

10	12	12	11	9	11	11
16	17	17	13	14	16	13
12	15	16	13	15	15	14
19	20	18	17	15	13	15

Identify the output from the array if these print statements are used:

(2)

print(item[1][1])

17

print(item[2][4])

15

2 marks awarded for:

- 17 (1)
- 15 (1)

Example response 2:

(a) Martha uses an array to store the temperatures. The array is shown here.

10	12	12	11	9	11	11
16	17	17	13	14	16	13
12	15	16	13	15	15	14
19	20	18	17	15	13	15

Identify the output from the array if these print statements are used:

(2)

print(item[1][1])

10

print(item[2][4])

20

0 marks awarded.

Question 2b

This question was very poorly answered by most candidates. Candidates were required to two describe two features that would be specified when writing a function. It was clear that some candidates knew what a function was and the benefits of using functions, however very few candidates knew what would be specified when writing a function. Many candidates gave generic reasons why programmers use functions.

Example response 1:

(b) Martha will use functions in her program.

Describe **two** features that may be specified when writing a function.

(4)

Feature 1

The name of the function would be needed to use the function in the code. This name should be stated in the code.

Feature 2

The functions ~~would~~ code would need to be specified. This would mean ~~spec~~ Specifing the code that will be in the function.

3 marks awarded for:

- 'the name of the function' (1) - the learner has shown understanding that the function name is defined.
- 'would be needed to use the function in the code' (1) - the learner has shown understanding that the name can be used to use/call the function later in the code
- 'function code would need to be specified' (1) - the learner has shown understanding that the function code/body is defined.

'this would mean specifying the code that will be in the function' this is a repeat of the point above.

Example response 2:

(b) Martha will use functions in her program.

Describe **two** features that may be specified when writing a function.

(4)

Feature 1

global variables - a variable that is used throughout the code.

Feature 2

A title for the function so you can move to and from each function as you please.

2 marks awarded for:

- 'title for the function' (1) the learner has shown understanding that the function name is defined when writing a function.
- 'so you can move to and from the function as you please' (1) just enough for the learner to show understanding that the function can be called.

Question 2c

This question was answered reasonably well with many candidates gaining at least two marks. The question required learners to explain why a count occurrences algorithm has been used and not a linear search algorithm. Most candidates gained a mark for stating that the count occurrences algorithm would count the total amount of times that 13 appeared in the array and that a linear search algorithm would stop when it found the first occurrence. However, few candidates were able to take this further and link this to the scenario or why this met the programmer's needs.

Example response 1:

(c) Martha would like to know how many days in the month had a temperature of 13 degrees.

Explain why Martha would use a count occurrences algorithm and not a linear search.

(4)

Because the linear search would only look for the number once and once found it will not look again. Where as with the count occurrence algorithm it will take all 28 days in a month and total up the amount of 13's it finds to give you the correct answer.

4 marks awarded for:

- 'linear search will only look for number once and once found it will not look again' (1) - the learner has shown understanding that a linear search will stop searching after finding the first occurrence.
- 'count occurrences will take all 28 days in a month' (1) - the learner has shown understanding that all of the numbers will be examined.
- 'and total the amount of 13's its finds' (1) - the learner has shown understanding that a count occurrences search will count how many times 13 exists.
- 'give you the correct answer' (1) - the learner has shown understanding that a count occurrences will output the correct value.

Example response 2:

(c) Martha would like to know how many days in the month had a temperature of 13 degrees.

Explain why Martha would use a count occurrences algorithm and not a linear search.

(4)

Because a [redacted] Count occurences algorithm will record how many times 13 degrees is present throughout the whole array, whereas a linear search will only store how many times it appeared on each line.

2 marks awarded for:

- 'a count occurrences will record how many times 13 degrees is present' (1) - the learner has shown understanding that a count occurrences will count the total number of times that 13 appears.
- 'throughout the whole array' (1) - the learner has shown understanding that a count occurrences search will search the whole array.

Question 2d

This question was very poorly answered by many candidates. The question required candidates to explain why truncation would have been used within the context. Many learners knew that truncation will remove characters although most did not know why this was needed within the context of the question.

Common misconception: Many candidates incorrectly thought that truncation rounds values up or down instead of truncation being a function that removes characters from a string.

Example response 1:

(d) Martha needs to find the average temperature each week.

The average is calculated by adding all temperatures recorded in a week and then dividing this value by 7.

Explain why Martha would use truncation.

(3)

The likelihood of the [redacted] calculated [redacted] average resulting in a decimal number is very high, if Martha uses truncation it will remove all [redacted] numbers after the decimal point to make the final result easier to work with.

3 marks awarded for:

- 'the calculated average resulting in a decimal number'(1)
- 'truncation will remove all numbers after the decimal point' (1)
- 'to make the final result easier to work with' (1)

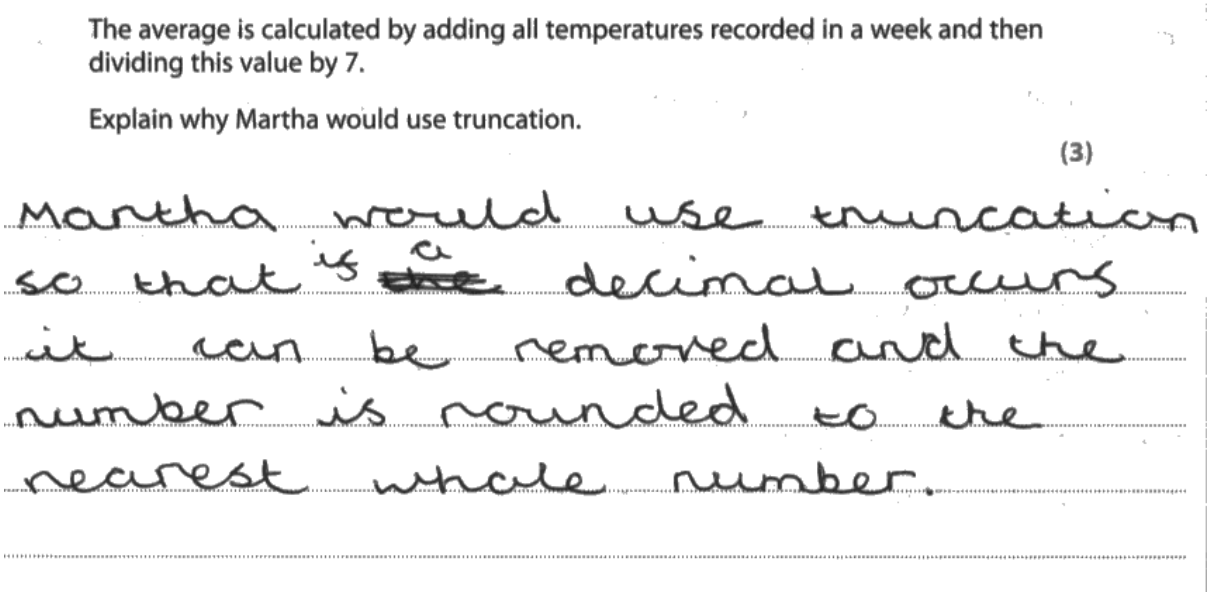
Example response 2:

(d) Martha needs to find the average temperature each week.

The average is calculated by adding all temperatures recorded in a week and then dividing this value by 7.

Explain why Martha would use truncation.

(3)



1 mark awarded for:

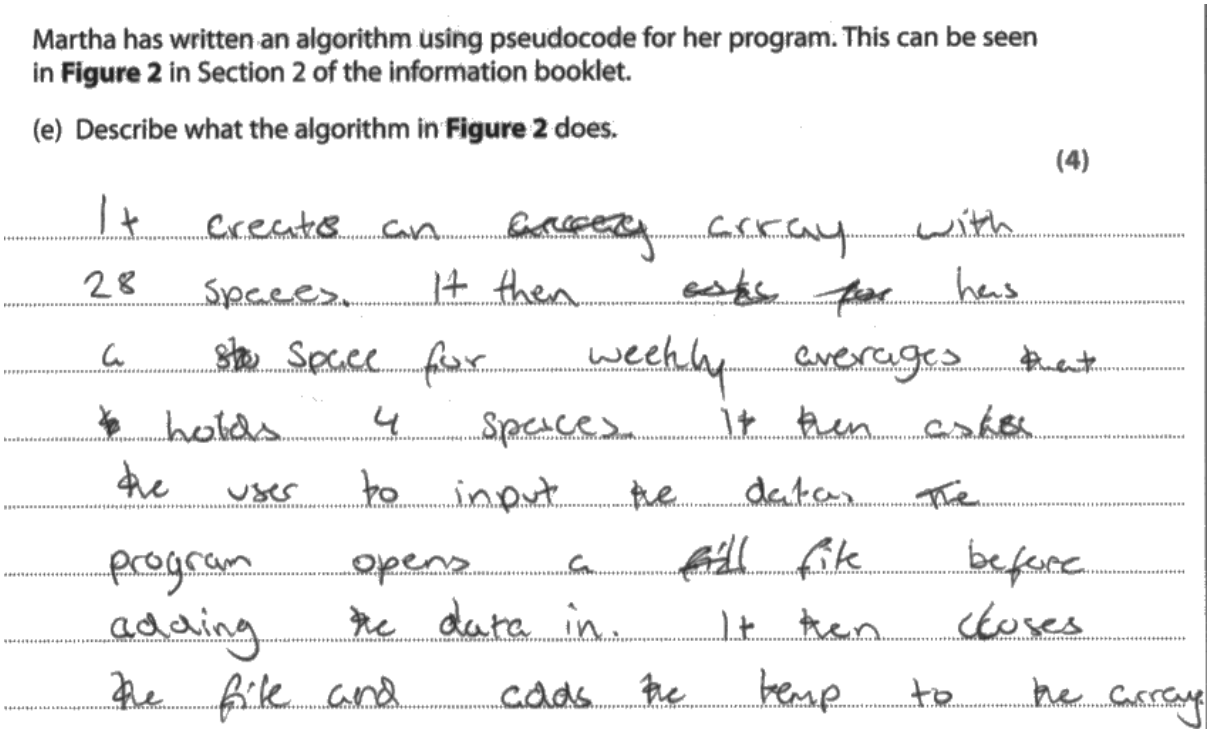
- 'so that if a decimal occurs it can be removed' (1)

'the number is rounded to the nearest whole number' - credit cannot be given for this response because a whole number is stored by removing values from the decimal and not by rounding it up or down.

Question 2e

This question was very well answered with many candidates scoring between 2 and 3 marks. The question required candidates to look at the algorithm stated within the information booklet and then to describe what the algorithm does. Most candidates were able to identify that the algorithm accepts user inputs and that these were written to a file. Fewer candidates were able to identify that an array was being declared or updated.

Example response 1:



Martha has written an algorithm using pseudocode for her program. This can be seen in **Figure 2** in Section 2 of the information booklet.

(e) Describe what the algorithm in **Figure 2** does.

(4)

It creates an ~~array~~ array with 28 spaces. It then ~~asks for~~ has a ~~the~~ space for weekly averages that holds 4 spaces. It then asks the user to input the data. The program opens a ~~file~~ file before adding the data in. It then closes the file and adds the temp to the array

4 marks awarded for:

- 'creates array' (1)
- 'asks for user to input the data' (1)
- 'opens a file before adding the data in' (1)
- 'add the temp to the array' (1)

Example response 2:

Martha has written an algorithm using pseudocode for her program. This can be seen in **Figure 2** in Section 2 of the information booklet.

(e) Describe what the algorithm in **Figure 2** does.

(4)

The algorithm has ~~selected~~ ~~calculation~~ calculated the weekly averages. The algorithm also has an input for the week, day, temp and reader. This will then all be put into a 'log' which the user can go back to and check. Once all the data has been inputted then Templog can be closed

1 mark awarded:

- 'This will then all be put into a log…' (1) - this section of the answer, until the end of the response, is enough to show an understanding that data is being written to an external file.

'the algorithm also has an input for…..' - it is not clear where the input has come from. Learners need to specifically state that it is a user input.

Question 2f

This question was poorly answered by most candidates. The question required learners to look at the algorithm given in the information booklet and then describe one way that the algorithm could be improved. Many candidates focused their answer on an alternative way that the algorithm could be done but not how it could be improved. This was an open question that allowed candidates to draw upon their knowledge from many different areas of the specification.

Example response 1:

(f) Describe **one** way that the algorithm in **Figure 2** could be improved.

(3)

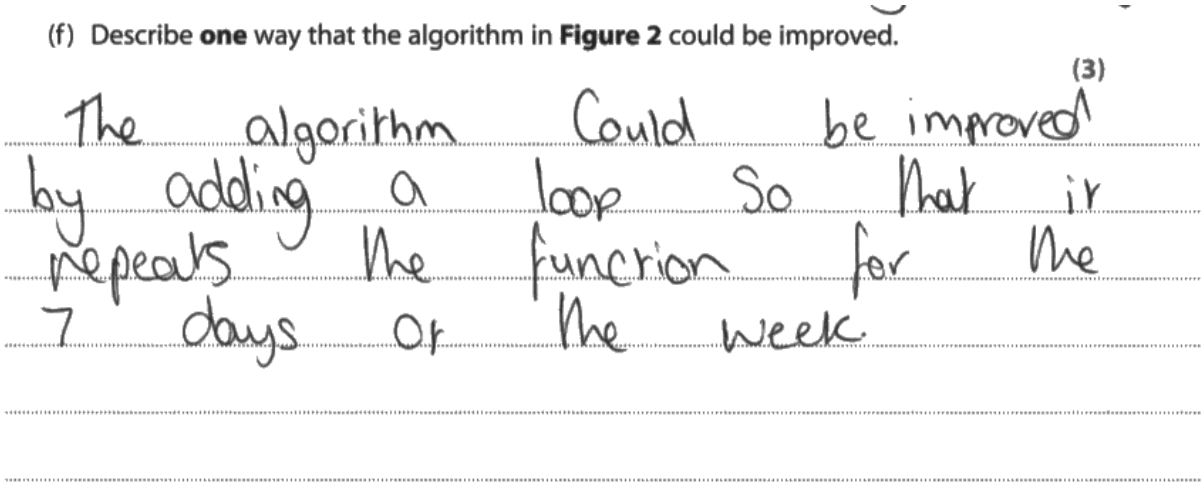
figure 2 algorithm could be improved through the usage of data validation to make sure that data being added mekts certain requirements, for instance, "days" cannot be greater than "7" & weeks cannot be greater than "4".

3 marks awarded for:

- 'data validation' (1)
- 'to make sure data being added meets certain requirements' (1)
- 'for instance, "days" cannot be greater than "7"' (1)

Award marks for three different points that are relevant to improving the algorithm given in figure 2 of the information booklet. Examiners should accept alternative wording / phrasing.

Example response 2:


(f) Describe **one** way that the algorithm in **Figure 2** could be improved.

(3)

The algorithm Could be improved by adding a loop So that it repeats the function for the 7 days of the week.

2 marks awarded for:

- 'adding a loop' (1)
- 'so that it repeats the function for each 7 days of the week' (1)

Award marks for three different points that are relevant to improving the algorithm given in figure 2 of the information booklet. Examiners should accept alternative wording / phrasing.

Question 3a

This question was reasonably well attempted. It was pleasing to see that the quality of algorithms produced by learners has improved since the last examination season. The question required learners to read the requirements stated within the information booklet and then produce an algorithm using pseudocode that meets these requirements.

Candidates generally gained marks for their algorithm meeting requirement 1 and 2. Some candidates had a good attempt at requirements 3-6 and scored some marks. While the quality of the algorithms produced by candidates has improved, there is still a lot of learners directly copying or simply summarising the bullet points given in the question which cannot be given credit.

Example response 1:

Develop an algorithm using pseudocode that meets the requirements shown in **Figure 3a** and **Figure 3b**.

(8)

```
BEGIN
  OUTPUT "Does car have current registration"
  INPUT currentReg
  OUTPUT "What year was car registered"
  INPUT regYear
  IF currentReg = "no" OR regYear < 2001
    OUTPUT "No rules apply"
  ELSE
    INPUT regNum
    reg = [ ]
    FOR i IN regNum
      reg.append[i]
    IF reg[0] OR reg[1] = "I" OR "Q" OR "Z"
      OUTPUT "The following digits are incorrect", reg[0] OR reg[1]
    ELSE IF reg[2] OR reg[3] ≠ 0≤x≤9
      OUTPUT "The following digits are incorrect", reg[2] OR reg[3]
    ELSE IF reg[4] ≠ " "
      OUTPUT "The following digits are incorrect", reg[4]
    ELSE IF reg[5] OR reg[6] OR reg[7] = "I" OR "Q"
      OUTPUT "The following digits are incorrect", reg[5] OR reg[6] OR reg[7]
    ELSE
      OUTPUT "Registration Completed"
END
```

Requirements:

- Requirement 1 - **ACHIEVED**. The learner has used the input built-in function to accept if the car has a current registration number.
- Requirement 2 - **ACHIEVED**. The learner has used the input built-in function to accept the car registration year.
- Requirement 3 - **ACHIEVED**. The learner has used suitable logic to check if the currentReg = "no" OR regYear < 2001 then OUTPUT "No Rules Apply"
- Requirement 4 - **ACHIEVED** - The learner has used a FOR loop to check every digit within the currentReg. The learner has used correct selection statements to check each part of the registration number. The learner has made good use of boolean operators to check if each section of the reg place contains the letters or numbers that are not allowed.
- Requirement 5 - **ACHIEVED** - The pseudocode outputs "Registration Completed" at the correct time under the correct selection statement.
- Requirement 6 - **ACHIEVED** - The learner outputs the message "The following digits are incorrect" and then refers to the indexes in that section at the correct time.

Overall:

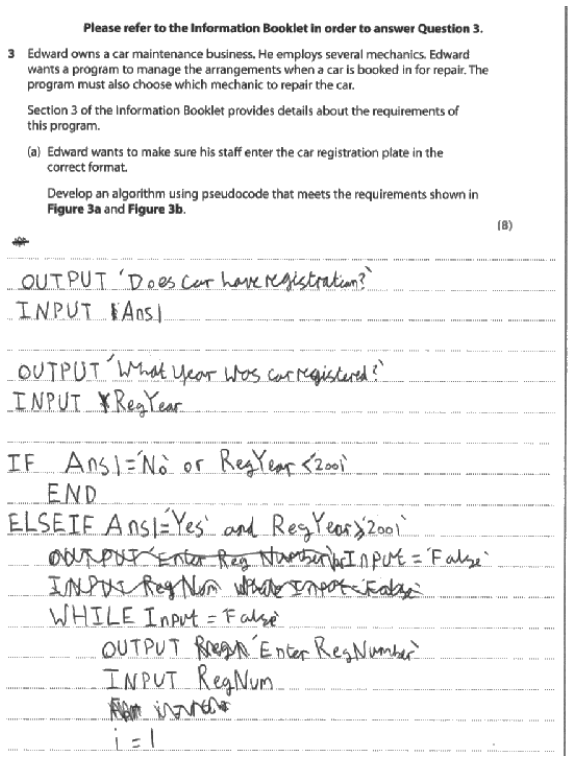
- All of the requirements have been met. The learner has met both the simpler and more complex requirements.
- Variable names are clearly defined and use standard conventions. The variable names are used consistently throughout and make good use of cammelCase.
- The algorithm is well structured and makes good use of indentation too for each selection statement and to split the code into blocks.
- The algorithm is efficient.

Examiners are reminded that the solution in the mark scheme is only an example. There are lots of different ways to solve this algorithm and all alternative ways which solve the problem should be awarded marks.

Examiners are also reminded to take into account the limited time that learners have to read the requirements and then construct their algorithm under test conditions.

This would be placed in Band 3 and awarded 8 marks.

Example response 2:



Please refer to the Information Booklet in order to answer Question 3.

3 Edward owns a car maintenance business. He employs several mechanics. Edward wants a program to manage the arrangements when a car is booked in for repair. The program must also choose which mechanic to repair the car.

Section 3 of the Information Booklet provides details about the requirements of this program.

(a) Edward wants to make sure his staff enter the car registration plate in the correct format.

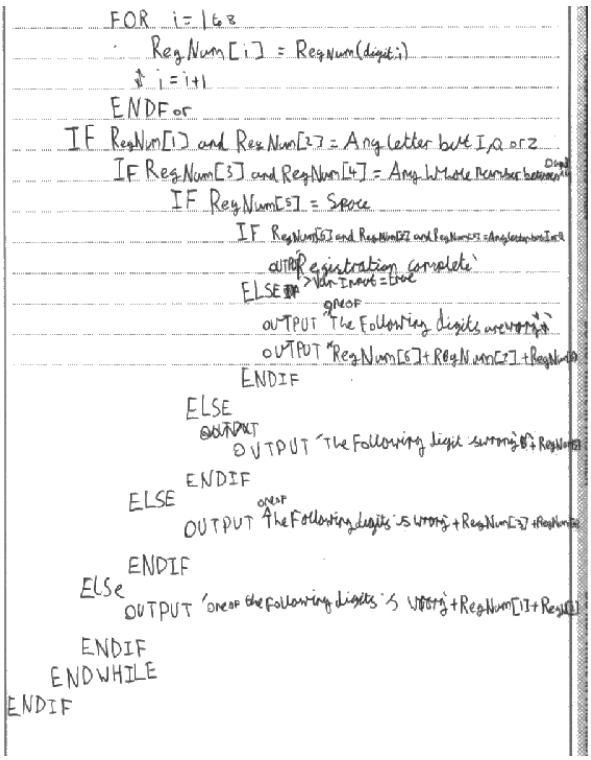
Develop an algorithm using pseudocode that meets the requirements shown in **Figure 3a** and **Figure 3b**.

(8)

```
OUTPUT 'Does car have registration?'
INPUT Ans1

OUTPUT 'What year was car registered?'
INPUT RegYear

IF Ans1='No' or RegYear<2001
   END
ELSEIF Ans1='Yes' and RegYear>2001
   OUTPUT 'Enter Reg Number' Input = False'
   INPUT RegNum
   WHILE Input = False
      OUTPUT 'Enter RegNumber'
      INPUT RegNum
      i=1
```



```
FOR i=1 to 8
   RegNum[i] = RegNum(digit;i)
   i=i+1
ENDFor
IF RegNum[1] and RegNum[2] = Any letter but I,O or Z
   IF RegNum[3] and RegNum[4] = Any Number between
      IF RegNum[5] = Space
         IF RegNum[6] and RegNum[7] and RegNum[8] = Any letter but I or
            OUTPUT 'Registration complete'
         ELSE
            OUTPUT 'The Following digits are wrong'
            OUTPUT RegNum[6]+RegNum[7]+RegNum[8]
         ENDIF
      ELSE
         OUTPUT 'The Following digit wrong'+RegNum[5]
      ENDIF
   ELSE
      OUTPUT 'The Following digits is wrong'+RegNum[3]+RegNum[4]
   ENDIF
ELSE
   OUTPUT 'one of the following digits is wrong'+RegNum[1]+RegNum[2]
ENDIF
ENDWHILE
ENDIF
```

Requirements:

- Requirement 1 - **ACHIEVED**. The learner has used the input built-in function to accept if the car has a current registration number.
- Requirement 2 - **ACHIEVED**. The learner has used the input built-in function to accept the car registration year.
- Requirement 3 - **ACHIEVED**. The learner has used suitable logic to check if the current Reg (Ans1) = "Yes" AND RegYear < 2001 then END.
- Requirement 4 - **ACHIEVED** - The learner has used a WHILE loop to continually check the registration number until the rules are met. The learner has made good use of logic to check every digit within the car registration. The learner has used correct selection statements to check each part of the registration number. The learner has made good use of boolean operators to check if each section of the reg place contains the letters or numbers that are not allowed.
- Requirement 5 - **ACHIEVED** - The pseudocode outputs "Registration Completed" at the correct time under the correct selection statement.
- Requirement 6 - **ACHIEVED** - The learner outputs the message "The following digits are incorrect" and then refers to the indexes in that section at the correct time.

Overall:

- All of the requirements have been met. The learner has met both the simpler and more complex requirements.
- Variable names mostly clearly defined and use standard conventions. The variable names are used consistently throughout and make good use of cammelCase. The variable 'Ans' is not a suitable variable name.
- The algorithm is well structured and makes good use of indentation to for each selection statement and to split the code into blocks.
- The algorithm is inefficient and could have been done using less lines of code. The code contains a lot of nested IF statements which would affect the performance of the solution.

Examiners are reminded that the solution in the mark scheme is only an example. There are lots of different ways to solve this algorithm and all alternative ways which solve the problem should be awarded marks.

Examiners are also reminded to take into account the limited time that learners have to read the requirements and then construct their algorithm under test conditions.

This would be placed in Band 3 and awarded 7 marks.

Example response 3:

(a) Edward wants to make sure his staff enter the car registration plate in the correct format.

Develop an algorithm using pseudocode that meets the requirements shown in **Figure 3a** and **Figure 3b.**

(8)

```
BEGIN
INPUT current registration number
INPUT year car was registered
IF current registration number = not and registered
    before 2001 = TRUE
THEN no rules apply
IF ELSE rules must be applied in figure 3b
IF registration number = [redacted] TRUE
~~THEN "Registration C~~
OUTPUT "Registration completed"
IF registration [redacted] number = FAISE
OUTPUT "The following digits are incorrect"
[redacted] THEN position number of each incorrect
    digit.
END
```

Requirements:

- Requirement 1 - **ACHIEVED**. The learner has used the input built-in function to accept if the car has a current registration number.
- Requirement 2 - **ACHIEVED**. The learner has used the input built-in function to accept the car registration year.
- Requirement 3 - **ACHIEVED**. They used some suitable logic. If the registration number is not current or was registered before 2001 then the learner has set a variable (although not named / defined) to TRUE.
- Requirement 4 - **NOT ACHIEVED** - No logic has been used to ensure that the registration number meets the rules given in figure 3b.
- Requirement 5 - **ACHIEVED** - The pseudocode outputs "Registration Completed" at the correct time under the correct selection statement.
- Requirement 6 - **NOT ACHIEVED** - No logic has been used to output the digits in the registration number which are not correct.

Overall:

- Some of the requirements have been met. The learner has met the simpler requirements however has not really attempted to solve the more complex requirements.
- Some variables are defined although the names generally tend to not follow the standard conventions. Despite this, the variable names are consistent throughout.
- There is limited indentation used when selection statements have been used.

This would be placed in Band 1 and awarded 3 marks.

Question 3b

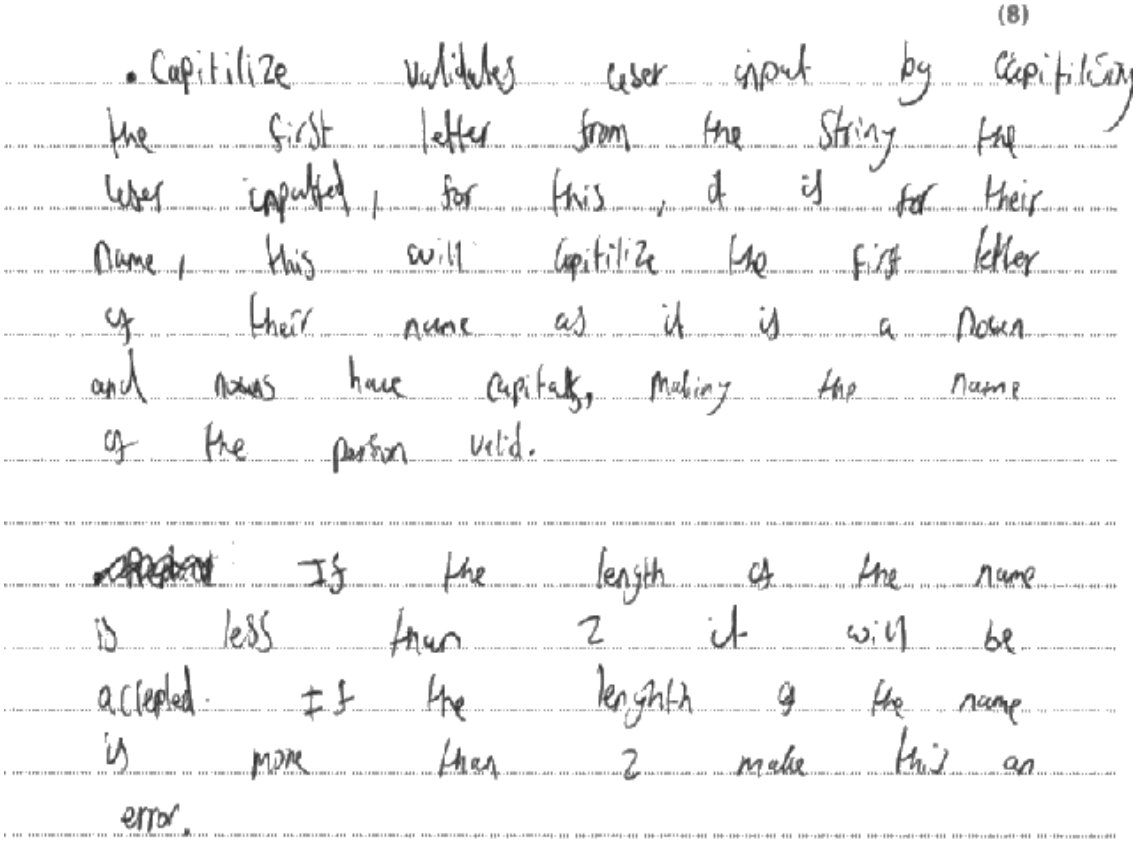
This question was reasonably well answered. The question required candidates to look at the Python programming code given within the information booklet and evaluate how well the code given in part A validates user input. The vast majority of candidates were able to identify at least one way that the code does this. Many candidates however, tended to focus their answer on describing how the code validates user input and not evaluate how effectively it validates user input.

Example response 1:

(b) Common built-in functions that have been used in the program, and also the program code can be seen in **Figure 3c**.

Evaluate how effectively the code in Part A validates user input.

(8)



Valid points made by the learner:

- '.capitilize….the first letter from the string the user inputted for the name' although the expansions are superficial, e.g. 'making the name of the person valid'.

'if the length of the name is less than 2 it will be accepted, if the length of the name is more than 2 make this on error.' This statement is inaccurate.

Overall:

- The learner has made 1 correct point. They have correctly linked the description of .capitilize that is stated in the information booklet to the customer name in the code.
- The point is expanded with superficial knowledge which does not show that the learner has a deeper understanding of how the data within the code is being validated.

This would be placed in Band 1 and awarded 1 mark.

Example response 2:

Evaluate how effectively the code in Part A validates user input.

(8)

When the user ~~is~~ inputs their name, the Program capitalizes the first letter automatically and checks to make sure the name isn't just a single letter, if the name doesn't follow this rule then they are presented with an error message and the name function is restarted, if it does follow the rules then it changes the state of the function to false and that ~~fi~~ function ends.

The telephone number is also validated ~~effectively~~, this is done by replacing the quotation marks with spaces so they do not cause errors. ~~the~~ The number entered is then checked to make sure it is not less than 6 numbers or bigger than 11. It is also checked to see if all of the ~~sen~~ input is numbers, using the ".isdigit()" function. Finally, once again if the rules are met then the variable is set to false and the code breaks.

Valid points made by the learner:

- 'when the user inputs their name, the program capitilizes the first letter automatically'
- 'checks to make sure it isn't just a single letter, if the name doesn't follow this rule then they are presented with an error message' and then expanded with 'and the name function is restarted'
- 'if it does follow the rules….the function ends'
- 'the number entered is checked to make sure it is not less than 6 numbers or bigger than 11'
- 'also check to see if all of the input is number using the .isdigit function.'
- 'finally…if the rules are met…the code breaks

‘telephone number…replacing the quotation marks with spaces so they do not cause an error’ this is an incorrect statement. The code will remove the spaces from the user input.

Overall:

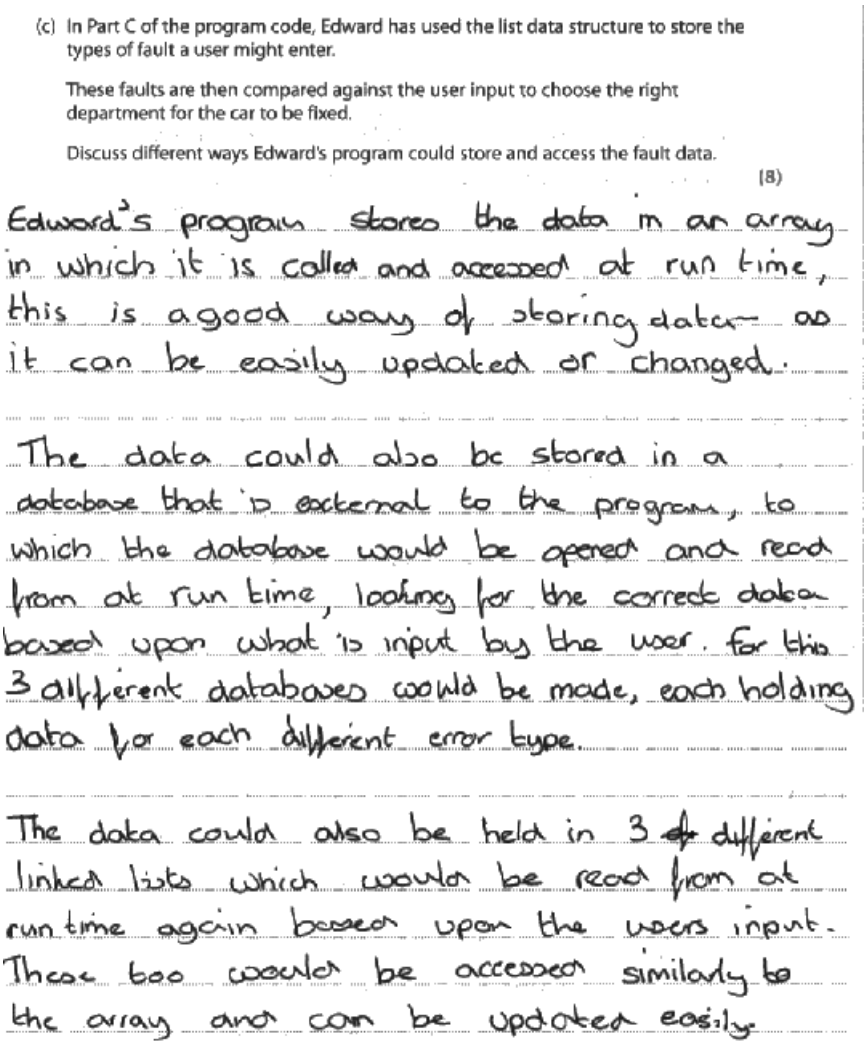
- The learner has made excellent correct points. They have said where the built-in functions have been used accurately within the code. The vast majority of the points made are accurate.
- The learner has expanded their points and have shown more depth. A large part of their answer is about what the code does, however the learner does not really state how effective the different areas of the code are when validating user input.
- No conclusion is given.

This would be placed in Band 2 and awarded 5 marks.

Question 3c

This question was generally poor answered by learners. The question required learners to come up with alternative ways in which the task could be achieved. However, many candidates simply explained what the code did, rather than giving an alternative. Many candidates gained marks for mentioning arrays, text files and databases. However, very few candidates were able to take this further beyond an initial point to give their answer more depth.

Example response 1:



(c) In Part C of the program code, Edward has used the list data structure to store the types of fault a user might enter.

These faults are then compared against the user input to choose the right department for the car to be fixed.

Discuss different ways Edward's program could store and access the fault data.

(8)

Edward's program stores the data in an array in which it is called and accessed at run time, this is a good way of storing data as it can be easily updated or changed.

The data could also be stored in a database that is external to the program, to which the database would be opened and read from at run time, looking for the correct data based upon what is input by the user. For this 3 different databases would be made, each holding data for each different error type.

The data could also be held in 3 ~~of~~ different linked lists which would be read from at run time again based upon the users input. These too would be accessed similarly to the array and can be updated easily.

Valid points made by the learner:

- 'Edwards program stores the data in an array which is called and accessed at run time' and is backed up with 'can be easily updated or changed.' Although the learner has made a slight mistake in saying the data is already stored in an array, the answer as a whole is good and credit should be given.
- 'could be stored in a database that is external to the program' and backed up with 'which...would be appended and read from at run time...' and '3

different database would be made, each holding data for each different error type'
- ‘stored in 3 different linked lists' and backed up with 'accessed similarly to the array.

Overall:

- Isolated knowledge and understanding is used in places although some parts are repeated, e.g. 'run time'. The learner has talked about a range of different alternatives including arrays, databases and linked lists.
- Points are identified and there is some explansions made. However, the expansions are largely repeated throughout.
- Limited discussion of relevant benefits, drawbacks etc. of the suggested techniques.

This would be placed in Band 2 and awarded 4 marks.

Example response 2:

(c) In Part C of the program code, Edward has used the list data structure to store the types of fault a user might enter.

These faults are then compared against the user input to choose the right department for the car to be fixed.

Discuss different ways Edward's program could store and access the fault data.

(8)

Edward could have used an Excel Spreadsheet as Python has easy I/O controls. This would mean he we can have multiple sheets, one for each department, where he can have the fault fault and price (if he wanted). This would be better for the Python program as the data is stored elsewhere and not taking up space in the RAM.

Another way could be to use an a multi dimensional array where the second and first value are paired eg: fault[x][y]. This would reduce the amount of variables needed, but would can make the readability of the code.

In addition to this, Edward could simply read write from multiple text files the same way he reads from a list. this is good as he user could be able to edit the file when the code is not running or open and it improves the codes readability

Valid points made by the learner:

- 'could have used an external spreadsheet' and then backed up with ‘this would mean he can have multiple sheets, one for each department’ and then backed up with ‘this would be better for the program as the data is stored elsewhere and not taking up space in the RAM.’ This answer demonstrates an excellent high level answer. The learner is aware that placing the data in an external file will mean that it doesn’t need to be stored in RAM at runtime.
- ‘could use a multi-dimensional array’ and then backed up with ‘this would reduce the amount of variables needed’
- ‘could simply read multiple text file the same way he reads from a list’ and then backed up with ‘this is good as he would be able to edit the file when the code is not running.’ The learner has again taken their answer further and provided a thoughtful response that shows a good technical understanding.

Overall:

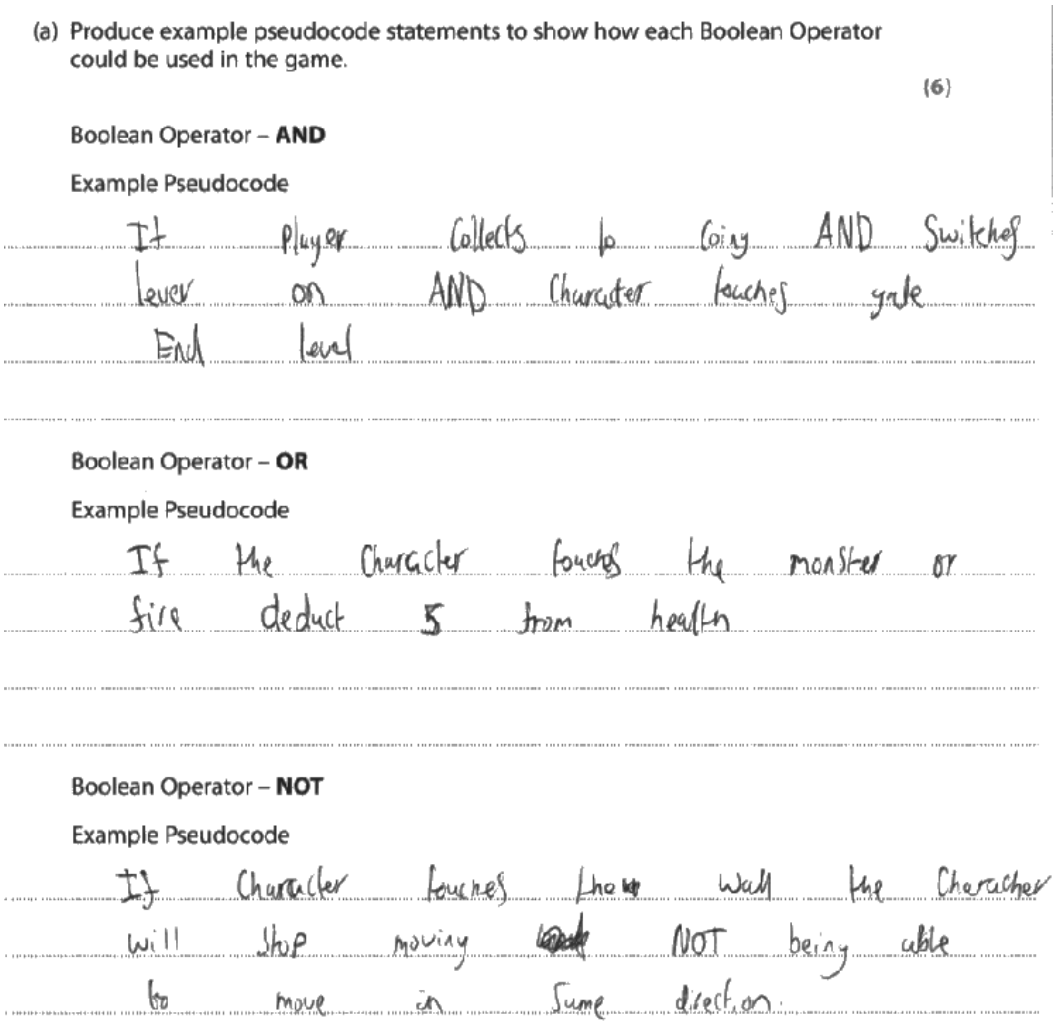
- Excellent knowledge and understanding is used throughout their response. The learner has talked about spreadsheets, multiple sheets, RAM, runtime, multidimensional arrays, variables and text file.
- Points are identified and excellent expansions made throughout.
- Most points raised have at least two expansions which shown a greater depth of knowledge.
- There is a strong link to the scenario made throughout.

This would be placed in Band 3 and awarded 8 marks.

Question 4a

This question was very well answered with most candidates achieving between 3 and 4 marks. It was also pleasing to see that many candidates also scored full marks for this question. The question required learners to read the requirements of a computer game within the information booklet and then give examples of how Boolean operations could be used within the program code. Most candidates achieved marks for providing a correct use of the AND operator and OR operator, however few candidates were able to give a correct use of the NOT Boolean operator.

Example response 1:



(a) Produce example pseudocode statements to show how each Boolean Operator could be used in the game.

(6)

Boolean Operator – **AND**

Example Pseudocode

If player collects 10 coins AND switches lever on AND Character touches gate End Level

Boolean Operator – **OR**

Example Pseudocode

If the Character touches the monster or fire deduct 5 from health

Boolean Operator – **NOT**

Example Pseudocode

If Character touches the wall the Character will stop moving ~~back~~ NOT being able to move in Same direction.

4 marks awarded for:

AND

- 'if player collects 10 coins AND switches leaver' (1) - a suitable condition has been created which clearly uses AND.
- 'End Level' (1) - suitable action given.

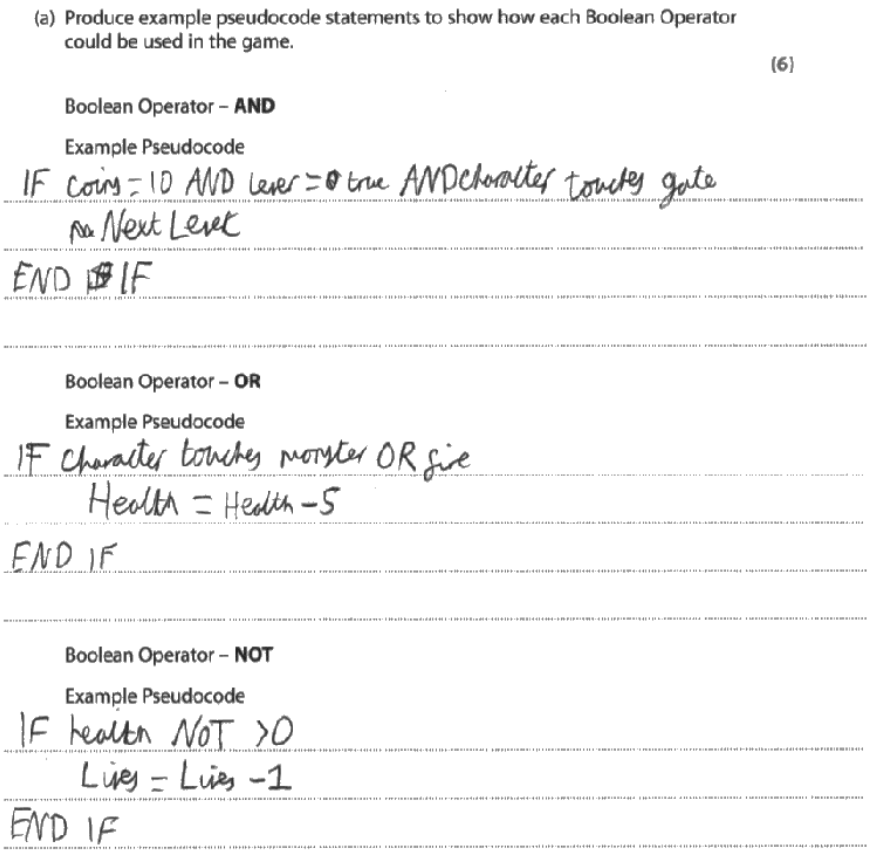
OR

- 'if the character touches the monster or fire' (1) - a suitable condition has been created which clearly uses OR.
- 'deduct 5 from the health' (1) - suitable action given.

NOT

Incorrect use of NOT operator and therefore credit cannot be given.

Example response 2:



(a) Produce example pseudocode statements to show how each Boolean Operator could be used in the game.

(6)

Boolean Operator – **AND**

Example Pseudocode

IF Coins = 10 AND Lever = true AND character touches gate
Next Level
END IF

Boolean Operator – **OR**

Example Pseudocode

IF character touches monster OR fire
Health = Health - 5
END IF

Boolean Operator – **NOT**

Example Pseudocode

IF health NOT >0
Lives = Lives - 1
END IF

6 marks awarded for:

AND

- 'if coins = 10 AND leaver = true' (1) - a suitable condition has been created which clearly uses AND.
- 'next level' (1) - suitable action given.

OR

- 'IF character touches monster or fire' (1) - a suitable condition has been created which clearly uses OR.
- 'Health = Health-5' (1) - suitable action given.

NOT

- 'If health NOT > 0'(1) - a suitable condition has been created which clearly uses NOT.
- 'Lives = Lives -1' (1) - suitable action given.

Question 4b

This question was reasonably well answered by most candidates. The question required learners to discuss the reasons why programming code may need to be translated into another programming language in the future. This allowed learners to apply their knowledge that they have developed within this unit, but also within other units. It was pleasing to see a wide variety of answers given. However, the vast majority of candidates struggled to go beyond giving an initial point and therefore many responses lacked depth.

Example response 1:

(b) Discuss the reasons why Kisha may need to translate her program code into another programming language in the future.

(8)

She may need to translate her program code in the future for many reasons.

One reason is that the code she is using is no longer usable, Maybe she realised that she needs a new language to be able to use news features, this will allow her game to be more complex and diverse.

Another reason may be that it is a code which is not widely recognised, so for other people to understand it it may need to be translated to a more widely recognised code.

A final reason may be that it is an old language and soon will not be available to use, so she has to translate her code to stop herself from losing all her work.

Valid points made by the learner:

- ‘the code she is using may no longer be available’ and backed up with ‘a new language…be able to use new features this will allow her game to be more complex and diverse’
- ‘an old language may not be available to use’ although this is then backed up with a very superficial answer.

Overall:

- Knowledge and understanding is limited.
- The learner has made two points. The first one is expanded to show a slightly deeper understanding but the expansion to the second point is very superficial and not really specific to the scenario.
- Very limited expansions are used and therefore the learner has not shown any depth of knowledge in their answer.

This would be placed in Band 1 and awarded 3 marks.

Example response 2:

(b) Discuss the reasons why Kisha may need to translate her program code into another programming language in the future.

(8)

One reason may be because her current programming language can no longer provide the required performance. This could lead to the game being delayed or could prevent kisha from upgrading the game.

Another reason may be because the other programming language is easier to de-bug. This will make fixing the software and improving it simpler and more efficent.

Thirdly kisha may be able to get more developers on the other language. This would make improving the game easier as there are more people working on it. it also brings new ideas to the game.

Furthermore there may be more technical support on the other language such as a better help desk. This will improve developer ability to create good quality code with a reduced amount of errors it will also improve de-bugging.

Valid points made by the learner:

- ‘current language can no longer provide the required performance’ and then backed up with ‘this could lead to the game being delayed or could prevent Kisha from upgrading the game’
- ‘Other languages are easy to debug’ and then backed up with ‘this will make fixing the software and improving it simpler and more efficient’
- ‘may get more developers on other languages’ and then backed up with ‘there would be more people working on….it also brings new ideas to the game’
- ‘may be more technical support on the other languages’ and then backed up ‘such as a better help desk’ and then backed up with ‘reduces the amount of errors it will also improve debugging’

Overall:

- There is very good knowledge and understanding throughout.
- The learner has made various different relevant points which are specific to the question.
- Each point raised by the learner is expanded one step further to show some additional understanding. The learner has also covered a range of different issues and therefore shown breadth of knowledge in their answer.
- Expansions are used and therefore the learner has shown further depth of knowledge in their answer.

This would be placed in Band 2 and awarded 6 marks.

Question 4c

This question was generally poorly answered with many learners not scoring any marks. The question required learners to look at the screen design for the first level of a computer game and then read the requirements. Learners then needed to analyse how the structure and features of object oriented programming could be used to create additional levels in the game.

Many learners focused their answer on how programming code could be used in general terms. For example learners described the different control structures that could be used, however these apply to all programming paradigms. Lots of learners also focused their answers on event driven languages. Learners who understood object oriented programming generally tended to describe the use of classes, objects and code reusability. However, most candidates tended to just describe what these are and not how they could have been used when additional levels are created in the game.

Example response 1:

(c) Analyse how the structure and features of object-orientated programming languages will benefit Kisha when she creates extra levels in her game.

(12)

This will benefit Kisha when she creates extra levels in her game because She can create levels alot quicker as she can use this level as a class, a template to create other levels quicker. She can reuse properties from levels of the game to save time in creating new levels, adding different properities to each level will make the game levels unique. Objects She can create more levels with the objects in her game. with instances She can make new objects from the class.

<u>Valid points made by the learner:</u>

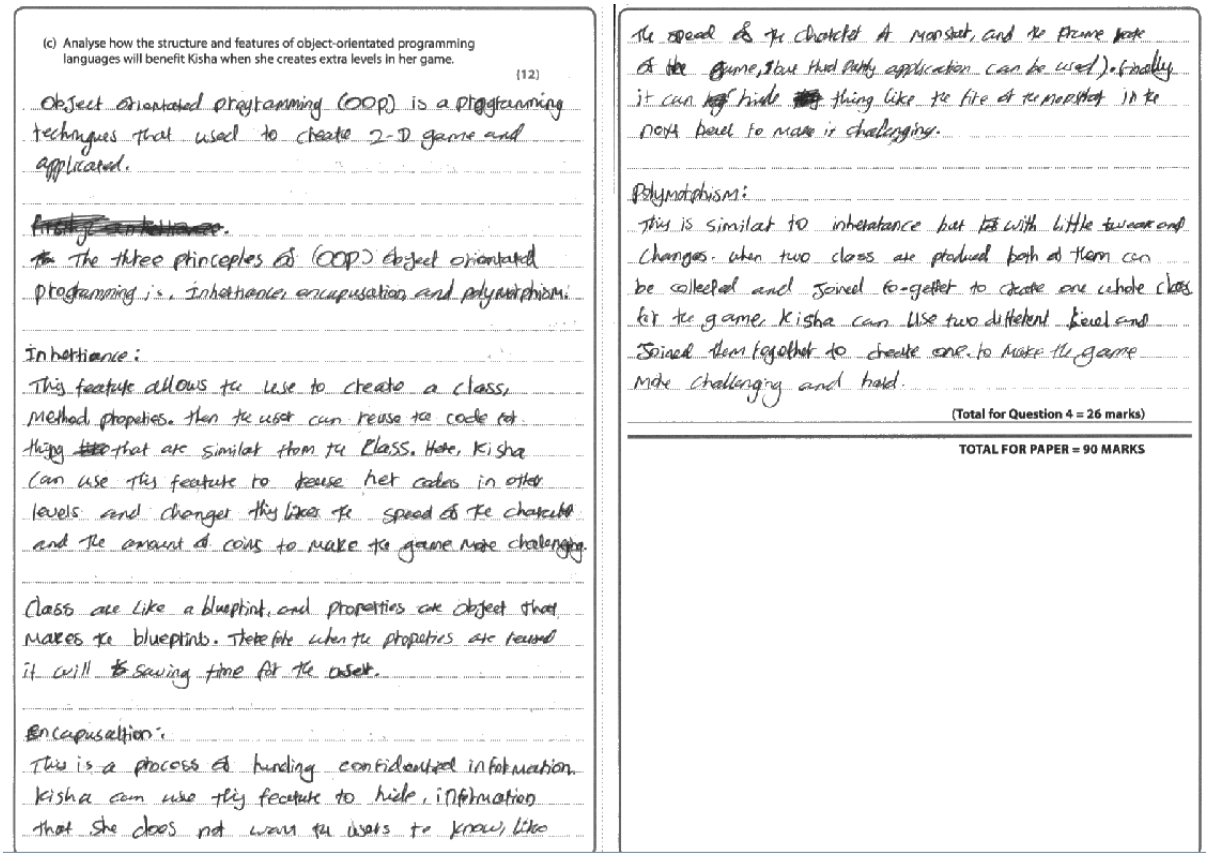
- 'can create levels a lot quicker as she can use this level as a class' and then backed up with
- 'a template to create other levels.'
- 'she can reuse properties from levels of the game to save time' and then backed up with
- 'adding different properties to each level will make the game levels unique'

<u>Overall:</u>

- The learner has shown some knowledge in one key area of object-oriented programmed (i.e. use of classes/templates)
- The learner has given expansions on the single point raised and therefore has shown some depth of understanding in this area.
- There is some reference to how their answers will benefit Kisha when she creates extra levels, although these are sometimes superficial.

This would be placed in Band 1 and awarded 4 marks.

Example response 2:



(c) Analyse how the structure and features of object-orientated programming languages will benefit Kisha when she creates extra levels in her game. (12)

Object orientated programming (OOP) is a programming techniques that used to create 2-D game and application.

~~Firstly, Inheritance.~~

The three principles of (OOP) Object orientated programming is, Inheritance, encapsulation and polymorphism.

Inheritance:
This feature allows the use to create a class, Method properties. Then the user can reuse the code of thing ~~that~~ that are similar from the Class. Here, Kisha can use this feature to reuse her codes in other levels and changes thing like the speed of the character and the amount of coins to make the game more challenging.

Class are like a blueprint, and properties are object that makes the blueprints. Therefore when the properties are reused it will be saving time for the user.

Encapsulation:
This is a process of hinding confidential information. Kisha can use this feature to hide, information that she does not want the users to know like the speed of the character at moment, and the future level of the game, third party application can be used). Finally it can hide thing like the life of the monster in the next level to make it challenging.

Polymorphism:
This is similar to inheritance but with little tweak and changes. when two class are produced both of them can be collected and joined together to create one whole class for the game. Kisha can use two different level and joined them together to create one to make the game more challenging and hard.

(Total for Question 4 = 26 marks)

TOTAL FOR PAPER = 90 MARKS

Valid points made by the learner:

- 'inheritance….allows the user to create a class, methods, properties' and then expanded with…
- 'then the user can reuse the code that are similar from the class' and then expanded with
- 'can use this feature because…in other levels and change the speed of the characters and the amount of contains to make the game more challenging.

Overall:

- The learner has shown very good knowledge in a range of different areas of object-oriented programming (i.e. inheritance, encapsulation, polymorphism, classes, objects etc.)
- The learner has given very good expansions on ALL of their points raised and therefore shown good depth of understanding in these areas.
- The learner has linked the structures and features of object orientated programming to the scenario.
- There is good understanding of OOP but in some cases (encapsulation) the examples provided are not fully explored.

This would be placed in Band 3 and awarded 9 marks.

Summary

Based on performance in this examination series, learners are offered the following advice:

- Ensure that learners make full use of the information booklet when answering the exam questions. When candidates are referred to the information booklet, they should make sure that their answer is specific to the information / program code / rules or other stimulus given.
- Address the misconceptions given in the 'Introduction to the Overall Performance of the Unit' section and throughout this report as this will help in all areas of the unit and in preparation for this exam.
- For shorter response questions (5 marks or less), learners should be encouraged to note the number of marks available as this will help them identify the number of points they need to make. For example, in a 4 mark 'Explain one…' style question, learners would need to make at least four linked points that expand/exemplify understating of a single point
- When producing extended writing responses (6 marks or more) learners should ensure that they consider a range of points, each of which should be expanded or supported with examples and applied to the given context.
- Develop a better understanding of logic and have more practice at being able to come up with solutions to complex problems. Being able to create effective algorithms will help in all learning aims in this unit. Learners should be familiar with developing algorithms using both flowcharts and Pseudocode. It may be best for learners to do this alongside this unit which increases in complexity over time rather than being taught in one go.

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