

Name:

Class Teacher:

Date:



OCR J276

GCSE Computer Science

REVISION BOOKLET – MARK SCHEME

2.3 PRODUCING ROBUST PROGRAMS

Content in J276 GCSE Computer Science:

- 1.1 Systems Architecture
- 1.2 Memory
- 1.3 Storage
- 1.4 Wireless and Wired Networks
- 1.5 Network Topologies, Protocols and Layers
- 1.6 System Security
- 1.7 Systems Software
- 1.8 Ethical, Legal, Cultural and Environmental Concerns
- 2.1 Algorithms
- 2.2 Programming Techniques
- 2.3 Producing Robust Programs
- 2.4 Computational Logic
- 2.5 Translators and Facilities of Languages
- 2.6 Data Representation

EXAM QUESTIONS

QUESTION 1

The area of a circle is calculated using the formula $A = \pi r^2$, where π is equal to 3.142 and r is the radius. Finn has written a program to allow a user to enter the radius of a circle as a whole number, between 1 and 30, and output the area of the circle.

```
01    int radius = 0
02    real area = 0.0
03    input radius
04    if radius < 1 OR radius > 30 then
05    print ('Sorry, that radius is invalid')
06    else
07    area = 3.142 * (radius ^ 2)
08    print (area)
09    end if
```

Explain, using examples from the program, **two** ways Finn can improve the maintainability of the program.

1		<ul style="list-style-type: none">• Comments / annotation...• ... To explain the key functions / sections• ... E.g. any relevant example, such as line 4 checks the input is valid• Indentation...• ... To show where constructs / sections start and finish• ...E.g. indenting within IF statement• Using constants...• ... so numbers can be updated easily• ...E.g. TT	6	<p>1 mark for identification of an example from the programme.</p> <p>1 mark for explanation of how it aids maintainability.</p> <p>1 mark for contextualisation.</p> <p>Maximum of 3 marks per method.</p>
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QUESTION 2

Charley is writing a program for music students. To make sure that there are no logic errors in the program, Charley uses a test plan. Describe what is meant by a logic error.

2	a	<ul style="list-style-type: none"> The error does not prevent program running... But it does not produce the expected output / it does not do what the programmer intended A reasonable example 	2	<p>Examiner's Comments</p> <p>Candidates who had learnt a definition for logic error were able to answer this more clearly and succinctly than candidates who were attempting to put it in their own words, often confusing the use of the term "logic" here with the everyday use of the term and giving answers such as "it doesn't make sense".</p>
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The program uses the letters in the following list to represent musical notes.

C D E F G A B

When the user inputs a letter from this list, the program outputs the next three notes in the list. If it gets to the end of the list, it starts again from the beginning, so the next note after B is C. Complete the test plan below by stating, for each input data, the expected outcome and a reason for the test.

b		<p><i>Correct answer:</i></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Input Data</th> <th style="width: 20%;">Expected outcome</th> <th style="width: 65%;">Reason for test</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">C</td> <td style="text-align: center;">D E F</td> <td>checks the output is the next three letters in the list</td> </tr> <tr> <td style="text-align: center;">A</td> <td style="text-align: center;">B C D</td> <td>checks the output goes back to the beginning of the list</td> </tr> <tr> <td style="text-align: center;">H</td> <td style="text-align: center;">Error message</td> <td>Not a valid / existing note</td> </tr> </tbody> </table> <p><i>1 mark per box</i></p>	Input Data	Expected outcome	Reason for test	C	D E F	checks the output is the next three letters in the list	A	B C D	checks the output goes back to the beginning of the list	H	Error message	Not a valid / existing note	6	<p>Only award the mark for Reason for test, if the Expected outcome is correct enough to justify the reason given</p> <p><u>Examiner's Comments</u></p> <p>This question was fairly well answered although there are two important points to note here about such test plans. Firstly, the reason for the test should be precise enough to clearly define the test case of that row (of which the data is only an example of) and exclude the other test cases/rows. It is not enough to say "to see if it works"(this is too general) or "to see if you get DEF when you input C"(this is too specific). Secondly while preparing for this examination and doing A453, candidates should be encouraged to make their programs robust by dealing with invalid inputs in a reasonable way. It is not desirable to design a program so that when the input is invalid (as in the third row in this question) the expected outcome is that it "crashes" or "nothing happens".</p>
Input Data	Expected outcome	Reason for test														
C	D E F	checks the output is the next three letters in the list														
A	B C D	checks the output goes back to the beginning of the list														
H	Error message	Not a valid / existing note														

QUESTION 3

When customers pay using a card such as the one below, shops use computer systems to process the payment.



Explain why it is important for computer systems that process card payments to be reliable. The quality of written communication will be assessed in your answer.

3		<p>Points may include:</p> <ul style="list-style-type: none"> • Need to be always available... • ... shops and customers want to process payments quickly, • ... if it goes down, there will be delays / customers lost etc... • Need to always process payments accurately • ... shops want to be confident that they will receive the payment • ... customers do not want to be overcharged • Need to be able to trust the security of the system • ... that fraudulent purchases cannot be made • ... that customers' personal details cannot be stolen / to prevent identity theft 	<p>High Level Response (5/6): A detailed description of the need for reliability with a number of fully justified points. There will be few if any errors in spelling, grammar and punctuation. Technical terms will be used appropriately and correctly.</p> <p>Medium Level Response (3/4); Some reasons why reliability is needed are explained, but some explanations may not be detailed. There may be occasional errors in spelling, grammar and punctuation. Technical terms will be mainly correct.</p> <p>Low level response (1/2): One or more reasons why reliability is needed are identified, but there is little or no explanation. Information will be poorly expressed and there will be a limited, if any, use of technical terms. Errors of grammar, punctuation and spelling may be intrusive.</p> <p>0 : Answer not worthy of credit</p> <p><u>Examiner's Comments</u></p> <p>Examiners were pleased to see candidates of all abilities make a reasonable attempt at this part. Centres should continue to emphasise to candidates that QWC questions are not necessarily essay questions, and they are not required to give an introduction if it does not add any information which is already in the question. Similarly, a conclusion is not necessary if it just repeats points already made. Candidates should focus on answering the question</p>
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					and will be rewarded for making relevant, detailed points as well as for the clarity, organisation and use of English (especially the use of the technical terms) in their answers.
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QUESTION 4

Joseph is an author and programmer, and he needs to estimate how many pages his new book will have. Each page has an average of 300 words. Each chapter starts with a chapter title page. The number of pages is estimated by:

- Dividing the number of words by 300
- Ignoring the decimal part of the division
- Adding the number of chapters to this total

Joseph uses the algorithm below to estimate the number of pages, but his algorithm does not give the correct result.

```

01 INPUT numberOfWords
02 INPUT numberOfChapters
03 CONST wordsPerPage = 300
04 numberOfPages = RoundDown(numberOfWords / wordsPerPage)
05 numberOfPages = numberOfWords + numberOfChapters
06 OUTPUT numberOfPages

```

Joseph has used a **RoundDown** function to remove the decimal part of the division, e.g. **RoundDown(6.2)** would return 6, **RoundDown(7.8)** would return 7. There is an error in Line 05 of the algorithm. Write a corrected line of code to replace line 05.

4		<pre> numberOfPages = numberOfPages+numberOfChapters </pre>	1	<p>Accept:</p> <ul style="list-style-type: none"> • += instead of = numberOfPages • numberOfPages=RoundDown(numberOfWords / wordsPerPage) +numberOfChapters • numberOfPages=RoundDown(numberOfWords / 300) +numberOfChapters <p>Variable names must be spelt correctly, ignore case</p> <p>Examiner's Comments</p> <p>This question was appropriate programming theory and techniques.</p> <p>There was a mix of responses to this question, many candidates were able to get this correct, whilst others were unable to follow the code.</p>
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