



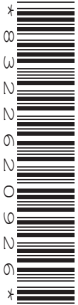
Oxford Cambridge and RSA

**Friday 27 May 2022 – Morning**

**AS Level Computer Science**

**H046/02 Algorithms and problem solving**

**Time allowed: 1 hour 15 minutes**



**Do not use:**

- a calculator



Please write clearly in black ink. **Do not write in the barcodes.**

Centre number

Candidate number

First name(s) \_\_\_\_\_

Last name \_\_\_\_\_

**INSTRUCTIONS**

- Use black ink.
- Write your answer to each question in the space provided. If you need extra space use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- Answer **all** the questions.

**INFORMATION**

- The total mark for this paper is **70**.
- The marks for each question are shown in brackets [ ].
- Quality of extended response will be assessed in questions marked with an asterisk (\*).
- This document has **16** pages.

**ADVICE**

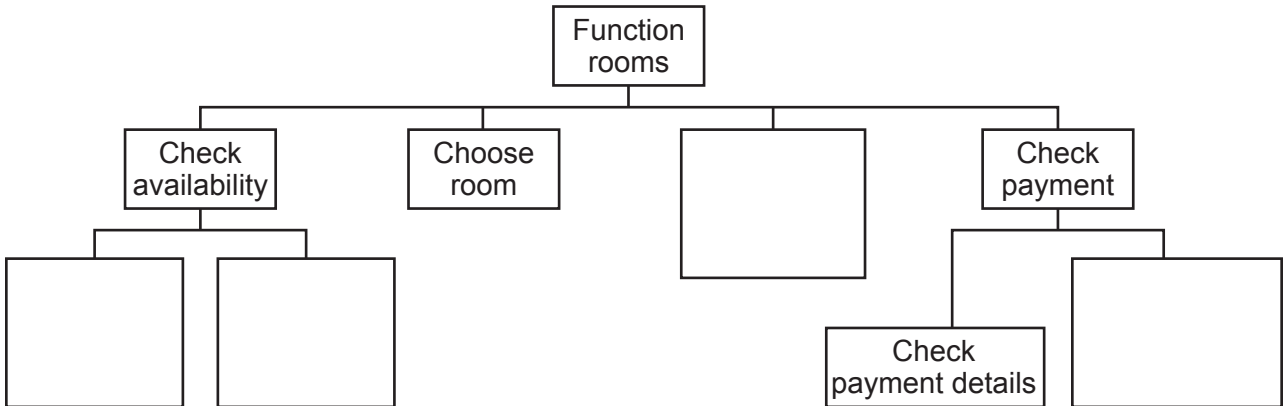
- Read each question carefully before you start your answer.

Answer **all** the questions.

- 1 Ruhail owns ten different function rooms which can be hired by different business customers to hold meetings. He would like a program to manage the booking process of each room.

Customers should be able to enter the date they want to hire a function room, and then a list of available rooms will be displayed. Customers can then select which room they want to hire. Customers can then enter their payment details which are then checked and then a confirmation email is sent to the customer.

- (a) Complete the structure diagram below to show the different component parts of the problem.



[4]

- (b) Ruhail will make use of an Integrated Development Environment (IDE).

State the purpose of an IDE.

.....  
..... [1]

- (c) State **two** different programming constructs and give an example of how Ruhail could use each construct when creating his program code.

1 .....  
.....  
.....

2 .....  
.....  
.....

[4]

(d) Ruhail will test his program code to make sure that it works correctly.

State **two** test strategies that Ruhail could use.

1 .....

.....

2 .....

.....

[2]

(e) Ruhail will make use of a software development life cycle methodology.

State **two** software development methodologies that Ruhail could consider using.

1 .....

.....

2 .....

.....

[2]

(f) Ruhail has been told to make use of reusable components when creating his program code.

Explain **two** benefits of using reusable components when writing program code.

1 .....

.....

.....

.....

.....

2 .....

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[4]

2 Logan is writing a program for his customers to be able to buy his gym equipment. In the program, once a customer has selected the items they want to buy, a procedure, `checkDetails`, will be called. This procedure will check that the customer has input their telephone number and also check that it is at least 11 characters long.

(a) Logan has written two possible versions of the procedure that could be used to achieve this.

**Version One:**

```
procedure checkDetails()  
    telephoneNo = input("Enter telephone number")  
    while (telephoneNo == "") or (telephoneNo.length < 11)  
        print("Error, please try again")  
        telephoneNo = input("Enter telephone number")  
    endwhile  
endprocedure
```

**Version Two:**

```
procedure checkDetails()  
    telephoneNo = input("Enter telephone number")  
    if (telephoneNo == "") or (telephoneNo.length < 11) then  
        print("Error, please try again")  
        telephoneNo = input("Enter telephone number")  
    endif  
endprocedure
```

(i) Explain why version one is more effective than version two at making sure that the telephone number entered is at least 11 characters long.

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..... [4]

- (ii) As well as the procedure `checkDetails`, Logan would like to use additional procedures to expand his program.

The program will be expanded to:

- allow customers to be able to register an account by setting up a username and password
- allow registered users to be able to log-in with their registration details
- allow customers, once logged in, to be able to add items that are in stock to their online shopping basket.

State **two** other procedures that Logan could write to meet these requirements, and for each one, state a suitable name and purpose.

**Procedure 1:**

Procedure Name: .....

Purpose: .....

.....

**Procedure 2:**

Procedure Name: .....

Purpose: .....

.....

[4]

- (iii) When setting up the additional procedures in his program, Logan will use a mixture of parameter passing by reference and by value.

State the difference between parameter passing by reference and parameter passing by value.

.....

.....

.....

.....

[2]





(b) Trudi has written a procedure, bubbleSort.

```
01 procedure bubbleSort(numbers)
02     do
03         sorted = true
04         for count = 0 to numbers.length -2
05             if numbers[count] > numbers[count+1] then
06                 temp = numbers[count+1]
07                 numbers[count+1] = numbers[count]
08                 numbers[count] = temp
09                 sorted = false
10             endif
11         next count
12     until sorted == true
13 endprocedure
```

(i) Identify a line in the procedure bubbleSort where a decision is taken.

.....  
..... [1]

(ii) Identify the name of the parameter used in the procedure bubbleSort.

.....  
..... [1]

(iii) Describe the purpose of the temp variable in the procedure bubbleSort.

.....  
.....  
.....  
..... [2]

(iv) Describe the purpose of the sorted variable in the procedure bubbleSort.

.....  
.....  
.....  
..... [2]



## 4 Given the following procedure:

```

01 procedure generate(number)
02     a = 0
03     while number > 0
04         if number MOD 2 == 0 then
05             a = a + 2
06             print(a)
07             number = number - 2
08         else
09             a = a + 1
10             print(a)
11             number = number - 1
12         endif
13     endwhile
14 endprocedure

```

(a) Explain why = is used on line 11 of the procedure `generate` instead of ==.

.....

.....

.....

..... [2]

(b) State the values printed by the procedure `generate` when `number = 8`.

.....

..... [1]

(c) State the values printed by the procedure `generate` when `number = 7`.

.....

..... [1]

(d) Describe the purpose of the MOD operator on line 04 of the procedure generate.

.....  
.....  
.....  
..... [2]





- 6 Kylie buys used games consoles and then sells them to make a profit. She sells her products in multiples of £5 such as £30, £55 and £95. Kylie only accepts £50, £20, £10 and £5 notes from her customers.

Kylie has written an algorithm which will calculate the amount of change needed by stating how many £20, £10 and £5 notes are needed.

The program should output the minimum number of notes required. For example if £35 change is required then it should output 1 x £20 and 1 x £10 and 1 x £5.

```

01 total = input("Enter total price of goods")
02 paid = input("Enter amount paid")
03 global change = paid - total
04 calculateChange()
05
06 procedure calculateChange()
07     twenty = 0
08     ten = 0
09     five = 0
10     while change >= 20 //Calculates number of £20 notes needed
11         twenty = twenty + 1
12         change = change - 20
13     endwhile
14     while change >= 10 //Calculates number of £10 notes needed
15         ten = ten + 1
16         change = change - 10
17     endwhile
18     while change >= 5 //Calculates number of £5 notes needed
19         five = five + 1
20         change = change - 5
21     endwhile
22     print("The amount of change you need is £" + str(change))
23     print("Total £20 Notes:" + str(twenty))
24     print("Total £10 Notes:" + str(ten))
25     print("Total £5 Notes:" + str(five))
26 endprocedure

```

- (a) Describe how `calculateChange()` on line 04 is used differently to `calculateChange()` on line 06.

.....

.....

.....

..... [2]

(b) When line 22 is run, it will always print:

The amount of change you need is £0

Explain why this error occurs when line 22 is run.

.....  
.....  
.....  
..... [2]

(c) Explain why Kylie has used `str` on lines 22 to 25 in her algorithm.

.....  
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.....  
.....  
.....  
.....  
..... [3]

**END OF QUESTION PAPER**

**ADDITIONAL ANSWER SPACE**

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

A large area of lined paper for writing. It consists of a vertical solid line on the left side, creating a margin. To the right of this line, there are 25 horizontal dotted lines spaced evenly down the page, providing a guide for writing.

A large area of the page is reserved for writing, featuring a vertical solid line on the left side and horizontal dotted lines extending across the page.



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