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**Computer science**  
**Standard level**  
**Paper 1**

Tuesday 11 May 2021 (afternoon)

1 hour 30 minutes

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**Instructions to candidates**

- Do not open this examination paper until instructed to do so.
- Section A: answer all questions.
- Section B: answer all questions.
- The maximum mark for this examination paper is **[70 marks]**.

### Section A

Answer **all** questions.

- 1. Identify **two** roles that a computer can perform in a network. [2]
- 2. Describe **one** method of implementation for a new computer system. [2]
- 3. Draw the logic circuit represented by the following truth table. [2]

A	B	Z
0	0	1
0	1	0
1	0	0
1	1	1

- 4. (a) Identify **two** reasons why patches may be necessary for an operating system. [2]  
(b) Identify **two** methods that can be used to obtain these patches. [2]
- 5. Calculate the denary (base 10) equivalent of the hexadecimal number BF. [2]
- 6. Identify **two** reasons why fibre optic cable would be preferred over wireless connectivity. [2]
- 7. Distinguish between a *variable* and a *constant*. [2]

8. List the output from the given algorithm for the following input. [3]

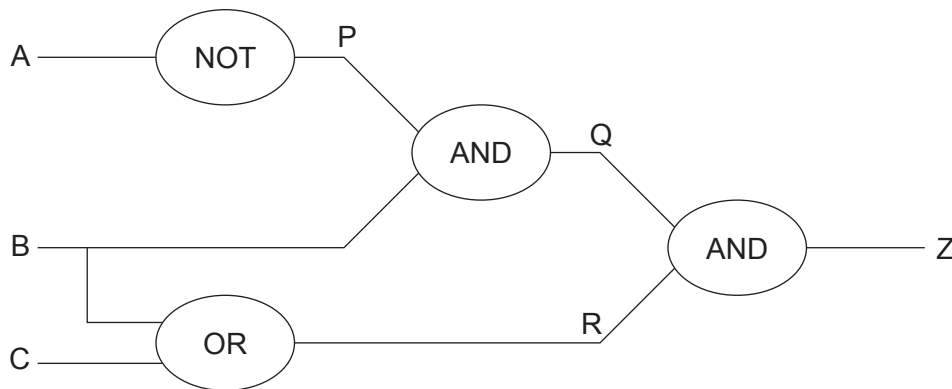
2, 6, 8, 9, 12, 15, 18, 20

```
loop for Count from 0 to 7
  input NUMBER
  if NUMBER div 2 = NUMBER / 2 then
    if NUMBER div 3 = NUMBER / 3 then
      output NUMBER
    end if
  end if
end loop
```

9. Define the term *data packet*. [1]

10. Identify **one** common feature found in the user interface of application software to improve its usability. [1]

11. Construct the truth table for the following logic circuit: [4]



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## Section B

Answer **all** questions.

**12.** A school currently has a cabled network but wants to add wireless networking across the whole campus.

(a) Describe **two** hardware components the school will need to implement the wireless network. [4]

(b) Identify **two** advantages to the students of the new wireless network. [2]

There are concerns that unauthorized people could access the data on the wireless network.

(c) Outline **two** methods the school could employ to prevent network data from being accessed over their wireless system. [4]

The school has decided to implement a virtual private network (VPN) to provide access to its network.

(d) Identify **two** technologies the school would require to provide a VPN. [2]

(e) Explain **one** benefit to the staff of using a VPN to remotely access the school network. [3]

**13.** A company has 600 employees whose names are currently stored using a collection called `NAMES`. The names are stored as surname, first name. For example: Smith, Jane, Uysal, Rafael, Ahmed, Ishmael, Jonsonn, Sara, ...

(a) Construct a pseudocode algorithm that will store the surnames in one array and first names in another. [4]

The names in the collection are kept in a random order. However, it would be more useful if they were kept in alphabetical order.

(b) Construct a pseudocode algorithm that will sort the surnames into alphabetical order using the *bubble sort* method. The order of the first names must also be changed so that they keep the same index as their corresponding surname. [5]

The company's staff list is now organized in the arrays in alphabetical order.

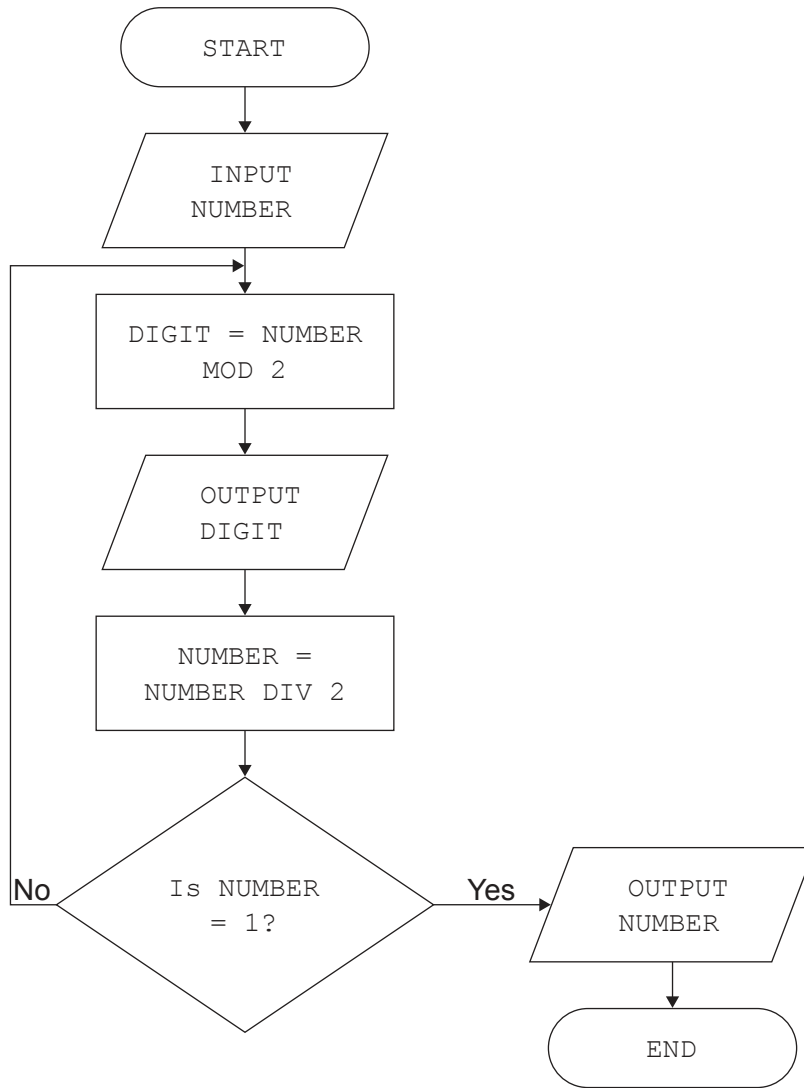
A binary search was used to find a specific name in the array.

(c) Describe the process a binary search would follow to find a record in the surname array. [4]

(d) Outline **one** benefit of using sub-programmes to implement your algorithms from parts (a) and (b). [2]

Turn over

14. The following flowchart represents a standard algorithm:



(a) Copy and complete the table that traces the algorithm in the flowchart using an input value of 19. [4]

NUMBER	DIGIT	OUTPUT
19		

(b) State the purpose of the algorithm. [1]

(c) Construct the algorithm from the flowchart using pseudocode. Add additional pseudocode to ensure that input is validated to only allow positive integers to be entered. [6]

(This question continues on the following page)

**(Question 14 continued)**

Efficiency is an important consideration when designing algorithms to ensure they don't waste computer resources such as memory or processing time.

- (d) Suggest **two** design considerations that could be made to an algorithm that would make it more efficient.

[4]

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**References:**

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