Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2020

Computer Science

Sections A & B

Ordinary Level

1 hour 30 minutes

130 marks

Examination number					

For Examiner use only	
Section	**Mark**
A	
B	
C	
Total	

Centre stamp

Instructions

There are **three** sections in this examination. Section A and B appear in this booklet. Section C is in a separate booklet that will be provided for the computer-based element.

Section A	Short Answer Questions	60 marks	12 questions
Section B	Long Questions	70 marks	3 questions
Section C	Programming	80 marks	1 question

Answer all questions.

Calculators may **not** be used during this section of the examination.

The superintendent will give you a copy of page 78 (Logic gates) of the *Formulae and Tables* booklet on request. You are not allowed to bring your own copy into the examination.

Write your answers for Section A and Section B in the spaces provided in this booklet. There is space for extra work at the end of the booklet. Label any such extra work clearly with the question number and part.

Answer all twelve questions.

Question 1

What is the output of the following piece of Python code?

```
1  num1=12
2  num2=10
3  print(num1 - num2)
```

Output:

Question 2

Choose the appropriate data type from the following list and place it in Column B to match the data in Column A.

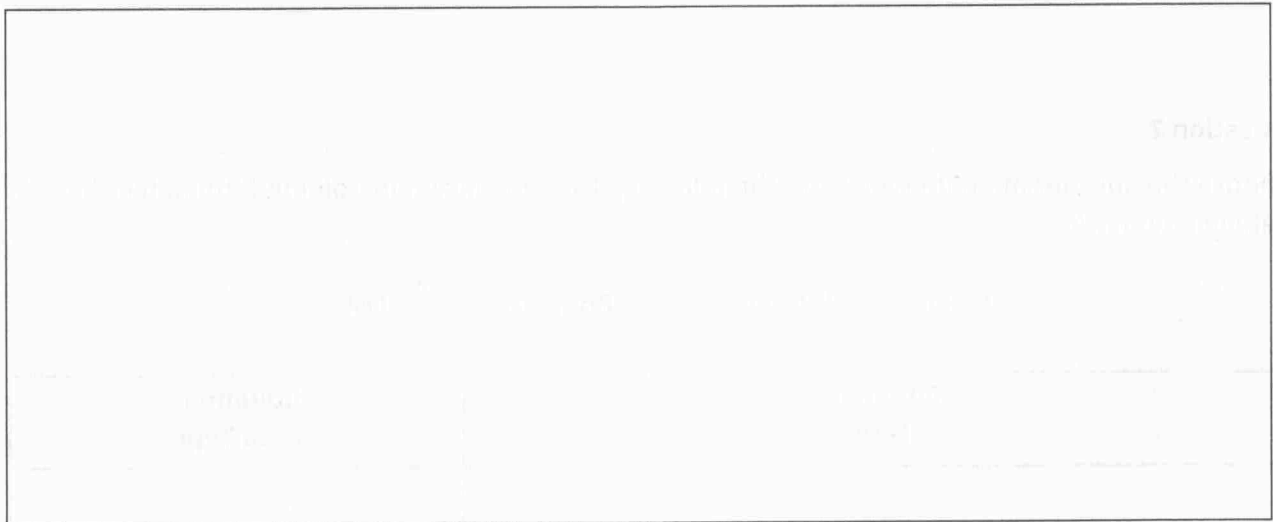Float   Integer   Boolean   List

Column A Data	Column B Data Type
45	
9.81	
["red", "green", "blue"]	
True	

Question 3

Sketch a picture of how the HTML below will be displayed in a typical web browser.

```
1   <html>
2   <body>
3
4   <h2>Colours:</h2>
5
6   <ul>
7     <li>Red</li>
8     <li>Green</li>
9     <li>Blue</li>
10  </ul>
11
12  </body>
13  </html>
```

Question 4

What output is shown in the console when the following piece of JavaScript code is run?

```
1   var x;
2   x = 4;
3   if (x == 7) {
4       x = x + 2;
5   } else if  (x < 6) {
6       x = x - 1;
7   }
8
9   console.log(x);
```

Output:

Question 5

In a typical embedded system project, you may use analogue and digital inputs. Choose the appropriate input type from the following list and place it in Column B to match the input component in Column A.

Analogue   Digital

Column A Input Component	Column B Input Type
Light Dependent Resistor	
Push Switch	

Question 6

A computer simulation is an application designed to imitate a real-life situation. An example of a computer simulation is software which simulates weather patterns and helps forecasters predict the weather.
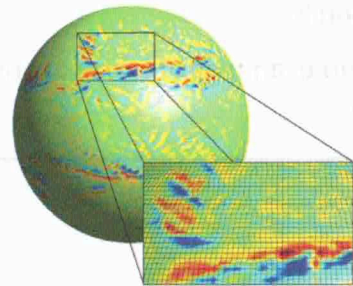
Excluding weather simulations, describe **one** other example of a computer simulation that could be designed to simulate a real-life situation.

Question 7

State whether each of the following statements about the *iterative design process* is true or false, by putting a tick (✓) in the appropriate box.

	True	False
There is a cyclic process of prototyping, testing, analysing, and refining a project.	☐	☐
Changes and refinements of the design are made based on the results of testing.	☐	☐
Testing only occurs once the project has been fully developed.	☐	☐
User feedback is constantly gathered.	☐	☐

Question 8

Give **two** examples of how adaptive technologies can assist the learning of students with special needs.

1.

2.

Question 9

Explain why a binary search algorithm is a better choice than a linear search algorithm if the following set of data is being searched for the value 195.

9, 13, 17, 22, 23, 28, 31, 32, 34, 42, 43, 44, 48, 51, 54, 58, 79, 90, 101, 112, 118, 122, 132, 135, 137, 145, 147, 154, 158, 161, 177, 179, 181, 183, 185, 192, 194, 195, 198, 199

Question 10

(a)   What do the letters in the acronym RAM stand for?

RAM:

(b)   Explain **one** key difference between RAM and ROM?

Question 11

You have created a new website which allows users to log in. You are unit testing the login page shown in the image.

Complete the table below with **two** additional test cases you would use to test the functionality of the web page. The first test case has been completed for you.

My Website

email

•••••

Sign In   Sign Up

Forgot your password? Click Here!
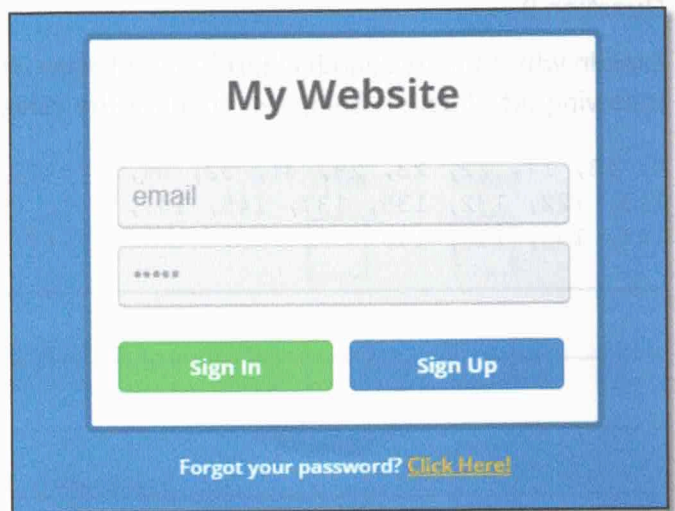
Number	Test Case	Expected Result
1	Enter valid email address and no password. Click on 'Sign In' button.	Error message displayed: "No password entered."
2		
3		

Question 12

Four of the key skills of computational thinking are listed below.
Choose the appropriate skill from the following list and place it in Column B to match the correct description in Column A. The first one has been done for you.

Abstraction **Decomposition** **Pattern recognition** **Algorithmic thinking**

Column A Description of Skill	Column B Skill
Thinking in terms of sequences and rules, creating an algorithm and executing an algorithm	Algorithmic thinking
Breaking down tasks, thinking about problems in terms of component parts and making decisions about dividing the problem into sub-tasks	
Removing unnecessary details, spotting key elements in the problem and choosing a representation of a system	
Identifying trends as well as similarities and connections	

Answer all three questions.

Question 13

In Ireland the government introduced a Public Services Card. According to the government website *"the Public Services Card establishes and fully authenticates your identity assisting you in accessing a range of public services in an easy and safe manner."*

(a) The image below shows an example of a Public Services Card.

(i) Identify the appropriate data type that could be used to store the information indicated by **A** (Forename) and **B** (Year) on the card.

A:
B:

The information indicated by **C** in the image above shows the card owner's signature. This piece of information could be stored in an image file. The size of such an image file could be measured in kilobytes (KB).
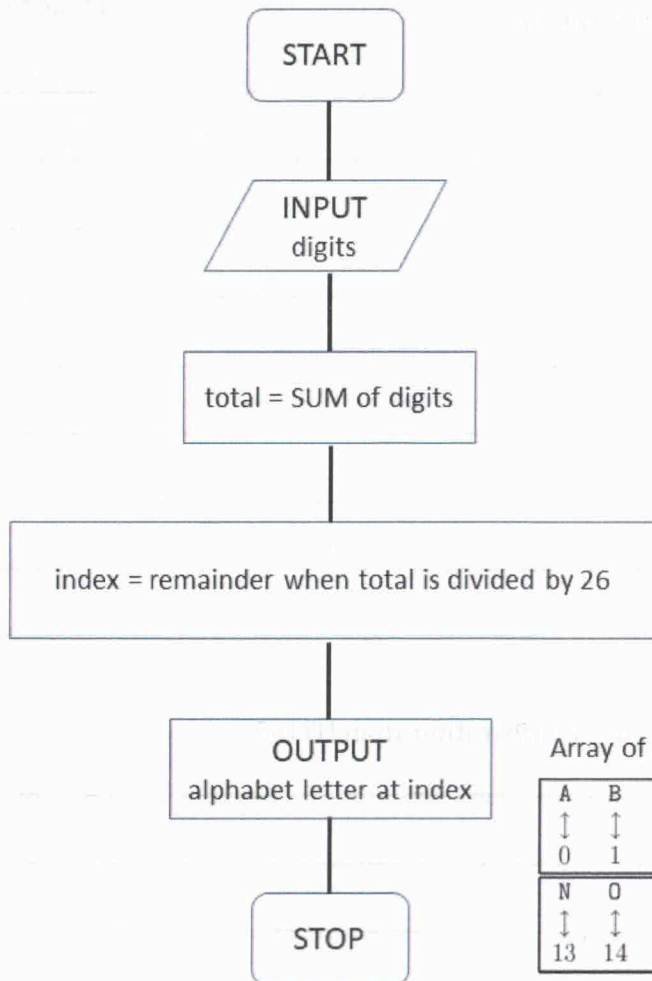
(ii) How many kilobytes (KB) are in one megabyte (MB)?

(iii) How many bits are in one byte?

(iv) A Public Services Card contains a person's Personal Public Service Number (PPSN) e.g. 1234567C. Most PPS numbers have 7 digits followed by a letter. One potential use of the letter is to check if a PPS number is valid. A simplified algorithm to generate the letter is shown in the flowchart below.

START

INPUT
digits

total = SUM of digits

index = remainder when total is divided by 26

OUTPUT
alphabet letter at index

STOP

Array of alphabet letters

A	B	C	D	E	F	G	H	I	J	K	L	M
↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕
0	1	2	3	4	5	6	7	8	9	10	11	12
N	O	P	Q	R	S	T	U	V	W	X	Y	Z
↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕
13	14	15	16	17	18	19	20	21	22	23	24	25

For example, using the process, the digits 1234567 would output the letter 'C' since 1+2+3+4+5+6+7=28 and 28 divided by 26 leaves a remainder of 2. Position 2 in the array of alphabet letters, shown above, is the letter 'C'.

Calculate, using the algorithm, the letter generated for the digits 7150909.

(b) The MyGovID website is designed to give users safe, online access to Irish government services. This website uses the HTTPS protocol instead of the HTTP protocol.

MyGov **id**

(i) Describe the purpose of the HTTP protocol.

(ii) Why does the MyGovID website use HTTPS rather than HTTP?

(c) The article below reports on how a United Nations official has reacted to the Irish Government's introduction of the Public Services Card.

Public services card carries 'big risk', says UN poverty envoy

The public services card (PSC) system runs the risk of becoming a centralised database containing intimate, personal information, the UN's poverty envoy has said.
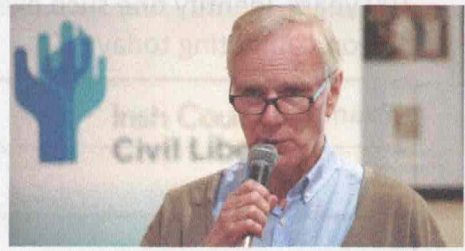
(Adapted from Irish Times article, July 29th 2019)

Give **two** reasons why you think that a government should **not** have unlimited access to people's personal data.

1.
2.

Question 14

(a) There have been many important computing developments that have taken place in the last 100 years. Identify **one** such example and discuss the significance that this development has had on computing today.

Example:
Discuss:

(b) Explain the function of the following computer components and give **one** example of each.

(i) Input devices

Function of input devices:
Example:

(ii) Output devices

Function of output devices:
Example:

(iii) Secondary storage

Function of secondary storage:
Example:

(c) Computers can convert between binary, hexadecimal and decimal numbers.

    (i) Convert the binary number 10111 to a decimal number.

    (ii) Convert the decimal number 165 to a hexadecimal number.

Question 15

You should be familiar with following a design process, similar to the one below, when working on computer science projects such as the Applied Learning Tasks (ALTs).

(a) Describe **three** activities that you would undertake in the design and development process to ensure that the user's needs are met as part of the project solution.

1.
2.
3.

(b) It is generally agreed that the quality of a user's experience in interacting with computers is enhanced when these interactions follow the principles of universal design.

Name **one** principle of universal design and explain how that principle can improve the quality of user experience.

Principle:
Explain:

(c) Klaus Schwab is a German engineer and economist best known as the founder and executive chairman of the World Economic Forum.

In a 2018 publication entitled *Future of Jobs*, Schwab predicted that there will be a high demand for careers based on computer science as the "*Fourth Industrial Revolution*" unfolds.

Identify **two** careers based on computer science and explain how these careers use computing technologies.

Career 1:
Explain:
Career 2:
Explain:

Space for extra work.

Indicate clearly the number and part of the question(s) you are answering.

Space for extra work.

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