DEPARTMENT FOR CURRICULUM,
RESEARCH, INNOVATION AND LIFELONG LEARNING
Directorate for Learning and Assessment Programmes
Educational Assessment Unit

Annual Examinations for Secondary Schools 2018

YEAR 11 Computing TIME: 1h 45min

Name: _____ Class: _____

Directions to candidates:
Answer ***ALL*** questions in **Section *A*** and ***Section B*** on this paper;
The use of flow chart template is permitted
Calculators are ***NOT*** allowed

Good English and orderly presentation are important

For office use only:

QUES	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**Paper Total**	**Course Work**	**Final Mark**
MAX	5	5	5	5	5	5	5	5	5	5	5	15	15	85%	15%	100%
MARK																

1. In 2012, Microsoft removed the Start Menu from Windows 8, but the public felt that the new user interface was not user-friendly and Microsoft soon brought the Start Menu back.

a. What do you understand by the term **user interface**? [1]

b. **Name** and **briefly describe** two other features of a user interface that make an Operating System more user-friendly. [2]

	Feature	**Description**
i.		
ii.		

c. Windows is a multi-programming Operating System. Explain how this differs from a single-programming Operating System. [1]

d. A photocopier has a batch processing Operating System, while a SMART TV has a multi-programming Android Operating System. [1]

Mention **one** significant difference between these two types of Operating Systems.

2. A newly refurbished gym is now offering its members access to an indoor pool. The database used to keep the necessary records was updated. One of the tables used, called 'Members', stores the usual basic information about the members and also whether they had paid for pool access or not.

   a. Complete the record structure for the 'Members' table. [2]

Field name	Field type
ID Number	
Name	Text
Surname	
	Date
Pool Access	

   b. Which field would you establish as the **keyfield**? Explain your answer. [1]

   c. Name **one** other file (table) you would expect to find in this database and briefly describe its use. [1]

   d. While updating the database, the database specialist had the possibility to use variable-length records or fixed-length records. Which type of record would you use? Briefly explain your answer. [1]

3. A university is setting up a new Virtual Learning Environment (VLE), hoping it will improve the students' learning experience when compared to the VLE they are currently using. The university engaged a Systems Analyst to carry out this task.

   a. The first step that the Systems Analyst follows is the Problem Definition and Feasibility Study. What is the purpose of carrying out the feasibility study? [1]

b. Name **two** techniques which the Systems Analyst can use to gather information about the current system. [2]

i. _____

ii. _____

c. Step 5 of the System Development Life Cycle is the Implementation and Changeover. Briefly explain what is done in the Implementation phase. [1]

_____

_____

d. Name **one** other use of computers in education. [1]

_____

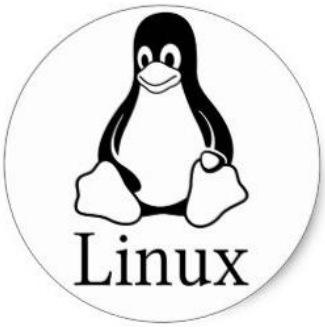
4. The hexadecimal number system is often used by programmers to refer to locations in memory.

a. Give **one** reason why programmers prefer the hexadecimal system to binary. [1]

_____

Programmers using the Linux Operating System, use assembly instructions to interact with the core of the Operating System, also known as the kernel.

One assembly instruction used is **ADD 80h;**
(where h signifies that 80 is in hexadecimal form)



b. Name **one** reason why programmers often code in higher level languages rather than assembly language. [1]

_____

_____

c. Suggest **one** context in which assembly language would be preferable to a high level language. [1]

_____

_____

d. What are the binary and decimal equivalents to 80_{16}: [2]

i.	Binary	*Answer:* _____
ii.	Decimal	*Answer:* _____

5. AMD has recently launched the top of the line processor called Ryzen 7, with a clock speed of 4GHz.

a. What do you understand by the term 'clock speed'?

_____ [1]

_____

b. **Name** and **briefly describe** two features, other than clock speed, that can impact CPU performance. [2]

	Feature	**Description**
i.		
ii.		

c. A CPU consists of a number of special-purpose registers. Which of these registers are used during the following stages of the Fetch and Execute Cycle? [2]

i.	Stores the address of the next instruction.	
ii.	Holds the instruction currently being executed.	

6. Maurice Wilkes was a British computer scientist whose work greatly simplified CPU development. One of his famous quotes is:

> "I can remember the exact instant when I realized that a large part of my life from then on was going to be spent in finding mistakes in my own programs."

a. Mistakes in our programs can be of three main types. Complete the table with: [2]

syntax error	runtime error	logical error

i.	The Java compiler will help you find these errors in your program.	
ii.	These are errors generated due to circumstances that arise during program execution.	

b. The following code has **two** errors. Name the type of error involved and suggest a solution. [2]

```
class Rectangle{
    int length;
    int breadth;
    int area;

   void enterDetails(){
           System.out.println ("Enter length");
           this.length = Keyboard.readInt();
           System.out.println ("Enter length");
           this.breadth = Keyboard.readInt();
   }

    void showArea(){
        System.out.println ("The area is: "  this.area);
        this.area = this.length * this.breadth;
    }
}
```

	Type of Error	Solution
i.		
ii.		

c. Would you expect the System Changeover phase of the System Development Life Cycle (SDLC) to happen before or after the Testing phase? Explain your answer. [1]

7. The University of Malta (UoM) offers a BSc in Computer Engineering which is particularly oriented towards students who would like to become computer engineers.

The UoM website describes the course as a three-year programme covering the following areas:

- Embedded systems
- Computer networks
- Computer Systems
- Telecommunications
- Signal processing and machine learning
- Microelectronics

a. What is the role of a computer engineer? [1]

b. **Underline** the correct answer. [1]

Embedded systems are:

(general-purpose computers, special-purpose computers)

c. Name **one** household use of an embedded system. [1]

d. Cars make use of a number of embedded systems. **Name** and **describe** one embedded system used in modern cars that increases driving safety. [2]

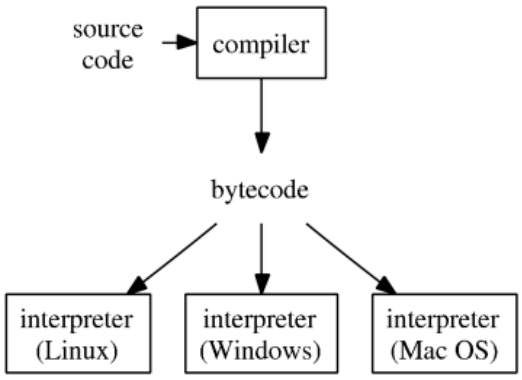
8. Ms Ann Camilleri is a teacher who has recently bought a new tablet which she will be using for her work.

Name the **type of software** that she can install for each of the following tasks.
(Use only generic software terms. For example, use 'Email Browser' instead of 'MS Outlook')

i.	Producing presentations to use as visual aids in class.	
ii.	Producing notes for her class.	
iii.	Recording student marks and obtaining basic statistics like highest, lowest and average marks.	
iv.	Editing photos to use on the school website.	
v.	Looking up material related to her subject online.	

[5]

9. One major advantage of Java is its platform-independence, which means that programs in Java will run on different machines. This is achieved because a two-step translation process is used.



- Java is first **compiled** to produce 'bytecode' which is compatible with all systems.
- Every system then uses a specific **interpreter**, called the Java Virtual Machine (JVM), which will convert the bytecode into a platform-dependent executable code.

a. **Tick** (✓) whether a compiler **or** an interpreter is ideal in the following scenarios. [3]

	Scenario	**Compiler**	**Interpreter**
i.	Ideal when testing code.		
ii.	Ideal for code distribution.		
iii.	Produces an executable file that can be stored.		

b. Suggest **one** reason why platform-independence is a very useful feature of modern programming languages. [1]

c. Mention **one** other **advantage** of coding in Java. [1]

10. Two's complement representation allows addition and subtraction to be performed with the same CPU circuitry. Therefore, processors designed this way are simpler and more economical.

a. What is the largest positive number that can be stored in an 8-bit two's complement register? [1]

b. Represent -23 in 8-bit two's complement. [1]

Answer: _____

c. Hence add -23 to 75 in 8-bit two's complement. [2]

Answer: _____

d. Which CPU register temporarily stores the result of the answer in part (c)? [1]

11. A soft drink factory needs a circuit that controls the power-on mechanism of its capping machine. The circuit should determine whether or not the machine powers ON based on the following rules:

1. The machine powers ON (P=1) if it is set up on WORKING mode (W=1)
2. The machine powers ON (P=1) if the caps container is loaded with caps (C=1)
3. A manual override powers the machine ON (P=1) regardless of the above settings (M=1)

a. Design a logic circuit for the above-mentioned system. [2]

b. Hence, make the truth table for this capping machine. [3]

Section B

12. The tech giant, Apple, has recently released the iPhoneX, a flagship smartphone that was announced in late 2017. This phone's display is detailed below.

Type	Super AMOLED capacitive touchscreen, 16M colours
Size	5.8 inches (~82.9% screen-to-body ratio)
Resolution	1125 x 2436 pixels (~458 ppi pixel density)
Multitouch	YES
Protection	Scratch-resistant glass * Wide colour gamut display * Dolby Vision/HDR10 compliant * 3D Touch display * True-tone display

a. What is the colour depth of this display? [1]

b. Given that a phone uses 24-bit colour representation, how many bits are sent to the screen to light it up once? [1]

c. Which device would have the best picture quality: The iPhoneX or a tablet with a 9.7 inch display with the same resolution of that of the iPhoneX? Explain your answer. [2]

d. Old mobile devices had a menu-driven interface while modern smartphones use a graphical user interface. Which type of user interface do you prefer and why? [1]

A key feature of the iPhoneX and other current flagship phones is facial recognition unlock.

e. Do you think this is a useful security feature? Explain your answer. [1]

f. **Name** and **briefly describe** two other security features you may find implemented on current smartphones. [2]

i.	
ii.	

This phone comes with 3GB of RAM and an option of 64GB or 256GB of internal storage which are not expandable.

g. Explain why users generally favour devices with more RAM. [1]

h. Unlike this phone, some other smartphones come with a fixed internal storage capacity and the possibility to expand storage. [1]

Mention **one** storage medium that is usually used as expandable storage for smartphone devices.

The majority of smartphone users access the Internet from their phone. Those who do not have an unlimited broadband usually tend to monitor data consumption to avoid exceeding the monthly data quota which is generally measured in GB.

i. While waiting for his bus home, John downloaded a song, replied to an email, browsed a web page, watched a five-minute HD video clip on YouTube and uploaded a photo on Facebook. [2]

Match John's activities with the data consumption amounts below. The first one has been done as an example.

1MB	**400KB**	**4MB**	**25MB**	**25KB**

i.	Post a photo on Facebook	*400KB*
ii.	Browse a web page	
iii.	Watch a 5-minute HD video	
iv.	Send a text-only mail	
v.	Download a song	

Once John arrived home, his phone connected automatically to his home WLAN as that allowed him to use the internet more cheaply.

j. Suggest **two** reasons why most households opt for a WLAN instead of a wired LAN. [1]

i.	
ii.	

k. Suggest **one** reason why users may still opt for a cabled connection over a WLAN. [1]

_____

l. Mention **one** type of cable used to connect to the Internet through a wired LAN. [1]

_____

13. Smartwatches can help the user lead a healthier lifestyle by monitoring certain factors, such as:

- Exercise
- Diet
- Weight
- Sleep patterns

a. Mention one **advantage** of keeping track of the above-mentioned factors through a smart watch rather than doing so manually (on paper). [1]

_____

A smartwatch is generally equipped with a heart rate monitor. The user's average heart rate (average beats per second) is stored in an array.

b. How would you declare an array called 'hourlyHeartRate' to store the average heart rate of every hour for ONE day (24 hours)? [2]

_____

c. Complete the section of code below to find and output the difference between the fastest and the slowest heart rate in a day. [4]

```
public int getLowestHeartRate(){
    int lowest = 1000;
    for(_____________________________){
        if (_____________________________){
            lowest = this.hourlyHeartRate[i];
        }
    }
    _____________________;
}

public int getHighestHeartRate(){
    int highest = 0;
    for(_____________________________){
        if (_____________________________){
            highest = this.hourlyHeartRate[i];
        }
    }
    _____________________;
}

public void showRange(){
    int range = _____________________________________;
    System.out.println ("The difference between the fastest
    and slowest heart rate is " + range + "beats per minute");
}
}
```

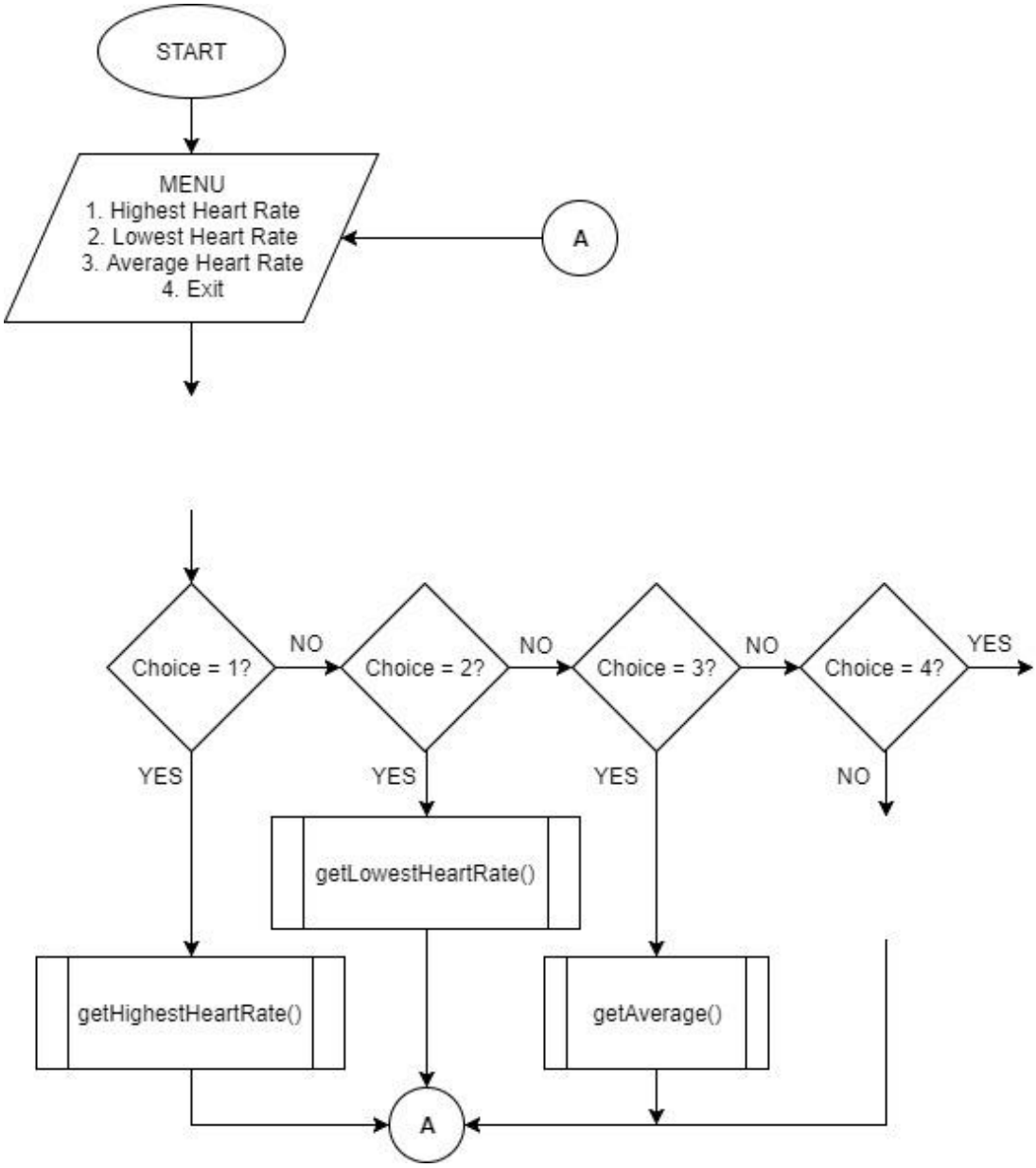
d. Write a method called *getAverage()* that finds and returns the average heart rate (avgRate) of an entire day. [4]

e. Another method called *mainMenu()* shows a menu and the user can select from the available options as shown on the right. Also, if an inexistent option is chosen it will display an "invalid" message. Complete the following flowchart which represents the algorithm for this method. [3]

```
<< MAIN MENU >>

1. Highest Heart Rate
2. Lowest Heart Rate
3. Average Heart Rate
4. Exit

>>Option:
```



f. **Name** and **briefly explain** one other use of computerised devices in the medical field. [1]

End of Paper