DULWICH COLLEGE | SINGAPORE |

Year 9 Examination

Computer Science

Date: May 2017

Paper 1:Computer Science

Name:……

Time allowed: 90 minutes

Answer **all** questions in the spaces provided/on lined paper.

Total Marks available	/90	Teacher comment:
	%	
Level/Grade		

Student reflection

Section 1 – 20 Marks

Attempt All Questions

1. Convert the 8 bit binary number **0110 1100** into a decimal/denary number. Show your working. **1**

2. Assuming two's complement, convert **1110 1100** into a decimal/denary number. Show your working. **1**

3. True Colour refers to the colour depth of an image. How many bits per pixel is true colour **1**

4. Computer Systems make use of Input, Output and Backing Storage devices. Give three examples of each **3**

Input Devices	Output Devices	Backing Storage Devices

5. RAM and ROM are two types of Main Memory, fully explain the difference between the two **1**

6. The *Pseudocode* below shows how a program could store and process the house points of pupils in a Computing Science class.

```
Line 1. SET Total House Points TO Receive Input from Keyboard
Line 2. SET House Name to Receive Input from Keyboard
Line 3. SEND [House Name, " received" , Total House Points] TO DISPLAY
```

State the most suitable *data type* for each of the variables in this pseudocode **2**

7. a) Backgroundz.com is a website that features high definition background images to download for free. Each image uses 16 bit colour and a resolution of 1024 by 800. Calculate the backing storage requirements in Kilobytes **2**

Show your working

b) Backgroundz.com is researching using Compression. Explain the difference between Lossless and Lossy Compression methods **2**

c) i)Backgroundz.com decides to implement compression for all of their images. Explain one advantage for Backgroundz.com if they were to compress the images **2**

c) ii) Explain one advantage for Backgroundz.com customers now that the images are compressed **2**

_____

_____

8. a) State where in a computer system binary instructions are executed **1**

_____

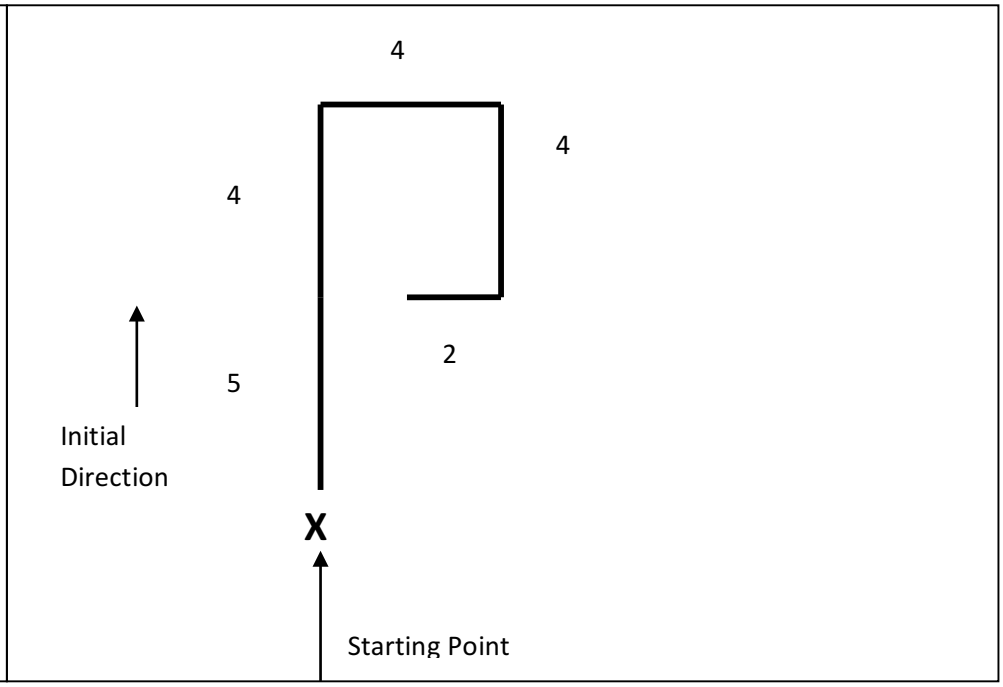
_____

9. A programming language has several built in functions

move(n)	n = distance moved in squares
turn(d)	d = degrees turned (positive means clockwise)

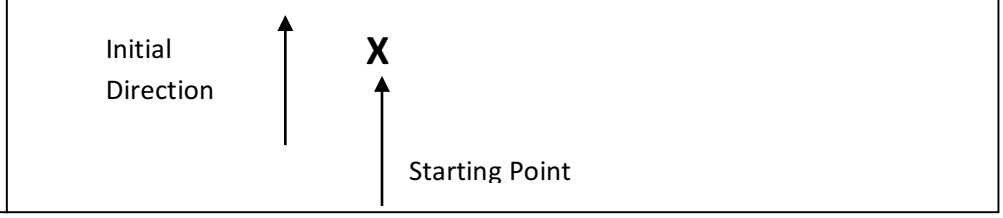
These can be used by the programmer to move objects and characters on screen.
An example program is used to move a tank sprite to a position on screen like so

```
Move(5)
REPEAT 3 TIMES
        move(4)
        turn(90)
END REPEAT
Move(2)
```



a. A missile is fired at the tank from the same starting point. Show the motion path of the missile and draw the output of its path, label the diagram for clarity **2**

```
Move(2)
Turn(-90)
REPEAT 3 TIMES
        move(3)
        turn(90)
        move(2)
        turn(-90)
END REPEAT
```



b. when the program is being developed it is translated into Binary using a translator

i. State the name given to binary instructions **1**

ii. State one reason why it would be better to use an Interpreter in this situation **1**

iii. State two reasons why a compiler is used to translate the completed program **2**

iv. Explain why a translator is required for a program written in a High Level Language **2**

10. A computer program is used to store the number of hours a students studies on Monday to Friday. The 5 numbers are stored in five separate variables.

a. Using Pseudocode or a programming language of your choice, write a short program which will tell the user their average number of hours studied over the week **3**

b. The Pseudocode shown below shows how the hours are entered

```
Line 1      REPEAT
Line 2          RECEIVE hours FROM keyboard
Line 3          IF hours < 0 or hours > 12 THEN
Line 4              SEND appropriate message to display
Line 5          END IF
Line 6      UNTIL hours >=0 and hours <= 12
```

Describe all of the events that will occur if the user enters the value 15 **3**

c. State the type of loop shown in the design. Justify your answer **2**

d. The program is now tested using the following *test data*

i. Complete the table below to show four examples of test data and the type of each example **3**

Test Data	Type of Test Data
Hours = 5	Normal
Hours = 12	
Hours = 3	
	Erroneous

11. An autonomous car automatically applies its breaks when it detects another object in front of it closer than 10 metres. The car also automatically applies its breaks if it exceeds 30 miles per hour.

    a. The Pseudocode below shows the design for the program
    There are thee errors made in the logic of the program. Find and describe each error made and how to correct them **3**

```
Line 1    RECEIVE speed FROM real sensor
Line 2    RECEIVE distance_to_object FROM real sensor
Line 3    IF distance_to_object > 10 AND  speed > 30
Line 4        REPEAT
Line 5            SEND apply_break to BREAKS
Line 6        UNTIL speed > 30
Line 7    END IF
```

Error	Line Number	Description
1.	_____	_____
		_____
		_____
2.	_____	_____
		_____
		_____
3.	_____	_____
		_____
		_____

b. The above design was created using *Pseudocode*.

i. Name another design notation which could have been used instead **1**

_____

(ii) Describe one advantage of using this design notation rather than pseudocode **2**

_____

_____

12. A countdown timer on a website is created to give users 60 seconds to enter their password before it automatically blocks them from the website. A separate loop gets the user to enter the password. This particular Pseudocode shows the loop for the timer.

```
Line 1    SET total_time to 0
Line 2    REPEAT
Line 3        WAIT 1 seconds
Line 4        SET total_time to total_time +1
Line 5    UNTIL total_time = 60
Line 6    SEND ["Time to enter has now expired"] to DISPLAY
```

a. The program above stops when the total_time = 60
The design is changed to display a warning message when the time is more than 45.
Use Pseudocode or a programming language with which you are familiar to show how this extra feature could be implemented. **2**

b. Describe clearly, with reference to values and variables, what the following *Pseudocode* does. **3**

```
Line 1 Set length_of_text to length(username)
Line 2    IF length of text  < 5 THEN
Line 3                        SEND [“Username must be more than 5 characters”] to display
Line 4               END IF
```

13. Michelle is the office manager of a large web design company. She has to buy 20 computers to replace the old stand-alone Desktop computers that her company use at present.

(a) Describe two advantages of replacing the Desktop computers with tablet computers **2**

(b) Michelle wants to issue all employees in the company with an External hard drive. State two criteria that they should use when deciding which external hard drive to buy. **Money is not an issue** **2**

(c) Employees in the web design company use a 4 megapixel camera for taking pictures to be uploaded to websites. Michelle has decided to upgrade the camera to a 12 megapixel camera. State one advantage and one disadvantage that her new photographs will have over her old photograph **2**

(d) Michelle has two specifications for replacement workstations

Specificaiton 1: 3 GHz, 64-bit CPU with 8 MB RAM, 1TB

Specifiation 2: 3.2Ghz, 64-bit CPU with 4MB RAM, 800 GB

Compare the performance likely to be provided by these two specifications **4**

14. Rob is a junior web designer at a local delivery company. He is currently training to write and develop websites using HTML and is also responsible for the graphical content online for the company

(a) Describe how Binary Digits are used to represent bitmap images **1**

(b) The photo gallery features a wide range of product images. A photograph is going to be added to the gallery **2**

Toy Truck Version 1

Item Type: JPEG Colour Image Bit Depth: 24 bits

Date Taken: 28/4/2016 File Size: 4.5 Mb

Dimensions: 4000X3000

Toy Truck Version 2

Item Type: JPEG Colour Image Bit Depth: 8 bits

Date Taken: 28/4/2016 File Size: 2.61 Mb

Dimensions: 4000X3000

Explain why Toy Truck Version 2 is being added to the photo gallery instead of Toy Truck Version 1

(c) What does RLE stand for **1**

(d) The website makes use of sound files stored as MP3 files which play automatically when a user visits a page. Give a detailed description of how the following to items are used to store sound and their implications for the sound/memory usage **2**

Sampling Frequency/Sampling Rate

Bit Depth/Sample Depth

	Implications on Memory Requirements	Implications on Sound Quality
Increasing Sample Rate		
Decreasing Sample Depth		

(e) The website stores details on all of its users. State two rights the users are given under the data protection act **2**

(f) RLE is applied to a colour graphic, a sample row of colours is shown below. Explain how these colours would be compressed using RLE **2**

RRRBBGGBGGGGGBBBBBBGGGGGGGGGG

(g) Visitors to the site are relieved to see that the website uses encryption. Explain what is meant encryption and how it protects visitors to the site **3**

(g) One of the first methods of Encryption involves shifting characters a specific number of characters in the alphabet. What is the name give to this type of encryption **1**

_____

(g) Decode/Encode the following messages **2**

Message	Shift	Shifted Message
Tablet	**-5**	
fgumvqr	**+2**	

15. Trace Tables are a method used to track the value of variables as a program executes. This can be used to find errors in code where values do not match expectations

(a) Complete the trace table for the following code example. The table may contain more rows than are necessary to complete this question **4**

```
searches = 0
found = false
memoryUsed = 1.0

For i in range(1,7):
    If i == 6:
            Found = True
            searches = searches -1
    Else:
            searches = searches + 1
            memoryUsed = memoryUsed + 0.3
```

Iteration / Variables	Searches	Found	memoryUsed
Initial Values			
1			
2			
3			
4			
5			
6			
7			
8			

9			
10			

(b) Identify the variables and state their data types used in the program design **3**

	Variable	Data Type
1.	_____	_____
2.	_____	_____
3.	_____	_____

16. Digital Wars is an eGaming league who have different memberships based on the level at which a gamer is playing.

Gold memberships are given to users with 250 or more points
Silver memberships are given to users with more than 150 points
Bronze memberships are given to users with more than 50 points
Anyone else, has a basic membership

Users score points for three different games. Insane Race – users can score from 0 to 100 points. CrimeMaft – users can score from 0 to 200 points. Kario Mart – users can score from 0 to 150 points.

A user enters the points they have scored in each game which is then totalled. Inputs are validated.
All values are then displayed on screen. The type of membership the user has achieved is also displayed.

The user is then told how many more points they need to earn to achieve the next tier. A member with Gold status will not see a message telling them how many more points are required to achieve the next tier.

A sample output is shown

Insane Race – 85 points
CrimeMaft – 15 points
Kario Mart – 20 points
Total – 120 points
Bronze Membership
You need to achieve 30 more points to achieve Silver Membership status

a. Using Pseudocode or a programming language of your choice, write a short program which will achieve this outcome (You may use additional pages if necessary) **9**