Name: _____ **Class:** 4S3 **Index Number:** _____

Anglo-Chinese School (Barker Road)

PRELIMINARY EXAMINATION 2020

SECONDARY FOUR EXPRESS

COMPUTING PAPER 1

7155/01

2 HOURS

INSTRUCTIONS TO CANDIDATES:

Do not open this booklet until you are told to do so.
Write your name and index number clearly in the spaces at the top of this page.
Write in dark blue or black pen. You may use soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Approved calculators are allowed.

Answer **all** questions.

The number of marks is given in brackets [ ] at the end of each question or part of question.
You should show all your working.
The total mark for this paper is 80.

TOTAL	80

This paper has 13 pages, inclusive of the cover page.

1 The diagram show four types of computer or network identifiers and six types of representation on the right.

Draw one line between each identifier to its correct representation.

Identifiers		Representation
		• sequence of six hexadecimal numbers, one for each byte of the address, separated by hyphens or colons
IPv4	•	• two byte number assigned in a range from 0 to 65,535.
Media Access Control (MAC)	•	• sequence of four denary numbers, one for each byte of the address, separated by dots.
Port	•	• sequence of three bytes, one for each component
SSID	•	• thirty-two byte string
		• sequence of sixteen hexadecimal digits, one for each byte of the address, separated by dots.

[4]

2 **(a)** Convert the binary number **1011 1101** into a positive whole denary number.

_____

_____[1]

(b) In a signed byte, the leftmost bit in one byte of data can be used as a sign bit, i.e. 0 or 1 to represent positive or negative numbers respectively.

State the biggest positive whole denary number that can be represented by one signed byte of data.

_____[1]

3 Memory addresses can be represented in hexadecimal codes.

(a) 6EF50A50 is an example of a hexadecimal memory address.

Complete the table below to convert each unique hexadecimal digit to its binary value.

Hexadecimal	**6**	**E**	**F**	**5**	**0**	**A**
Binary	……	……	……	……	……	……

[3]

(b) Convert the denary number **1258** into hexadecimal number. Show your working.

_____[2]

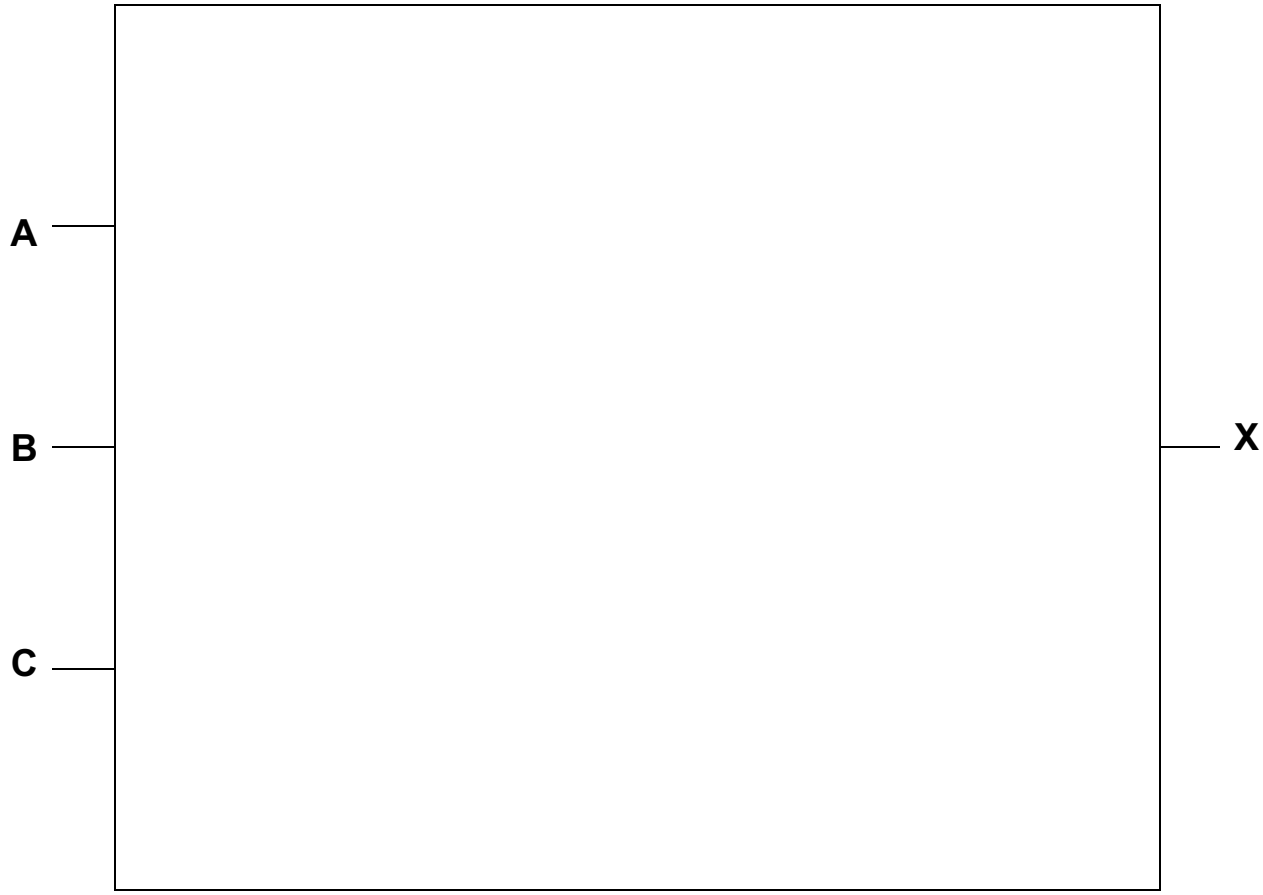
(c) Explain why hexadecimal numbers are commonly used to represent binary numbers.

_____

_____[1]

4 **(a)** Draw the logic circuit to represent the following Boolean statement. Do not simplify the statement.

X = NOT **A** OR (**B** NOR **C**) NAND (**A** OR **C)**



[4]

(b) Complete the truth table for the Boolean statement:

X = NOT **A** OR (**B** NOR **C**) NAND (**A** OR **C)**

A	B	C	Working space	X

[4]

5 Technology is currently an area of growth in the financial industry.

(a) Give **two** benefits to the consumers of using technology to manage their finances.

1 _____

_____

2 _____

_____[2]

(b) It is imperative that financial institutions are secured against cyberattacks. Describe the following terms **and** how they could be used in cyberattacks.

Pharming _____

_____

_____

_____

Malware _____

_____

_____

_____[4]

6 There are different types of software licenses.

(a) FOSS stands for _____software. [1]

(b) Proprietary software can be categorised as freeware or shareware. State one similarity and difference between the two types of software.

Similarity _____

_____

_____

Difference _____

_____

_____[2]

7 Computers need to process data and follow instructions.

(a) CPU stands for _____. [1]

(b) Describe and state the function(s) of the following parts found in the CPU.

Arithmetic Logic Unit _____

_____

_____

Control Unit _____

_____

_____[2]

(c) (i) Explain the use of a bus in a computer.

_____

_____[1]

(ii) State the **two** types of buses found in a computer.

1 _____

2 _____[1]

8 A local university is located on two campus within a city. It has a computing network to facilitate data transfer.

(a) Identify the geographical network of the university.

_____[1]

(b) State **two** advantages of a computer network.

1 _____

_____

_____

2 _____

_____

_____[2]

(c) State **two** disadvantages in using a computer network.

1 _____

_____

_____

2 _____

_____

_____[2]

(d) The university deploys a hybrid system of wired and wireless networks. Describe one possible use of each network and explain why it is used.

Wired network _____

_____

_____

Wireless network _____

_____

_____[4]

9 The Grade Point Average (GPA) of a group of students are shown in a spreadsheet.

	A	B	C	D	E
1	**Name**	**Student ID**	**Year of Admission**	**DOB**	**Grade Point Average (GPA)**
2	ASHER	20200398		2/1/2004	4.20
3	BELLE	20200253		5/3/2004	3.36
4	CHARLES	20200284		3/4/2004	3.42
5	DARREN	20200509		30/12/2003	4.63
6	EGLIN	20180145		15/11/2001	3.20
7	FELINE	20200304		7/6/2004	4.21
8	GEOFF	20200768		3/10/2004	3.23
9	HERMES	20190499		25/3/2003	2.86
10	ISAAC	20200239		18/8/2004	3.29
11	JACK	20190185		2/1/2004	2.62
12	KONAN	20200616		9/6/2004	2.44
13					
14	**Highest GPA**				
15	**Number of students who has GPA above 4**				

(a) State the type of data that is held in each of the following cells.

A2 _____

D8 _____

E3 _____[3]

(b) The year of admission in **Column C** can be taken from the first four digits of the Student ID in **Column B**.

Identify the most appropriate function that will need to be entered in cell **C2**.

_____[1]

(c) Cell **B14** needs to display the highest GPA.

Identify the most appropriate function that will need to be entered in cell **B14**.

_____[1]

(d) Cell **B15** needs to display the number of students who has a GPA above 4.

Identify the most appropriate function that will need to be entered in cell **B15**.

_____[1]

(e) Cells **E2** to **E12** need to display a red background if the number is less than 3.

State how the cells can be set to automatically change colour depending on the values inside them.

_____

_____[1]

10 A programmer is designing a point of sale (POS) system for a retail store. He wants to write an algorithm that calculates the total cost a customer has to pay for shopping at a retail store. Customers who are members of the store's loyalty program gets a 5% discount.

(a) The algorithm requires a number of input variables, e.g. number of items, cost of each item, member's name and validity of membership etc.

Tick (✓) **one** box to identify the most appropriate data type for each variable.

Variable	String	Integer	Float	Boolean
`member_name`				
`valid_membership`				
`number_of_items`				
`cost_of_each_item`				

[4]

(b) State the output(s) and the processes required to find the total cost of a customer's shopping.

Output(s): _____

_____

_____

Processes required: _____

_____

_____

_____

_____[4]

(c) The following pseudo-code algorithm validates the membership of the customer.

```
1  valid_membership = False
2  WHILE valid_membership = False
3      OUTPUT "Enter member ID"
4      INPUT ID
5      IF LEN(ID) = 5 AND ID[0] is in "AB" AND ID[1:].isdigit()
6          valid_membership = True
7      ENDIF
8  ENDWHILE
```

(i) Identify the data validation technique used in the algorithm.

_____[1]

(ii) The algorithm is tested using the following three strings as input:
`A501  AB531  B5031`

Complete the trace table for the algorithm.

ID	**valid_membership**

[2]

(d) To minimise accuracy errors, the algorithm should ensure that the `cost_of_each_item` ranges between 0 and 99.99 inclusive.

Give an example of test data for the `cost_of_each_item` for each test case condition in the following table.

Test case condition	**Test data**
Normal	
Error	
Boundary	

[3]

11 A pseudo-code algorithm is required to find the number of votes a student gets from his/her classmates during a poll. The list `Poll` contains the names of each student's vote. The algorithm will iterate through the `Poll` list and store each unique student name and its corresponding vote count on `Namelist` and `Resultlist` respectively, before outputting both lists. There are 10 students in the class.

```
1   Num_student = 10
2   Namelist, Resultlist = [], []
3   Result = 0
4   FOR Count1 = 0 to Num_student
5       Search = Poll[Count1]
6       IF Search NOT IN Namelist THEN
7           Namelist = Namelist + [Search]
8           FOR Count2 = Count1 to Num_student
9               IF Search != Poll[Count2] THEN
10                  Result = Result - 1
11              ENDIF
12          NEXT Count2
13          Resultlist = Resultlist + [Result]
14      ENDIF
15  NEXT Count1
16  OUTPUT Namelist, Resultlist
```

There are four errors in the code. Locate the errors and state the correct code.

Error 1: _____

Correction: _____

_____

Error 2: _____

Correction: _____

_____

Error 3: _____

Correction: _____

_____

Error 4: _____

Correction: _____

_____ [8]

12 A programmer wants to write a program that allows a student to key in his/her subjects taken and marks scored for each subject. The program then outputs the average marks of all subjects, the number of subjects passed and the subjects which the student failed. Each subject mark is a whole number between 0 and 100 inclusive. A student passes a subject if he/she scores 50 or more marks.

Write an algorithm, using only pseudo-code, to take the number of subjects, names and marks of each subject as input, and output the average mark, number of subjects passed and names of failed subjects. You only need to **validate** the marks input.

[8]

End of Paper

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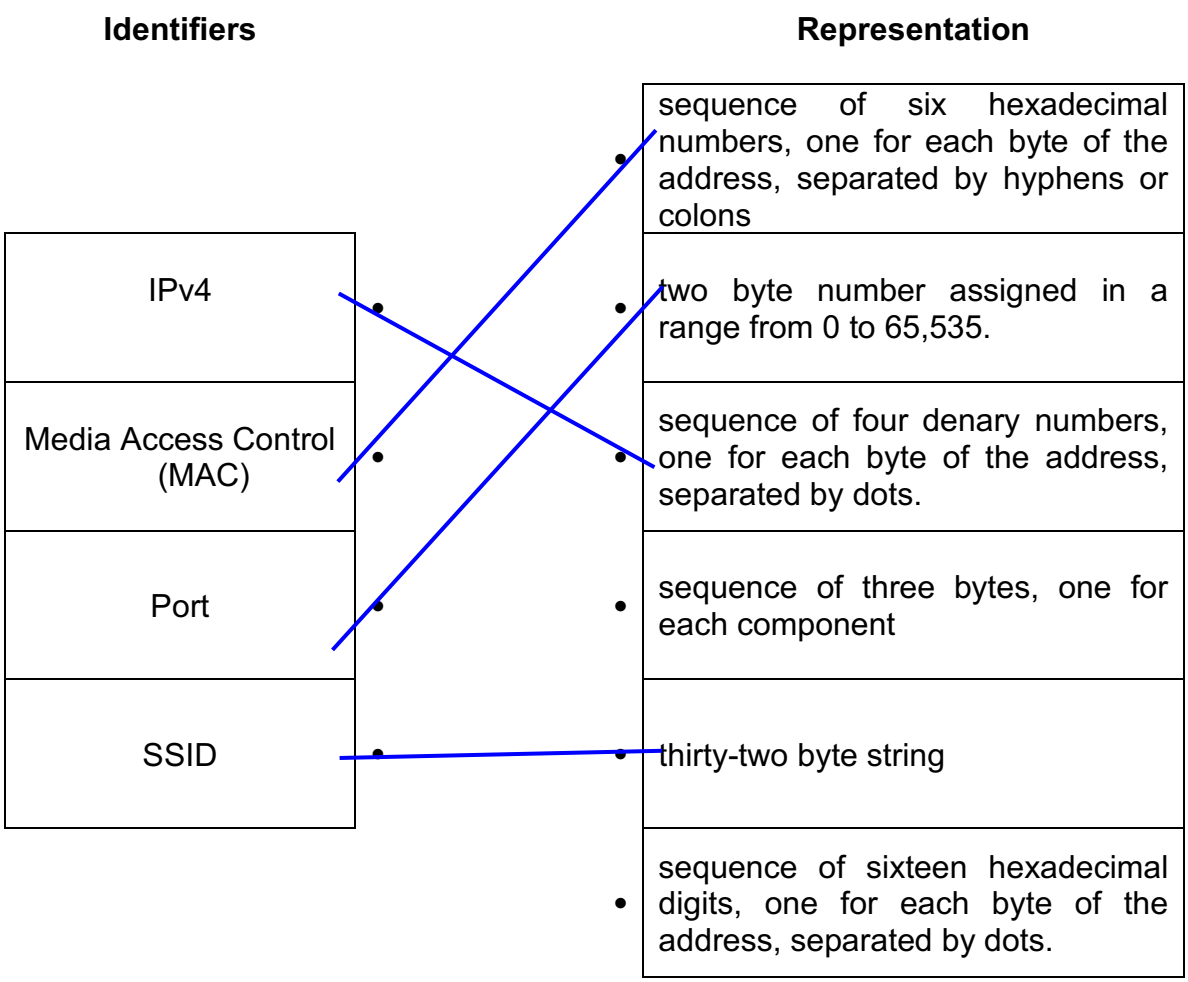
ANSWER KEY

1 The diagram show four types of computer or network identifiers and six types of representation on the right.

Draw one line between each identifier to its correct representation.



[4]

2 **(a)** Convert the binary number **1011 1101** into a positive whole denary number.

$2^7 + 2^5+2^4+2^3+2^2+2^0 = 189$

[1]

(b) In a signed byte, the leftmost bit in one byte of data can be used as a sign bit, i.e. 0 or 1 to represent positive or negative numbers respectively.

State the biggest positive whole denary number that can be represented by one signed byte of data.

127 [1]

3 Memory addresses can be represented in hexadecimal codes.

(a) 6EF50A50 is an example of a hexadecimal memory address.

Complete the table below to convert each unique hexadecimal digit to its binary value.

Hexadecimal	**6**	**E**	**F**	**5**	**0**	**A**
Binary	**0110**	**1110**	**1111**	**0101**	**0000**	**1010**

[3]

(b) Convert **1258** into hexadecimal. Show your working.

Denary	**Quotient**	**Remainder**	**Convert**
1258	**78**	**10**	**A**
78	**4**	**14**	**E**
4	**0**	**4**	**4**

[1 mark]

4EA [1 mark] [2]

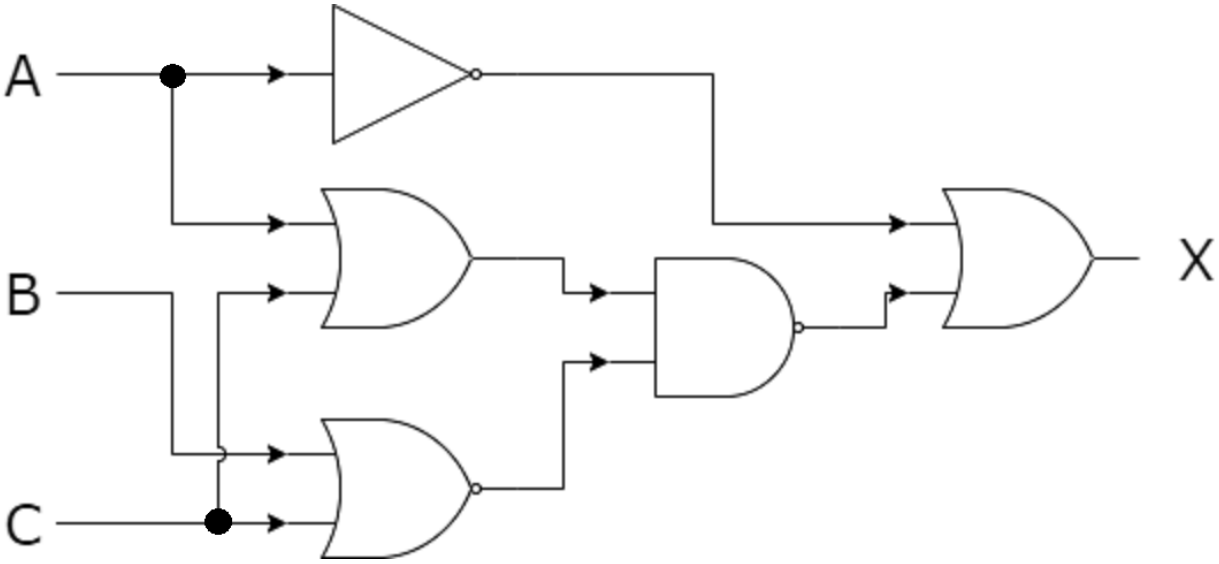
(c) Explain why hexadecimal is used commonly to represent binary.

Easy Readability and higher information density – 1 hexadecimal digit represents 4 bits

[1]

4 **(a)** Draw the logic circuit to represent the following Boolean statement. Do not simplify the statement.

X = NOT **A** OR (**B** NOR **C**) NAND (**A** OR **C)**



(b) Complete the truth table for the Boolean statement:

X = NOT **A** OR (**B** NOR **C**) NAND (**A** OR **C)**

A	B	C	Working space				X
			B NOR C	A OR C	(B NOR C) NAND (A OR C)	NOT A	
0	0	0	1	0	1	1	1
0	0	1	0	1	1	1	1
0	1	0	0	0	1	1	1
0	1	1	0	1	1	1	1
1	0	0	1	1	0	0	0
1	0	1	0	1	1	0	1
1	1	0	0	1	1	0	1
1	1	1	0	1	1	0	1

[4]

5 Technology is currently an area of growth in the financial industry.

(a) Give **two** benefits to the consumers of using technology to manage their finances.

1 **The rise of financial technology has enabled consumers to spend, borrow, invest and save money through low-cost and easy-to-use mobile and web applications. There is no longer a need to perform such transactions in person.**

2 **Individuals have also become better-educated on how to make smart financial decisions using information that is freely available on the Internet.**
[1 mark each for any suitable benefits] [2]

(b) It is imperative that financial institutions are secured against cyberattacks. Describe the following terms **and** how they could be used in cyberattacks.

Pharming **In pharming, the attacker will attempt to intercept requests sent from a computer to a legitimate website and redirect the user to a fake website [1 mark] to steal personal data or credit card details [1 mark].**

Malware **Malware stands for malicious software [1 mark] and is intentionally used to damage, disrupt or gain unauthorised access to a computer system [1 mark].**

[4]

6 There are different types of software licenses.

(a) FOSS stands for **Free and open-source** software. [1]

(b) Proprietary software can be categorised as freeware or shareware. State the similarities and differences between the two types of software.

Similarities **Both freeware and shareware are available for use at no cost.**

Differences **Freeware are "lite" versions of proprietary software, which allow users to try a limited version of the software while promoting the full version. There is no expiry date. Shareware is demonstration software that is distributed for a specific evaluation period only.**

[2]

7 Computers need to process data and follow instructions.

(a) CPU stands for central processing unit. [1]

(b) Describe and state the function(s) of the following parts found in the CPU.

Arithmetic Logic Unit **The ALU processes data by performing basic mathematical and logical operations such as addition, subtraction, multiplication and division. This unit performs the actual work of performing calculations and transforming data.**

Control Unit **The control unit follows instructions and decides when data should be stored, received or transmitted by different parts of the computer (including the ALU). This unit makes sure that data is transported to where it needs to be, and that it is processed in the correct order.**

[2]

(c) (i) Explain the use of a bus in a computer.

Collection of wires for transporting data from one part of a computer to another [1]

(ii) State the **two** types of buses found in a computer.

1 **Data**

2 **Address** [1]

8 A local university is located on two campus within a city. It has a computing network to facilitate data transfer.

(a) Identify the geographical network of the university.

Metropolitan area network _____[1]

(b) State **two** advantages of a computer network.

Advantages	Disadvantages
• Shared resources: A network allows a group of computers to make use of shared resources such as printers or files. • Shared Internet access: Depending on the network's configuration, every user who logs on to the network may have access to the Internet. • Shared software: Software can be stored on the central server of a network and deployed to other computers over a network. • Shared storage: Data files can be stored on a central server for ease of access and backup purposes. • Communication: Computers in the same network are often able to share instant messages and emails for communication.	• Initial costs: Installing a network could be costly due to the high setup and equipment costs. • Maintenance costs: There are also subsequent costs associated with administering and maintaining the network. • Security risks: As files are shared through a network, there is the risk of virus or worm attacks spreading throughout the network even with just one infected computer. • Risk of data loss: Data may become lost due to hardware failures or errors. Using a network means regular data backups are needed. • Server outage: If the server fails, the network will not be able to function, thus affecting work processes.

1 _____

2 _____[2]

(c) State **two** disadvantages in using a computer network.

1 _____

2 _____[2]

(d) The university deploys a hybrid system of wired and wireless networks. Describe the use of each network in the university and explain why.

Wired network **A wired network is a network of devices connected by cables. Data transfer is typically faster and more secure in a wired network. Wired network can be used in an intranet setup by university administrators and lecturers for personnel or confidential matters e.g. results processing, student admission etc.**

Wireless network **A wireless network is a network of devices in which signals are transmitted via radio waves. Wireless network allows university lecturers and students to connect to the internet easily using their mobile devices/laptops for research as it is more flexible and easy to configure and manage**

[4]

9 The Grade Point Average (GPA) of a group of students are shown in a spreadsheet.

	A	B	C	D	E
1	**Name**	**Student ID**	**Year of Admission**	**DOB**	**Grade Point Average (GPA)**
2	ASHER	20200398		2/1/2004	4.20
3	BELLE	20200253		5/3/2004	3.36
4	CHARLES	20200284		3/4/2004	3.42
5	DARREN	20200509		30/12/2003	4.63
6	EGLIN	20180145		15/11/2001	3.20
7	FELINE	20200304		7/6/2004	4.21
8	GEOFF	20200768		3/10/2004	3.23
9	HERMES	20190499		25/3/2003	2.86
10	ISAAC	20200239		18/8/2004	3.29
11	JACK	20190185		2/1/2004	2.62
12	KONAN	20200616		9/6/2004	2.44
13					
14	**Highest GPA**				
15	**Number of students who has GPA above 4**				

(a) State the type of data that is held in each of the following cells.

A2 **Text**

D8 **Date**

E3 **Number** [3]

(b) The year of admission in **Column C** can be taken from the first four digits of the Student ID in **Column B**.

Identify the most appropriate function that will need to be entered in cell **C2**.

=LEFT(B2, 4) or = MID(B2,1,4) [1]

(c) Cell **B14** needs to display the highest GPA.

Identify the most appropriate function that will need to be entered in cell **B14**.

=MAX(E2:E12) [1]

(d) Cell **B15** needs to display the number of students who has a GPA above 4.

Identify the most appropriate function that will need to be entered in cell **B15**.

=COUNTIF(E2:E12,">4") [1]

(e) Cells **E2** to **E12** need to display a red background if the number is less than 3.

State how the cells can be set to automatically change colour depending on the values inside them.

Conditional Formatting and select Format Cells that are less than 3 [1]

10 A programmer is designing a point of sale (POS) system for a retail store. He wants to write an algorithm that calculates the total cost a customer has to pay for shopping at a retail store. Customers who are members of the store's loyalty program gets a 5% discount.

(a) The algorithm requires a number of input variables, e.g. number of items, cost of each item, member's name and validity of membership etc.

Tick (✓) **one** box to identify the most appropriate data type for each variable.

Variable	String	Integer	Float	Boolean
`member_name`	✓			
`valid_membership`				✓
`number_of_items`		✓		
`cost_of_each_item`			✓	

[4]

(b) State the output(s) and the processes required to find the total cost of a customer's shopping.

Output(s): total_cost: total cost in currency that a customer needs to pay for shopping.

Processes required: initialise total_cost as 0; iterate through number of items times and add cost of each item to total_cost check valid_membership and apply 5% discount accordingly before output total_cost [4]

(c) The following pseudo-code algorithm validates the membership of the customer.

```
1  valid_membership = False
2  WHILE valid_membership = False
3      OUTPUT "Enter member ID"
4      INPUT ID
5      IF LEN(ID) = 5 AND ID[0] is in "AB" AND ID[1:].isdigit()
6          valid_membership = True
7      ENDIF
8  ENDWHILE
```

(i) Identify the data validation technique used in the algorithm. **Format Check** [1]

(ii) The algorithm is tested using the following three strings as input:
`A501` `AB531` `B5031`

Complete the trace table for the algorithm.

ID	valid_membership
A501	**False**
AB531	**False**
B5031	**True**

[2]

(d) To minimise accuracy errors, the algorithm should ensure that the `cost_of_each_item` ranges between 0 and 99.99 inclusive.

Give an example of test data for the `cost_of_each_item` for each test case condition in the following table.

Test case condition	Test data
Normal	**4.99 (or any other float between 0 to 99.99)**
Error	**Any number less than 0 or any other number beyond 99.99)**
Boundary	**0 or 99.99**

[3]

11 A pseudo-code algorithm is required to find the number of votes a student gets from his/her classmates during a poll. The list Poll contains the names of each students' vote. The algorithm will iterate through the Poll list and store each unique student name and its corresponding vote count on Namelist and Resultlist respectively, before outputting both lists. There are 10 students in the class.

```
1   Num_student = 10
2   Namelist, Resultlist = [], []
3   Result = 0
4   FOR Count1 = 0 to Num_student
5       Search = Poll[Count1]
6       IF Search NOT IN Namelist THEN
7           Namelist = Namelist + [Search]
8           FOR Count2 = Count1 to Num_student
9               IF Search != Poll[Count2] THEN
10                  Result = Result - 1
11              ENDIF
12          NEXT Count2
13          Resultlist = Resultlist + [Result]
14      ENDIF
15  NEXT Count1
16  OUTPUT Namelist, Resultlist
```

There are four errors in the code. Locate the errors and state the correct code.

```
1   Num_student = 10
2   Namelist, Resultlist = [], []
3   FOR Count1 = 1 to Num_student
4       Result = 0
5       Search = Poll[Count1]
6       IF Search NOT IN Namelist THEN
7           Namelist = Namelist + [Search]
8           FOR Count2 = Count1 to Num_student
9               IF Search == Poll[Count2] THEN
10                  Result = Result + 1
11              ENDIF
12          NEXT Count2
13          Resultlist = Resultlist + [Result]
14      ENDIF
15  NEXT Count1
16  OUTPUT Namelist, Resultlist
```

Error 1: Line 3 `Result = 0`

Correction: Should be in FOR loop after line 4

Error 2: Line 4 `FOR Count1 = 0 to Num_student`

Correction: `FOR Count1 = 1 to Num_student`

Error 3: **Line 9** `IF Search != Poll[Count2] THEN`

Correction: `IF Search == Poll[Count2] THEN`

Error 4: **Line 10** `Result = Result - 1`

Correction: `Result = Result + 1` [8]

12 A programmer wants to write a program that allows a student to key in his subject marks, and then outputs the average marks of all the subjects, number of subjects passed and the subjects which the student failed. Each subject mark is a whole number between 0 and 100 inclusive. The passing mark for each subject is 50 and more.

Write an algorithm, using only pseudo-code, to take the number of subjects, names and marks of each subject as input, and output the average mark, number of subjects passed and names of failing subjects. You only need to **validate** the **marks** input.

Sample algorithm

```
sub_name = []
sub_mark = []
fail_sub_list = []
sub_pass = 0

INPUT num_sub

FOR index = 1 to num_sub
  INPUT subject_name
  sub_name += [subject_name]
  INPUT subject_mark
  WHILE subject_mark < 0 or subject_mark > 100
      OUTPUT "Invalid"
      INPUT subject_mark
  ENDWHILE
  sub_mark += [subject_mark]
  IF subject_mark >= 50
      sub_pass += 1
  ELSE
      fail_sub_list += [subject_name]
  ENDIF
NEXT index

average = SUM(sub_mark)/num_sub
OUTPUT average
OUTPUT sub_pass
OUTPUT fail_sub_list
```

End of Answer Key