Year 10 Examination
Computer Science
Date: April 2020
Paper 2: Problem Solving and Programming

Name:……………………………………………...............

Time allowed: 1 hour 45 minutes

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

Total Marks available	/50	Teacher comment:
	%	
Level/Grade		

Student reflection

1 A student has written a program to allow users to enter their unique student code for discounts in the canteen. They have written a program to produce an error code in denary which will be stored as denary. Their code is as follows

```
01.   code = "ST123L"
02.
03.   errorCode = 0
04.
05.   codeOK = True
06.
07.   if code[0] != "S" or code[1] != "S":
08.       codeOK = False
09.       errorCode = errorCode + 1
10.   else:
11.       codeOK = True
12.
13.   #CODE 2:5 returns index 2,3 and 4 only
14.   if code[2:5].isdigit():
15.   #Checks code consists of numbers
16.       codeOK = False
17.       errorCode = errorCode + 2
18.   else:
19.       codeOK = True
20.
21.   if code[5] not in ["S", "L", "E", "M"]:
22.       codeOK = False
23.       errorCode = errorCode + 4
24.   else:
25.       codeOK =True
26.
27.   if len(code) != 6:
28.       codeOK = False
29.       errorCode = errorCode + 8
30.   else:
31.       codeOK = True
```

Codes should be in the format SSNNN? Where SS is followed by three numbers and ends with M, L, E or S (for each house in the College)

Accepted:	SS123L	SS000E	SS999M
Rejected:	958334	SS98753M	999SSL

a   Complete the trace table for this program when the code = "ST123L" on Line 01. You may not   [5]
     require all the rows in the table

codeOK	errorCode

b   Explain why the program correctly identifies the errors, but, on some occasions produces the   [2]
     incorrect output for codes that contain errors

     ………

     ………

     ………

c   The program above makes use of Library Routines. Identify code which is making use of a *function*   [1]
     from a Library Routine.

     ………

d   Explain why the print() command in python is a *procedure* and not a *function*   [1]

     ………

A routine checks the age and height of children who are allowed to enter a play area. The children must be less than 5 years of age and under 1 metre in height.

The first set of test data used is age 3 and height 0.82 metres.

Provide **two** additional sets of test data. For each, give

- the type of each set of test data
- the reason why it is used

Each type of test data and reason for use must be different.

Set 1 ....

Type ....

Reason ....

....

....

Set 2 ....

Type ....

Reason ....

....

....[4]

3

There is a program that stores the following data:

- EmployeeID, an employee ID which must be two letters followed by 4 numbers, e.g. TY4587
- Manager, whether the employee is a manager or not
- AnnualHoliday, number of whole days' annual holiday
- PayGrade, the employee's pay grade which must be a single letter A–F

Complete the following table to identify:

- The most appropriate data type for each variable
- An appropriate validation check for each variable. You must use a different validation check for each variable.

Variable	Data type	Appropriate validation check
EmployeeID		
Manager		
AnnualHoliday		
PayGrade		

[4]

5

Identify **three** different loop structures that you can use when writing pseudocode.

1 ....

....

2 ....

....

3 ....

....[3]

6   **Six** terms associated with programming and **six** descriptions are listed.   [5]

Draw a line to link each term with its most appropriate description.

Term	Description
Top-down design	Pre-written code to include in your own program to carry out a common task.
Structure diagram	Shows the steps representing an algorithm using various shapes of boxes.
Flowchart	Shows the hierarchy of the different components which make up a system.
Pseudocode	Shows the values of variables as you manually test your program.
Library routine	Breaks down a system into successively smaller pieces.
Trace table	Describes a program using a simplified high-level notation.

[5]

7   Describe, giving a different example for each, the purpose of these validation checks used in programming.   [6]

Range check ....

....

....

Example ....

....

....

Length check ....

....

....

Example ....

....

....

Type check ....

....

....

Example ....

....

....

8   An algorithm is written in pseudocode:

```
Total ← 0
FOR Count ← 1 TO 50
   INPUT Num
   Total ← Total + Num
NEXT Count
OUTPUT Total
```

(a)   Describe the purpose of the algorithm.

....

....

....

....

....

....[3]

(b) Re-write the algorithm in pseudocode using a different type of loop.

....

....

....

....

....

....

....

....

....

....[3]
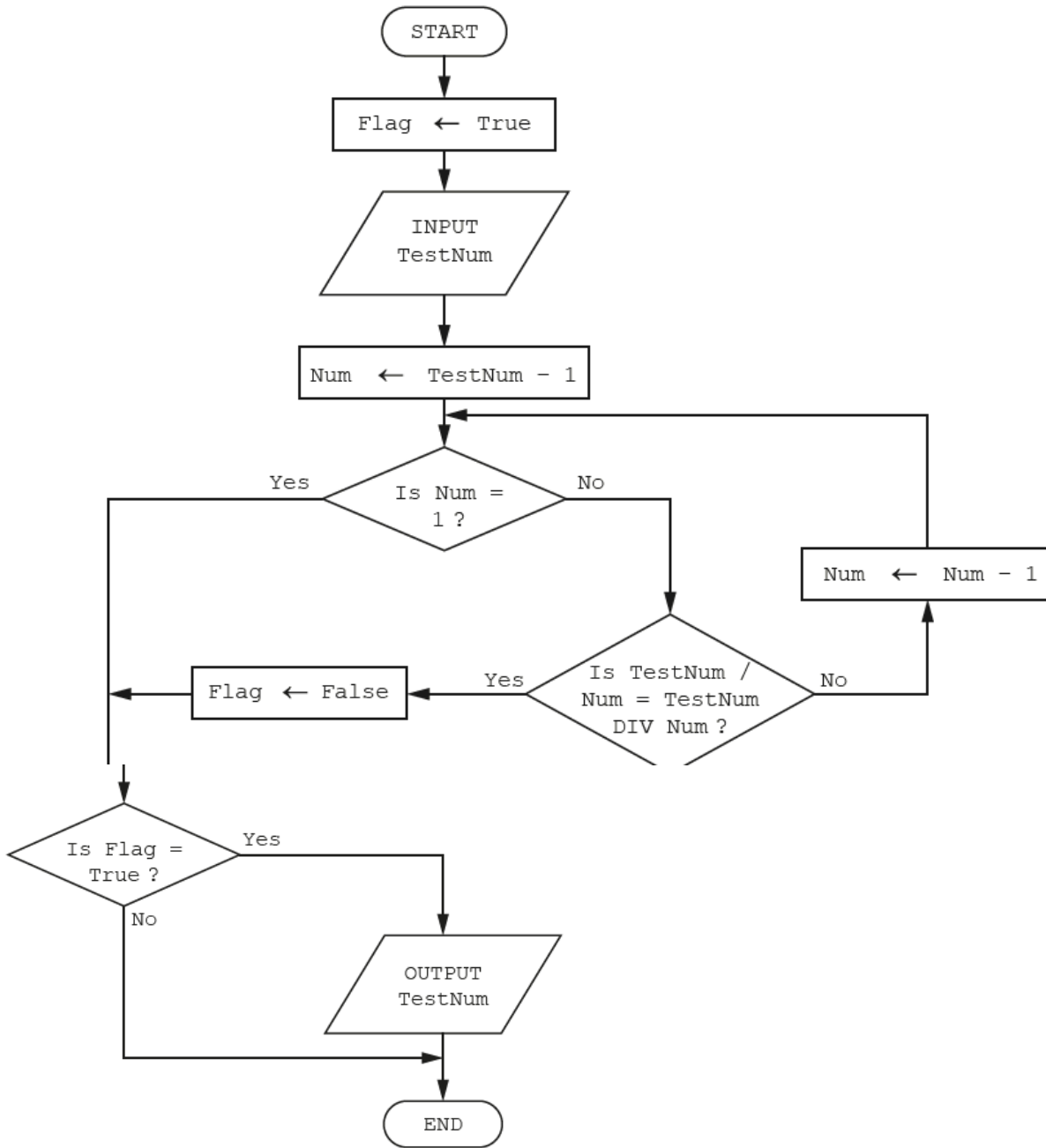
(c) Describe how you could modify the original algorithm shown at the start of question 4, to allow any number of inputs.

....

....

....

....[2]

9   The flowchart performs a mathematical process on a number input called TestNum
     DIV is used to represent integer division e.g. 7 DIV 3 = 2

```
                          ( START )
                              |
                              v
                  +-----------------------+
                  |  Flag  <-  True        |
                  +-----------------------+
                              |
                              v
                   /---------------------/
                  /     INPUT            /
                 /      TestNum         /
                /---------------------/
                              |
                              v
           +--------------------------------+
           |  Num  <-  TestNum - 1          |
           +--------------------------------+
                              |
                              v
    Yes          /--------------------\        No
      +---------<    Is Num =           >----------------+
      |          \    1 ?              /                 |
      |           \-----------------/                    |
      |                    | Yes (No)                     v
      |                    v                   +------------------------+
      |                                        |  Num  <-  Num - 1      |
      |       +------------------+             +------------------------+
      +--- |  Flag <- False   |<---Yes---/----------------\     No     ^
      |       +------------------+         \  Is TestNum /   >---------+
      |                                     \ Num = TestNum/
      |                                      \  DIV Num ?  /
      |                                       \----------/
      v
   /------------\      Yes
  <  Is Flag =   >-------------------+
   \  True ?    /                    |
    \----------/                     v
         | No                /---------------------/
         |                  /    OUTPUT           /
         |                 /     TestNum         /
         |                /---------------------/
         |                         |
         +------------------------>|
                                   v
                              ( END )
```

A   Complete the trace table for the input data: 7

[2]

Flag	TestNum	Num	OUTPUT

B   Complete the trace table for the input data: 6

Flag	TestNum	Num	OUTPUT	
				[2]

C   State the purpose of the algorithm in the flowchart   [1]

10   Each column in the table below is stored in a number of parallel one-dimensional arrays.

The name of each array is highlighted in grey on the first row. A piece of software stores   [6]
some of the desktop (DT), tablet (TB) and laptop (LT) computers an electronics company
has in stock. In the space below write the programming code to output how many
computers which meet each of the following two sets of criteria:

CRITERIA A:
   • Screen size bigger than 22 inches
   • Hard drive greater than 1999
CRITERIA B:
   • 16 or more Gb of RAM
   • Cost is less than $3000

PCID	ScreenSize	RAM	Type	HDD(GB)	Price
DT303240	30	32	DT	4000	$5000.00
DT303220	30	32	DT	2000	$4500.00
DT301620	30	16	DT	2000	$4000.00
DT231610	23	16	DT	1000	$3000.00
LT191620	19	16	LT	2000	$3000.00
LT171610	17	16	LT	1000	$2500.00
DT230820	23	8	DT	2000	$2000.00
DT190810	19	8	DT	1000	$1500.00
LT190810	19	8	LT	1000	$1500.00
LT170805	17	8	LT	500	$1200.00
DT230420	23	4	DT	2000	$1000.00
DT190410	19	4	DT	1000	$750.00
LT190410	19	4	LT	1000	$950.00
TB100206	10	2	TB	64	$200.00

A