



**COMMONWEALTH SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2024**

**COMPUTING
Paper 1 Mark Scheme (Theory)**

Name: _____ () Class: _____

**SECONDARY FOUR EXPRESS
SECONDARY FIVE NORMAL ACADEMIC
7155/01**

**Wednesday 28 August 2024
1130 – 1330
2 hours**

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

Approved calculators are allowed.

Candidates will answer on the question paper.

Answer **all** questions.

The number of marks is given in brackets [] at the end of each question or part question.

You should show all your working.

The total number of marks for this paper is 80.

For Examiner's Use	
Total	80

This paper consists of **13** printed pages including the cover page.

[Turn over

- 1 A company dealing with digital locks uses a standard touch screen keypad for its customers to enter their 4-digit pin codes to unlock the locks.

(a) State **two** reasons why the pin codes can be easily stolen.

- 1 Fingerprints from the touch screen can be traced and used to guess the combination.
 - 2 4-digit pin codes can be easily found through guess and check algorithms
-

[2]

(b) Suggest **two** ways to protect the pin codes from being stolen.

- 1 Use a dynamic touch screen keypad which changes the locations of the digit every time.
- 2 Increase the number of digits in the pin code to increase the number of combinations

[2]

The company provides an online service for customers who forget their pin codes to log into the system to reset their pin codes.

(c) Describe the difference between authentication and authorisation.

Authentication is the process of verifying the identity of a user while authorisation controls the user's access to data and resources. Authorisation occurs only after authentication is cleared.

[2]

(d) Explain why authentication is important for this service and suggest **one** method to enhance the authentication.

Authentication helps to prevent unauthorised access to the system and reset the pin codes of the actual customer. One method includes: passwords, multiple-factor authentication, security tokens or biometrics (Any one)

[2]

- 2 During COVID-19, a rural town has to use video-conferencing service for medical consultation. This includes patients who live in nearby mountainous areas.

Describe a positive, negative and ethical impact of introducing this service.

Positive

Patients in remote places or limited mobility are able to do e-consultations and get diagnosed. *(Accept hacking into video-conferencing, retrieving important data during conferencing and lack of internet access leading to being unable to video-conference. Do not accept AI, 3-D printing technology or area of growth in technology or hacking of system and retrieving the medical data as it has nothing to do with video-conferencing)*

Negative

Some patients may prefer the personal approach to medicine and distrust the diagnosis given through e-consults. *(Do not accept misuse of information from internet or decrease in jobs)*

Ethical

Is the service safe or is it ok to be monitored by unauthorised personnel such as systems administrators? *(Do not accept robots replacing humans)*

[3]

- 3 A system checks if a plant is growing healthily by checking the number of days it has grown and its corresponding height.

- (a) Identify **one** input to the system and its data type.

Number of days, integer; height of plant, float (Any one)

[1]

- (b) Identify **one** output to the system and write a program code to produce the output.

Output Health status of plant

Program code `print("The plant is growing healthily.")`

[1]

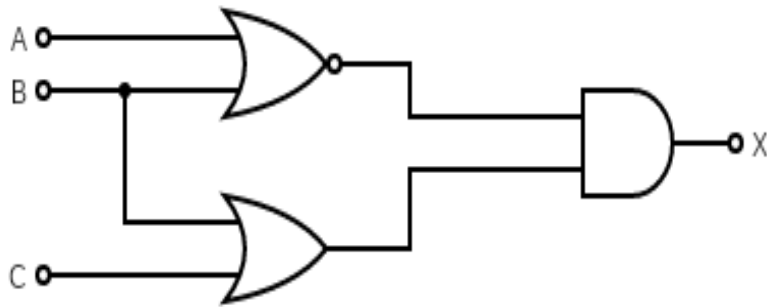
The system is upgraded to check the health status of any number of plants.

- (c) Identify a problem-solving technique that can be used to modify the program code.

Generalisation

[1]

- 4 (a) Complete the truth table for the following logic circuit.



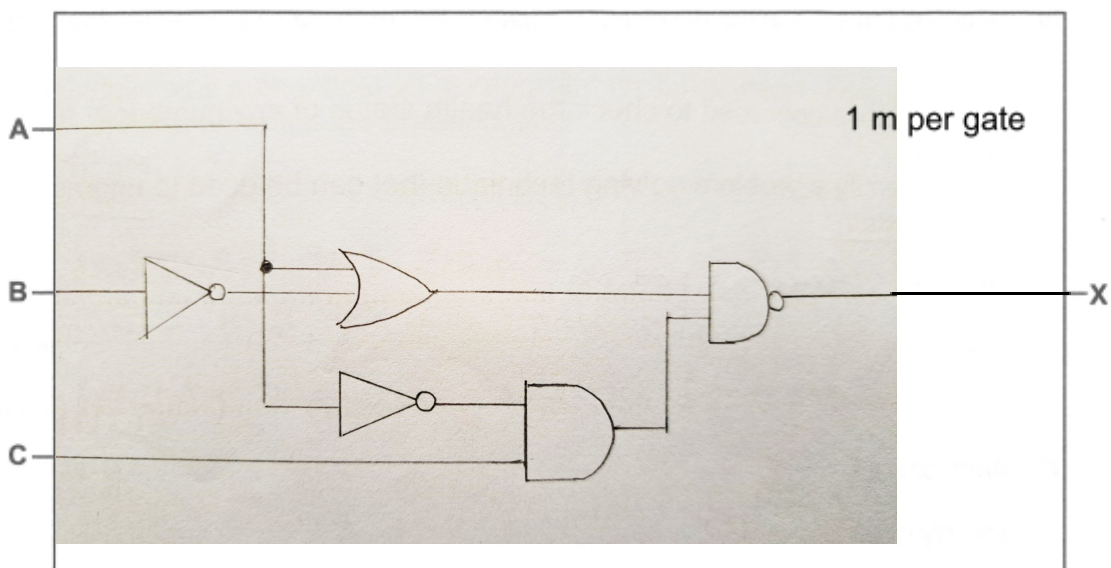
A	B	C	Working Space		X
			A NOR B	B OR C	
0	0	0	1	0	0
0	0	1	1	1	1
0	1	0	0	1	0
0	1	1	0	1	0
1	0	0	0	0	0
1	0	1	0	1	0
1	1	0	0	1	0
1	1	1	0	1	0

1 m per column

[3]

- (b) Draw a logic circuit for the expression:

$$X = (A \text{ OR NOT } B) \text{ NAND } (\text{NOT } A \text{ AND } C)$$



[5]

5 A software developer is tasked to develop a computer game for teenagers.

(a) In the development of his game, he follows a set of stages. Other than the writing of code, state two other stages.

1 Gather requirements

Plan solutions

Test and refine code

Deploy code

(Any two)

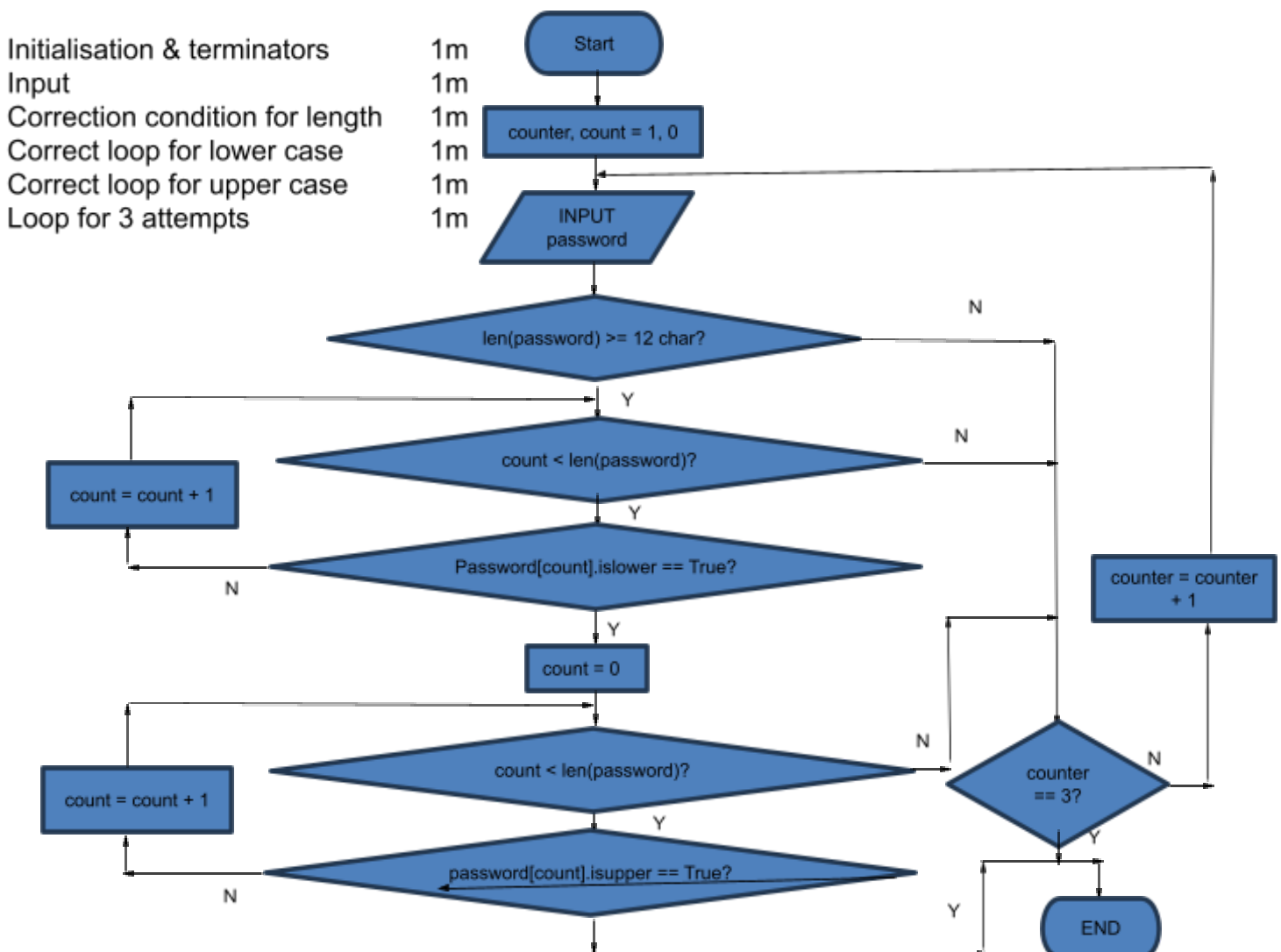
[2]

(b) The users of the game must have a username and password to log into the game.

The password must contain at least:

- 12 characters
- 1 lower-case letter
- 1 upper-case letter

Write an algorithm, using a **flowchart**, to take the password as input, repeatedly, until it is valid or invalid for three times.



- (c) Complete the table by identifying **two** types of checks used in (b) and suggest a password that will test the error conditions of each check. [6]

Type of check	Password
length check	Abc
format check	abcdefghij (1m/row)

[2]

6 Rahim is setting up a computer at a computer shop.

- (a) The owner advises him to purchase a multi-core processor as a dual-core processor will run twice as fast while a quad-core processor will run four times faster than a single-core processor.

State whether the owner's statement is true and explain your reason.

The owner's statement is false as the cores need to communicate with each other through channels and thus uses up some of the speed

[2]

- (b) Rahim wants to purchase a secondary storage device. State two factors that he should consider while purchasing a secondary storage device.

Capacity, speed, portability, durability, cost (Any two)

[2]

- (c) Rahim decided to purchase a solid state storage device. State two examples of solid state storage devices.

Memory cards, secure digital (SD) cards, thumbdrives, solid state drive (SSD) (Any two)

[2]

- 7 A program is written for a cashier of a mini-mart. The program allows the user to input the price of items bought by a customer, calculates the amount to pay in dollars and to the nearest cents, and outputs the number of items bought and the change. The amount to pay includes an additional Goods and Services Tax (GST) of 9% of the price of each item.

```

01  more_items = "Y"
02  num_items = 0
03  total_price = 0
04  while (more_items = "Y"):
05      price = float(input("Enter the price of the item:
06          $"))
07      total_price = total_price + price
08      num_items = num_items + 1
09      more_items = input("Any more items? 'Y' or 'N': ")
10  total_GST = 1.09 * price
11  print("-----")
12  print("Please pay $" + (round(total_GST, 2)))
13  money_tendered = float(input("Enter cash tendered: $"))
14  while money_tendered > total_GST:
15      print("Cash not enough to pay for items")
16      money_tendered = float(input("Enter cash tendered:
17          $"))
18  print("-----")
19  change = money_tendered - total_GST
20  print("Items bought :", num_items)
21  print("Change : $" + str(round(Change, 2)))

```

- (a) The program has **five** errors.

Give the line number of each error and write the correct line for each.

Line number4.....

Correction while (more_items == "Y"):

Line number9.....

Correction total_GST = 1.09 * total_price

Line number11.....

Correction print("Please pay \$" + str(round(total_GST,2)))

Line number13.....

Correction .. while money_tendered < total_GST: ..

Line number19.....

Correction print("Change:\$" + str(round(change,2)))

- (b) State **two** reasons for using constants in a program.
- 1 Constants protect users from accidentally changing their values somewhere in the code.
 - 2 Constants are declared once and can be used over and over again throughout the program.

[2]

- (c) The program uses a `WHILE ... ENDWHILE` loop.

State **one other** type of loop and explain when it is used over a `WHILE ... ENDWHILE` loop.

`FOR` loop is used for **repeating a set of steps using a counter**. The `FOR` command **goes through the values in a sequence using a variable and repeats the set of steps between `FOR` and `NEXT` for each value**. It is used over `WHILE ... ENDWHILE` loop **when the number of repetitions is known beforehand**.

[3]

- (d) Explain **one** difference between a compiler and an interpreter.

The compiler translates source code to machine code before running compiled program but the interpreter translates the source code to machine code while the interpreted program is running.

The compiler produces an executable file that makes use of the compiled machine code. The interpreter performs on-the-spot translation or determines which part of its own machine code to run.

The compiler is not needed for the program to function as executable file is reused. The interpreter is needed every time to re-run as the translated machine code is discarded after the program is stopped.

(Any one)

[2]

- 8 Mr Lee uses a spreadsheet software to keep track of the money he has deposited in a local bank and the interest received for the number of years he deposited in the bank.

	A	B	C	D	E	F
1	LEE'S SAVINGS					
2						
3	Transaction Number	Amount deposited	Year of Transaction	Number of Years Deposited	Interest Rate	Interest Receivable
4	2017DP0702	\$1,700.00	2017	7	4%	\$476.00
5	2018DP0903	\$1,600.00	2018	6	4%	\$384.00
6	2019SP0104	\$1,200.00	2019	5	3%	\$180.00
7	2020DP1905	\$1,800.00	2020	4	3%	\$216.00
8	2020DP0706	\$1,200.00	2020	4	3%	\$144.00
9	2022SP0909	\$660.00	2022	2	2%	\$26.00
10	2023DP0908	\$660.00	2023	1	1%	\$7.00
11						
12	Total	\$8,820.00				
13	Number of deposits	7				
14	Range deposited	\$1,140.00				
15						
16	Rates					
17	Number of Years Deposited	Description	Interest Rate per Year			
18	1	One year	1%			
19	2	Two or three years	2%			
20	4	Four or five years	3%			
21	6	Six years and over	4%			
22						

- (a) Identify the functions used in the following cells:

C4 ...LEFT.....

E4 ...VLOOKUP.....

B13 ...COUNT/COUNTA.....

[3]

- (b) The cells **D4:D10** is calculated by subtracting the Year of Transaction from the current year.

State the formula in **D4** that will do this.

..... = (YEAR(TODAY())) - C4

[2]

- (c) The cell **B14** is calculated by subtracting the lowest Amount deposited from the highest Amount deposited.

State the formula that will do this.

$\text{MAX}(B4:B10) - \text{MIN}(B4:B10)$

[1]

- (d) The background colour of cells **F4:F10** changes to red if the interest receivable is less than \$200.

Identify the spreadsheet feature used to change the colour of the cells depending on their value.

.....Conditional formatting.....

[1]

- 9 (a) Convert the following denary integer into hexadecimal.

2846

.....B1E.....

[1]

- (b) Describe, using an example, how to convert a binary number into denary.

Using 10011_2 as an example, denote the right-most digit as position number 0. The position number increases by 1 for each subsequent digit to the left. Multiply each binary digit by 2 to the power of the position number. Add each of these products to get the denary number. So, $10011_2 = 1 \times 2^0 + 1 \times 2^1 + 1 \times 2^4 = 1 + 2 + 16 = 19_{10}$

[3]

- (c) There are many types of encodings used to represent characters.

Describe **one** type of encoding.

ASCII codes use 7 bits to **represent common characters that can be typed using a keyboard**. It is **7 bits (128 characters) long** and varies from **$000\ 0000_2$ to $111\ 1111_2$ or 00_{16} to $7F_{16}$** .

Unicode is used to **represent characters of other languages**. It can **vary from 8 to 32 bits, representing over a million characters**.

(Any one) (*Do not accept RGB as it is not used to represent characters*)

[3]

- 10 (a) Determine the parity bit of the following data strings if an odd parity system is used.

1100110

.....1.....

.....

[1]

- (b) Write down the checksum for the block of data with the following byte sums.

1455

.....175.....

.....

[1]

- (c) Computers in a network can be organised in either a client-server or peer-to-peer network.

Complete the comparisons of these two networks by writing the missing terms.

The client-server network has a ...**centralised**..... control of data and resources, unlike the peer-to-peer network.

It is easier to schedule**backups**..... of all shared files at regular intervals as compared to a peer-to-peer network which requires more effort.

.....**Security**..... may be enhanced with the use of specialised software or operating system features designed for servers whereas for a peer-to-peer network, it is only as strong as the individual computers.

The**bandwidth**.... is typically high but limited to the capability of the server while the peer-to-peer network varies depending on how data needs to be transmitted.

Storage-wise, it is centralised and carried out only at the ...**server**..... while a peer-to-peer network allow individual users to carry out at each computer.

The setup and administrative**costs**..... are high as maintenance of servers and clients are needed.

[6]

- 11 A n -narcissistic number is a n -digit number that is the sum of the n th powers of its digits.

For example, 153 is a narcissistic number because $153 = 1^3 + 5^3 + 3^3$, but 1635 is not a narcissistic number because 1635 is not equal to $1^4 + 6^4 + 3^4 + 5^4$.

Write a pseudo code or program code that does the following:

- accepts a positive integer of 4 digits
- calculates the sum of the 4th powers of its digits
- checks if the sum is the same as the integer
- outputs if the number is a narcissistic number.

```
numDigit = 4, result = 0, digit = 0
INPUT number
WHILE len(number) != 4 or int(number) <= 0
    INPUT number
tempnum = int(number)
WHILE tempnum > 0:
    digit = tempnum MOD 10
    result = result + (digit ** numDigit)
    tempnum = tempnum DIV 10
ENDWHILE
IF number == result
    OUTPUT "Narcissistic Number"
ELSE
    OUTPUT "Not Narcissistic Number"
ENDIF
```

Initialisation:	1m
Input:	1m
Conditional loop:	1m
Calculation:	1m
Condition for positive:	1m
Condition for 4 digits:	1m
Condition for Output:	1m
Output:	1m

.....[8]

END OF PAPER