2026-DSE
ICT

PAPER 1
(SECT B)

RECURSO LIMITED

HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2026

Please stick the barcode label here.

Candidate Number									

INFORMATION AND COMMUNICATION TECHNOLOGY

PAPER 1

SECTION B: Question-Answer Book

8:30 am – 10:30 am (2 hours)

This paper must be answered in English

INSTRUCTIONS

(1) After the announcement of the start of the examination, you should first write your Candidate Number in the space provided on Page 1 and stick barcode labels in the spaces provided on Pages 1, 3, 5 and 7.

(2) Refer to the general instructions on the cover of the Question Paper for Section A.

(3) This section consists of TWO parts, Parts I and II.

(4) Answer ALL questions in both Parts I and II. Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins. Answers written in the margins will not be marked.

(5) Supplementary answer sheets will be supplied on request. Write your Candidate Number, mark the question number box and stick a barcode label on each sheet, and fasten them with string INSIDE this book.

(6) No extra time will be given to candidates for sticking on the barcode labels or filling in the question number boxes after the 'Time is up' announcement.

(7) The last page of this Question-Answer book contains SQL commands and spreadsheet functions which you may find useful.

撥款資助
FUNDED BY

創新計劃項目
INNOVATIVE PROGRAMME

協創機構
INTERMEDIARY

印刷贊助
PRINTING SPONSOR

* A 2 0 0 E 0 1 B *

PART I

Answer **ALL** questions. Write your answers in the spaces provided.

1. Paul uses a chatbot, which is capable of obtaining information from the Internet. He uses this chatbot instead of a search engine.

   (a) Give an advantage and a disadvantage of this approach. (2 marks)

   (b) Give **two** factors that will affect the quality of the result of the chatbot. (2 marks)

2. Harris connects his notebook computer to a Wi-Fi network of a coffee shop.

   (a) The connection involves the following technologies. Write down the responsibility of each technology.

   (i) Network Interface Card (NIC) (1 mark)

   (ii) Access Point (AP) (1 mark)

   (iii) Give **two** potential risks of connecting a notebook computer through a public Wi-Fi network of the coffee shop. (2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Please stick the barcode label here.

3. A farming game uses a database table SEEDS to store the information related to seeds in the game. The first 6 records of SEEDS are as follows-

SEEDS

ID	NAME	MaxStar	Price	Type
1	Apple	5	25	Tree
2	Carrot	4	20	Crop
3	Cucumber	4.5	25	Crop
4	Orange	5	30	Tree
5	Rose	4	30	Crop
6	Tomato	3	15	Crop

(a) Write down the data type of MaxStar. (1 mark)

(b) According to the 6 records provided, write down the result of the following SQL command. (2 marks)

```
SELECT Type, AVG(Price) FROM SEEDS
WHERE ID NOT IN (2, 4)
GROUP BY Type;
```

(c) Give a reason why database should be used over spreadsheet in this scenario. (1 mark)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Go on to the next page

4. In a Visual Arts lesson, students create videos on their laptops. Each video has a file size of 1.5 GB. At the end of the lesson, all 20 students in the class upload their videos to the school's file server concurrently. The school requires all uploads to be completed within 2 minutes.

(a) Estimate the minimum upload bandwidth, in Mbps, that the school network must provide for this classroom. Show your calculations. (2 marks)

(b) The school uses Public Key Infrastructure (PKI) to manage submissions.

(i) Describe how students can use PKI to ensure the authenticity of their submitted videos (i.e., to ensure that videos are originated from them). (2 marks)

(ii) The school is upgrading its asymmetric key encryption system from 1024-bit to 2048-bit. Explain one reason why using a 2048-bit key enhances security. (1 mark)

5. A digital marketing company is considering the following two desktop computers:

	Computer A	Computer B
CPU	16-core, 4.5 GHz	8-core, 3.6 GHz
GPU	Standalone (32 GB VRAM)	Integrated with CPU
RAM	16 GB DDR5	8 GB DDR5
Secondary storage	512 GB SSD	1 TB HDD
Ports	4 × USB 2.0	2 × USB 3.0
Network	1 Gbps LAN 802.11n supported	2 Gbps LAN 802.11ax supported

Based on the specifications provided, choose the most suitable computer for each of the following scenarios. Give one reason to support your choice for each scenario.

(a) Processing sales data and training a machine learning model. (2 marks)

(b) Importing video clips from a camera and uploading them to a video-sharing website. (2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Please stick the barcode label here.

6. The following algorithm is developed to sort an array `arr` as follows:

```
i ← 1
N ← 6
WHILE i < N DO
       IF i = 0 OR arr[i] >= arr[i-1] THEN
         i ← i + 1
       ELSE
         temp ← arr[i]
         arr[i] ← arr[i-1]
         arr[i-1] ← temp
         i ← i - 1
```

Suppose that the initial content of `arr` is:

A[0]	A[1]	A[2]	A[3]	A[4]	A[5]
6	5	9	6	1	4

Complete the table below to show the values of `i` and the content of the array `arr` after completing the first, second and third iteration through the WHILE loop. (3 marks)

First iteration:

A[0]	A[1]	A[2]	A[3]	A[4]	A[5]

i:_____

Second iteration:

A[0]	A[1]	A[2]	A[3]	A[4]	A[5]

i:_____

Third iteration:

A[0]	A[1]	A[2]	A[3]	A[4]	A[5]

i:_____

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

PART II

Answer **ALL** questions. Write your answers in the spaces provided.

7. Kelly is the manager of an art gallery. She uses a spreadsheet to track its monthly sales. Part of the data are shown below:

Sales

	A	B	C	D
1	ArtworkID	Artist	Type	SalesPrice
2	A001	Rina	Painting	7100
3	A002	Keke	Computer art	8200
4	A003	Kanon	Photography	2500
5	A004	Kaho	Painting	4800
6	A005	Kaho	Computer art	6300
7	A006	Riko	Painting	12500

Total

	A	B	C
1	Price less than or equal to	Total sales ($)	
2	5000	7300	
3	10000	37900	
4	15000	50400	
5			
6			
7			

(a) To calculate the total sales amount for artworks with a sale price of 5000 or less, 10000 or less, or 15000 or less, Kelly enters the formula in cell `B2` of worksheet Total, then copies it to `B3:B4`. Write down the formula in cell `B2` of worksheet Total. (3 marks)

(b) Kelly wants to create a pivot chart to understand the number of artworks sold in each type. Complete the following parts to create pivot chart. (2 marks)

ROWS	**VALUES**

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(c) Kelly exports the pivot chart as an image and uploads it to the website of the art gallery. The website has two versions: a mobile version and a desktop version.

(i) Give a reason of providing two versions of the website. (1 mark)

(ii) Apart from file size, give another technical consideration when preparing an image for the mobile version of a website. (1 mark)

(d) The spreadsheet software Kelly uses runs on an operating system. Apart from process management, state **two** other functions of an operating system. (2 marks)

(e) Kelly wants to share the spreadsheet file to her colleagues through the Internet; hence, she compresses the spreadsheet file using data compression software. State one advantage and one disadvantage of compressing the file. (2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Go on to the next page

8. A supermarket sells drinks to customers. The drink taps include a QR code to provide customer information.

(a) State **two** advantages of this method over printing the information directly on the bottle. (2 marks)

The supermarket wants to analyse the sales data on the quantity of drinks sold. The following variables are used in designing and implementing algorithms:

Variable	Description
`sales`	A 0-based array storing the sales figures of drinks for 7 consecutive days
`A`	A Boolean variable
`longest`	An integer storing the length of the longest sequence of days with increasing sales

(b) What is the data type of array `sales`? Explain briefly. (1 mark)

The manager develops two algorithms, `ALG1` and `ALG2`, which have the same purpose.

Line	ALG1	ALG2
1	`A ← False`	`A ← False`
2	`for i from 0 to 5 do`	`i ← 0`
3	`  if sales[i+1] < sales[i] then`	`while i < 6 do`
4	`    A ← True`	`  if sales[i+1] < sales[i] then`
5	`output A`	`    A ← True`
6		`  i ← i + 1`
7		`output A`

(c) (i) What is the purpose of the above two algorithms? (1 mark)

(ii) Although the execution efficiency of `ALG1` and `ALG2` is similar, the manager prefers `ALG1` over `ALG2`, why? (1 mark)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(iii) Modify one line of the content in ALG2 so that its execution efficiency can be enhanced.
(2 marks)

Line	Content

The manager develops an algorithm, ALG3, to find the length of the longest sequence of days with increasing sales (i.e., the sales of each day are greater than the sales of the previous day). The required value is stored in the variable longest. For example, suppose the value of sales is:

sales[0]	sales[1]	sales[2]	sales[3]	sales[4]	sales[5]	sales[6]
350	380	**370**	**400**	**410**	**450**	420

After executing ALG3, the value stored in the variable longest is 4, meaning that there are 4 consecutive days where the sales of each day are greater than the sales of the previous day.

(d) (i) Given the value of sales is:

sales[0]	sales[1]	sales[2]	sales[3]	sales[4]	sales[5]	sales[6]
210	230	200	240	220	260	150

After executing ALG3, what is the value of longest? (1 mark)

(ii) Please tick the appropriate box to indicate the programming language used.

Python ☐ C++ ☐ Pascal ☐

Write a program which implements the logic of ALG3 in Python, C++ or Pascal that updates the value of longest based on sales. (5 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

9. Ben develops a lighting system with 10 light bulbs. Each light bulb can display 3 colors, Red (R), Green (G) and Blue (B).

(a) What is the minimum number of bits required to represent the state of the light system? Show your calculation. (2 marks)

(b) The color of each light bulb is stored in a 1-based character array `light` with 10 elements. For example, suppose the content of `light` is:

light[i]	1	2	3	4	5	6	7	8	9	10
	R	R	R	G	G	G	G	G	B	B

The above content in `light` means that the 1st light bulb is red in color, while the 10th light bulb is blue in color. What is the color of the 7th light bulb? (1 mark)

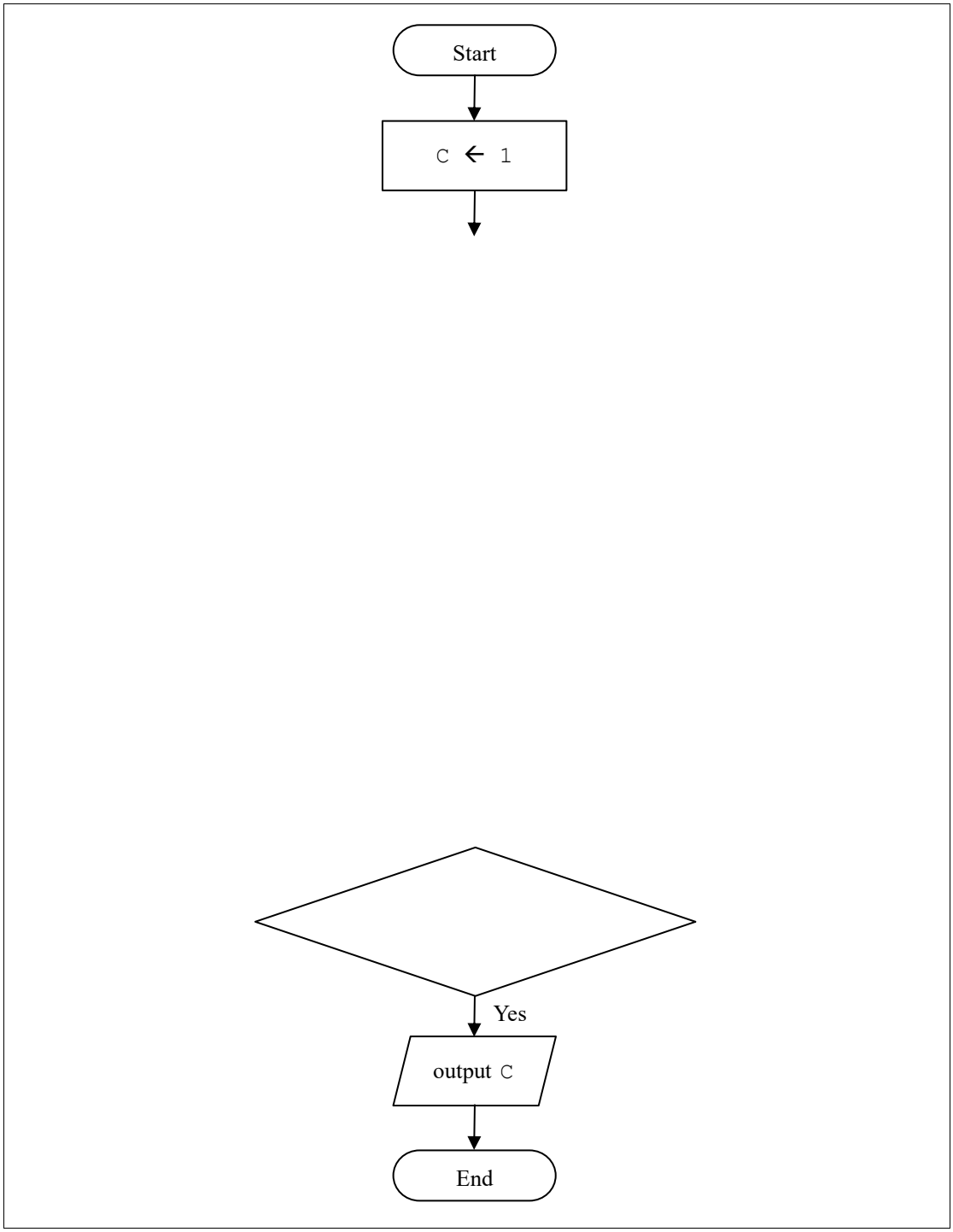
(c) Ben develops an algorithm, `COMP1`, in pseudocode as follows:

```
C ← 1
for i from 2 to 10 do
   if light[i] = light[i-1] then
      C ← C + 1
   else
      C ← 1
output C
```


Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

The flowchart below is an implementation of the `COMP1`. Complete the flowchart by rewriting the pre-test loop in the pseudocode as a post-test loop. (4 marks)



Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(d) Ben develops another algorithm, `COMP2`, to compress the content of `light`. The following variables are used in the algorithm:

Variable	Description
`comp`	A 1-based character array with 10 elements, used to store the output of compressed data. It will hold alternating characters representing the count and the color (e.g., '3', 'R', '5', 'G', etc.).
`cur`	A character variable that holds the color of the current sequence being counted.
`cou`	An integer variable that serves as a counter for the number of consecutive and identical colors found in the array `light`.
`i`	An integer variable that acts as a loop counter in the for loop.
`idx`	An integer variable that tracks the index position of `comp`.

Variables are initialized as follows:

```
initialise comp as an empty character array
cur ← light[1]
cou ← 1
idx ← 1
```

The follow is the implementation of `COMP2` in pseudocode.

Line	Content
1	`for i from 2 to 10 do`
2	`   if light[i] = cur then`
3	`      cou ← cou + 1`
4	`   else`
5	`      convert cou from integer to character`
6	`      comp[idx] ← cou`
7	`      comp[idx + 1] ← cur`
8	`      idx ← idx + 2`
9	`      convert cou from character to integer`
10	`      cur ← light[i]`
11	`      cou ← 1`
12	`comp[idx] ← cou`
13	`comp[idx + 1] ← cur`
14	`remove all empty elements in comp`

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Suppose the content of `light` is:

light[j]	1	2	3	4	5	6	7	8	9	10
	R	R	R	G	G	G	G	G	B	B

After executing `COMP2`, the content of `comp` is

comp[j]	1	2	3	4	5	6
	3	R	5	G	2	B

(i) Under some conditions, the compressed array `comp` might require more elements than the original `light` array. State an example of such content for `light` that would cause this. (1 mark)

light[i]	1	2	3	4	5	6	7	8	9	10

(ii) Ben notices that if the above content of `light` is used when executing `COMP2`, there will be a program error. What is the type of program error? Explain briefly. (2 marks)

(e) Ben wants to insert two lines of codes at the end of the loop body in the original `COMP2` so that the program error in part (d)(ii) can be avoided. Complete the following content. (2 marks)

Line	Content
10	`cur ← light[i]`
11	`cou ← 1`
12	
13	

END OF PAPER

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Database (SQL commands)

Constants	TRUE, FALSE
Operators	+, –, *, /, >, <, =, >=, <=, <>, %, _ , ' , AND, NOT, OR
SQL	AVG, MAX, MIN, SUM, AS, BETWEEN, BY, ASC, DESC, DISTINCT, FROM, GROUP, HAVING, LIKE, NULL, ORDER, SELECT, WHERE

Spreadsheet

Constants	TRUE, FALSE
Operators	+, –, *, /, <, >, =, <>, <=, >=, &
Functions	INT, RAND, SQRT, ROUND, AND, NOT, OR, LEFT, LEN, MID, RIGHT, AVERAGE, COUNT, COUNTIF, MAX, MIN, RANK, SUM, SUMIF, FIND, XLOOKUP, IF

Do not write on this page.

Answers written on this page will not be marked.

Do not write on this page.

Answers written on this page will not be marked.