

Level 1  
Paper 1 Section B  
Exemplar 1

**Answer all questions.**

1. A company uses a spreadsheet to store the attendance records of 4 staff members, as shown in the following example. If the staff enter and exit the office using their smart cards, the value 1 will be shown in Column D and Column E respectively, and 0 if otherwise.

	A	B	C	D	E	F
1	<b>EID</b>	<b>NAME</b>	<b>DATE</b>	<b>SIGNIN</b>	<b>SIGNOUT</b>	<b>ATTENDED</b>
2	S02	Ann	2024-02-28	1	1	1
3	S04 ✓	David	2024-02-28	0	1 ✓	1
4	S03 ✓	Susan	2024-02-28	1	0 ✓	1
5	S01	Tom	2024-02-28	0	0	0
6	S02 ✓	Ann	2024-02-27	0	0	0
7	S04 ✓	David	2024-02-27	1	0 ✓	1
8	S03 ✓	Susan	2024-02-27	0	1 ✓	1
9	S01 ✓	Tom	2024-02-27	1	0 ✓	1
:	:	:	:	:	:	:
81	S01	Tom	2024-02-03	0	0	0
82						
83	<b>Summary</b>					
84	EID	TOTAL		EID	TOTAL	
85	S01	17		S03	19	
86	S02	18		S04	18	
87						

Answers written in the margins will not be marked.

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- (a) A staff member is considered to have attended if the corresponding value in either Column D or Column E is 1. In such cases, the value 1 will be shown in Column F. Otherwise, the value will be 0.

- (i) A formula is entered into F2 and then copied to F3:F81. Complete the formula in F2 below.

=IF(D\$2:E\$2, "1", "0")

(2 marks)

- (ii) To calculate the total number of attended days of individual staff members, a formula =SUMIF(A2:A81, "S01", F2:F81) is entered into B85 and then copied to B86, E85 and E86. The result in B85 is correct but the results in B86, E85 and E86 are wrong. Correct the formula in B85 below.

=SUMIF(A2:A81, "B85", F2:F81)

(2 marks)

- (iii) Besides verifying that fields are non-empty, describe a suitable validation for the data in D2:D81.

Range check

(1 mark)

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- (iv) A1:F1 are column names and the records in A2:F81 have been already sorted. State the sort options below:

	Column name	Order (Ascending / Descending)
First sort by	EID	Ascending
Then sort by	ATTENDED	Ascending

(2 marks)

- (b) Data in A1:F81 are converted to a database table ATTEND.

- (i) Explain briefly why NAME cannot be a key field.

Because the name "Ann" can appear more than once, thus it is not unique

(1 mark)

- (ii) State the primary key for ATTEND. EID + NAME

(1 mark)

- (iii) Based on the first 8 given records on the spreadsheet, what is the output after executing the following SQL statement?

```
SELECT EID, COUNT(*) FROM ATTEND
WHERE SIGNIN + SIGNOUT = 1
GROUP BY EID HAVING COUNT(*) > 1
```

S04  
S03  
S01

(2 marks)

- (iv) Explain briefly why it is **not necessary** to convert and include data in A84:E86 in ATTEND.

Because SQL can perform those calculations on its own.

(1 mark)

2. Tom plans to buy a new computer for video editing. There are two computers, P and Q, with the following specifications:

	P	Q
CPU	8 Cores, 3.6 GHz	8 Cores, 4.4 GHz ✓
RAM	16 GB	16 GB ✓
Secondary storage	1TB solid state drive (SSD)	4TB hard disk drive (HDD) ✓
Graphics Processing Unit (GPU)	Integrated with CPU	Standalone (16 GB memory) ✓
Network interface card	100 Mbps LAN	1 Gbps LAN
Port	2 × USB 3.0	4 × USB 3.0

- (a) (i) Arrange the storage devices, SSD, HDD and RAM, in descending order by their data transfer rates.

HDD > SSD > RAM (1 mark)

- (ii) Other than data transfer rate and storage capacity, describe a functional difference between RAM and SSD.

SSD increases the seek time for accessing files while  
RAM improves the data transfer rate from the CPU to RAM. (1 mark)

- (iii) Tom argues that Q is better for 4K video rendering. Give two reasons to support his argument.

4K Video rendering requires high computational power, therefore the  
CPU with 8 cores and 4.4 gigahertz is necessary.

② Q has a standalone (16 GB memory) which means it does  
not depend on the CPU unlike P, so it will be less burden  
on the CPU reducing power consumption. (2 marks)

(b) Finally, Tom buys Q and connects it to a LAN.

(i) Estimate the time required to receive a 5 GB video file from the LAN. Show your calculation.

$$5 \div 1$$

$$= 5,$$

$\therefore$  He needs 5 seconds to receive a 5GB video file from the LAN.

(2 marks)

(ii) Tom reads that the anti-virus software in the computer displays the following messages on two different occasions.

Message A	X
<p>⚠ WARNING!</p> <p>The file cannot be executed because it contains a virus.</p> <p>C:\game.exe</p>	<input type="button" value="Next"/>

Message B	X
<p>⚠ WARNING!</p> <p>Viruses are detected in a scheduled scan.</p> <p>C:\game.exe C:\program\draw.exe D:\player.exe</p>	<input type="button" value="Next"/>

Which mode (batch processing or real time processing) best describes the virus scanning on each occasion? Explain briefly.

Message A: Real Time System because Tom is trying to execute a program currently

Message B: Batch processing system because the computer processed tasks periodically or at a scheduled time.

(2 marks)

- (c) When Tom tries to change his password in an online system, his new password does not fulfill three password requirements of the system, as shown below. Fill in the remaining two requirements.

Change password

Login name:	Tom
Old Password:	.....
New Password:	Tom1133
Confirm New Password:	Tom1133

✉ ⚡

Confirm

*Password requirements are NOT fulfilled*

Password requirements

1. Minimum of 10 characters
2. Have a combination of symbols.
3. Incorrect old password.

(2 marks)

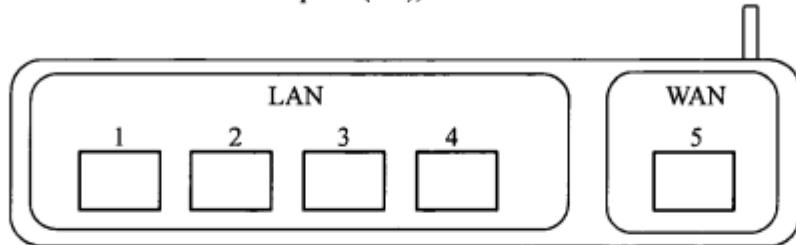
- (d) Tom spends a lot of time using a keyboard in his work. Give a potential health hazard of this, and state a corresponding measure to protect his health, other than taking regular breaks.

His elbow can be bruised or sore from exhaustion, to avoid this, Tom should have a proper arm rest on his chair so he can rest his arm on the chair while using the keyboard.

(2 marks)

3. Ada uses wired connections to connect an all-in-one wireless router to her desktop computer and a broadband modem at home.

- (a) The rear side of the router has 5 ports (1-5), as shown below:



- (i) For each of the following devices, suggest a port to be used for connection.

Broadband modem: 5

Desktop computer: 1

(2 marks)

- (ii) Other than bandwidth, state an advantage of using a wired connection over a wireless connection between the router and the computer.

The data transfer rate is higher.

(1 mark)

- (b) Ada plans to send an important message to Bob through the Internet. Public Key Infrastructure (PKI) is used to guarantee the message originated from Ada. Ada and Bob have their own pairs of public and private keys (i.e. Ada's public key, Ada's private key, Bob's public key and Bob's private key). State the appropriate keys used in the transmission.

Ada uses private key to sign the message.

Then, Bob uses public key to verify the message.

(2 marks)

- (c) Ada often sends emails. Give two benefits of sending emails in HTML format instead of plain text format.

① Lower file size compared to plain text format.

② Users will not have to download the file.

(2 marks)

- (d) Ada works in a school. She develops an online system for students to view examination papers in PDF format. Students can input a subject and a year to select a past paper, as shown below:

Examination paper system

Subject:	Chemistry	Year:	2018	Confirm
<div style="text-align: center; margin-top: 10px;"> <b>Chemistry</b>  <b>2018 Exam Paper</b> </div>				

- (i) Redesign the layout of the web page to improve the user-friendliness for the following:

- selecting a past paper ✓
- navigating PDF documents ✓
- viewing PDF documents ✓

Annotate your design.

Drop-down Menu Examination paper system

Subject :

Biology

Chemistry

Maths

... ~ ~ ~

Year :

2018

2017

2016

[Confirm]

Biology  
2018 past  
paper

Paper 1  
Paper 1  
—  
—  
—  
—  
—  
—

Paper 2

Instead of providing the entire exam paper, have different parts of the paper.

By placing the cursor on the magnifier, students may have a quick view of what paper it is.

(3 marks)

(ii) Suggest two measures to protect the copyright of the past papers.

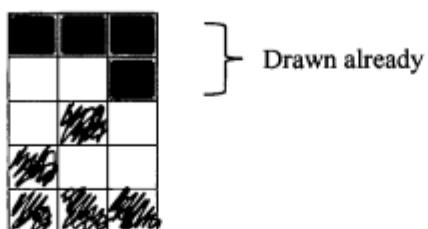
① Have owner's permission and consent before uploading the past papers.

② Add a hyperlink <sup>and</sup> organization name to give credits and reassure users where the past paper is originated from.

(2 marks)

4. A display board consists of  $5 \times 3$  black-and-white dots. Bit patterns are used for representing the display image where 1 and 0 represent a black dot and a white dot respectively.

- (a) (i) Complete the following display image represented by the bit pattern 111 001 010 100 111. The first two rows have been drawn already.



(1 mark)

- (ii) An even parity bit is added at the end of the original bit pattern.

- (1) Write the bit pattern (16 bits) representing the following display image.

0	1	0
0	1	0
0	0	0
0	1	0
0	1	0

0|0 0|0 0|0 0|1 0 0|1

(2 marks)

- (2) How many different images can be shown by this display board?

240

(1 mark)

- (b) When a display image is changed, some dots are toggled (i.e. from black to white or from white to black). These dots are then recorded.

In the following example, the dots to be toggled are B3 and C2.

	1	2	3
A			
B			
C			
D			
E			

Original display image



	1	2	3
A			
B			
C			
D			
E			

Next display image

Answers written in the margins will not be marked.

- (i) State the dots to be toggled below.

	1	2	3
A	■	■	■
B	■	■	■
C	■	■	■
D	■	■	■
E	■	■	■

Original display image



	1	2	3
A	■	■	■
B	■	■	■
C	■	■	■
D	■	■	■
E	■	■	■

Next display image

B1, C1, C2

(2 marks)

- (ii) How many bits are required to record the position (e.g. B3) of one dot? Explain briefly.

Only one bit, no bit is required to store the value of a white dot because the original colour of the dots are already white.

(2 marks)

- (iii) Draw the next display image below that requires the maximum number of bits to record the dots to be toggled.

	1	2	3
A	■	■	■
B	■	■	■
C	■	■	■
D	■	■	■
E	■	■	■

Original display image



	1	2	3
A	■	■	■
B	■	■	■
C	■	■	■
D	■	■	■
E	■	■	■

Next display image

(2 marks)

- (c) Suggest a function of application software and system software respectively during the operation of this display board.

Application software: Application software acts as a user interface for users to toggle the dots.

System software: System software is running the arithmetic calculations behind.

(2 marks)

5. Array A stores 6 integers. The algorithms ALG1 and ALG2 validate the following requirements (I) and (II) respectively.

- (I) All integers in A are positive.
  - (II) Integers in A are sorted in ascending order.
- (a) Referring to the requirements above, describe the purposes of using the following invalid test data:

Case 1:

A[0]	A[1]	A[2]	A[3]	A[4]	A[5]
3	3	5	5	8	5

Purpose: To test whether there will be an error if the requirement (II) is not followed which is arranging in ascending order.

Case 2:

A[0]	A[1]	A[2]	A[3]	A[4]	A[5]
-1	-1	3	5	5	8

Purpose: To test whether negative data can be detected since the requirement in (I) is that all integers are positive.

(2 marks)

- (b) ALG1 outputs TRUE if all integers in A are positive, FALSE if otherwise. Complete the pseudocode for ALG1 below.

```

P ← TRUE
for i from 0 to 5 do
    if A[i] < 0 then
        P ← FALSE
    output P

```

(2 marks)

- (c) ALG2 outputs TRUE if all integers in A are sorted in ascending order, FALSE if otherwise. Complete the pseudocode for ALG2 below.

```

S ← TRUE
for i from 0 to 5 do
    if A[0] > -1 then
        S ← FALSE
    output S

```

(2 marks)

(d) Below is the algorithm ALG3.

Line number	Content
1	$C \leftarrow 1$
2	$M \leftarrow 1$
3	$N \leftarrow A[0]$
4	for $i$ from 1 to 5 do
5	if $A[i-1] = A[i]$ then
6	$C \leftarrow C + 1$
7	else
8	$C \leftarrow 1$
9	if $C > M$ then
10	$M \leftarrow C$
11	$N \leftarrow A[i]$
12	output $N$

C	M	N	ALG3
1	1	3	1
1	1	1	2
1	1	1	3
1	1	1	4
1	1	1	5

(i) Suppose that the initial content of  $A$  is:

$A[0]$	$A[1]$	$A[2]$	$A[3]$	$A[4]$	$A[5]$
3	5	5	5	8	8

What are the contents of  $C$ ,  $M$  and  $N$  after completing the first, second and last iterations of the loop (Lines 4 to 11)?

	C	M	N
First iteration	1	1	3
Second iteration	2	1	3
Last iteration	4	1	5

(4 marks)

(ii) What is the purpose of ALG3?

To test whether or not the ascending order and integers are meeting the requirement.

(2 marks)

**END OF PAPER**