Paper 1 (Section A)

Question No.	Key	Question No.	Key
1.	B (44%)	21.	D (69%)
2.	B (71%)	22.	B (73%)
3.	C (54%)	23.	A (61%)
4.	A (75%)	24.	C (49%)
5.	C (79%)	25.	D (56%)
6.	B (49%)	26.	C (55%)
7.	D (33%)	27.	A (82%)
8.	A (87%)	28.	A (54%)
9.	B (70%)	29.	A (41%)
10.	D (70%)	30.	D (81%)
11.	C (87%)	31.	C (50%)
12.	B (59%)	32.	B (66%)
13.	D (52%)	33.	D (69%)
14.	C (84%)	34.	C (80%)
15.	A (52%)	35.	C (94%)
16.	A (85%)	36.	D (87%)
17.	A (38%)	37.	B (67%)
18.	D (30%)	38.	B (81%)
19.	A (38%)	39.	B (83%)
20.	B (44%)	40.	C (88%)

Note: Figures in brackets indicate the percentages of candidates choosing the correct answers.

Paper 1 (Section B)

				Marks
1.	(a)	(i)	Many users can use the system at the same time. / The waiting time is shorter.	1
		(ii)	The system can response to users' requests as early as possible.	1
	(b)		Font size, colour scheme, languages available, simple navigation with a few large buttons (concrete examples)	1×3
	(c)	(i)	Screen size The input methods (touch screen) System resources such as notification	1×2
		(ii)	It is because there are a number of operating systems for mobile devices. (Support different OSs)	1
		(iii)	Some information has been pre-loaded in the mobile application so that citizens can access the system faster. / Allow users to use the system offline. / Users can directly use the system by clicking the icon of the app.	1
	(d)		① illustrate the choices of 18 districts and more than 10 clinics each ① illustrate the choices of date and time ① list out available choices ① a confirmation button	4
2.	(a)	(i)	It should be a long password with at least 8 characters. (password length) It should contain at least one special character. (additional character combination) The latest three passwords cannot be used. (password history) Users need to change passwords periodically. (password life time)	1×2
		(ii)	(1) It ensures that the password is personalised. / It prevent problems arising from the leak of default password. (2) The account owner can check that the last login is done by himself/herself.	1 1
		(iii)	16 x 8 = 128 bits ① ①	2
	(b)	(i)	Click the 'videos' tab to narrow down the search. Use quotations for the keywords, such as "shot put". Use more keywords such as "shot put skills" and "learn shot put".	1×2
		(ii)	The web site is blocked. (site accessibility) The video is removed from the web site by the owner. (video availability /share rights) No suitable plugin is installed in the browser. (software compatibility e.g. player, codec)	1×2
		(iii)	Ask for a permission for using the photos. Use the photos from the websites that agree for using the photos in further publications. Buy the right for using of the photos.	1×2

Marks

3. (a) (i) `=IF(D2 < 2004,"A",IF(D2 > 2005, "C","B"))` — ① ① — 1, 1

(ii) `=COUNTIF($E$2:$E$1001, $A1004)` (or `E$1:E$1001`) — ① ① — 1, 1

(b) (i) SID + ENAME in the second and the third records are identical. — 1

(ii) SID + EVENT — 1

(c)
```
A  100M  2
B  100M  1
B  Shot put  1
C  100M  1
```
① COUNT(*)
① GROUP BY — 2

(d) (i) Use templates.
Use transition effects.
Insert demonstration videos about the safety guidelines.
Others: typeface, colour scheme, background, layout — 1×2

(ii) ① Use of Object Linking/dynamic link
① description of updating/synchronisation — 1+1

4. (a) (i) stable connections (less interference), lower security risk, higher data transfer rate — 1×2

(ii) WiFi / 802.11ac — 1

(b) (i) ① Concept of data packets (division of data)
① Use of IP address (IP address to destination / routing) — 2

(ii) The bandwidth for uploading the live video
The ease of access of the live video on the client side
The bitrate of the streaming
Server loading
Video resolution
Encoding scheme — 1×2

(c) Lighting environment when using the computer — 1
Posture in using the computer — 1
Duration of using the computer — 1

(d) Use encryption / secure channels for the data transmission.
Set access rights of the cloud storage.
Encrypted data in the cloud storage.
Use anti-spyware to prevent hackers' attack.
Destroy all data after the event.
Install a firewall to prevent hackers' attack. — 1×2

		Marks
5. (a) (i)	110011	2
(ii)	010101	1
(b) (i)	(1) 110100	2
	(2) 001100	1
(ii)	110	2
(iii)	000	1
(c) (i)	The algorithm does not need much memory to be executed.	1
(ii)	CPU	1

Paper 2A

Marks

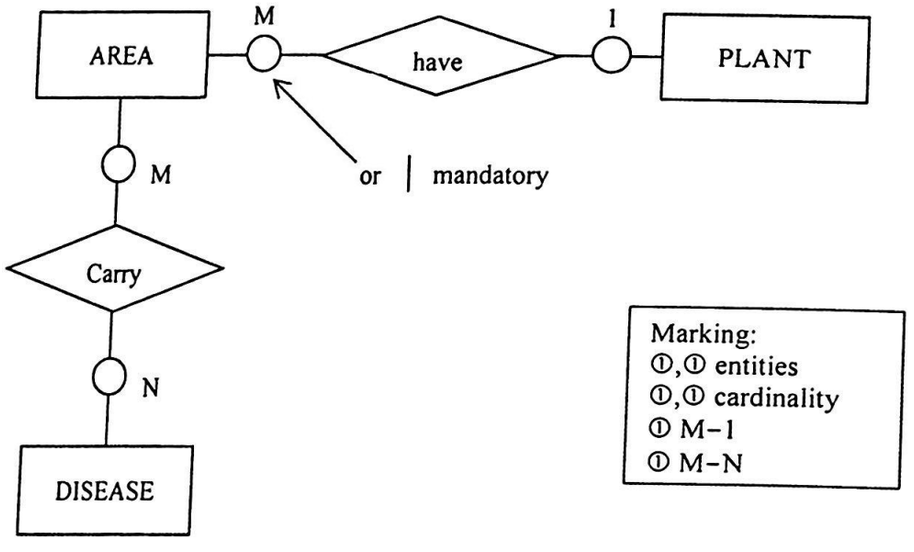
1. (a) Peter — 1
Peter — 1
Mary — 1

(b) (i) An ER diagram for the system / schema design — 1
An early sample/model of the system (prototype) — 1
Testing results/reports of the system — 1

(ii) There are some existing/original data that needs to be used in the new system. — 1

(iii) Requirements collection and analysis / system definition — 1

(c) — 6



(d) Peter should seek the approval from the park as well as the company of the IT project team so as to use the system and the data collected in this project. He should also acknowledge the data sources in his research. — 2*

Marks

2. (a) HKID card number is sensitive, personal data. / 1
Some students may not have a HKID card at the registration period.

(b) Age, Number of awards received 1×2

(c) (i) Reduce update anomalies. (integrity) 1
Reduce duplicated data or records. (Data redundancy) 1

(ii) STUDENT(Student number, HKID card number, Name, Date of birth) 8
Foreign key: N/A
AWARD(Award code, Year of award, Award name)
Foreign key: N/A
RESULT(Student number, Award code)
Foreign key: Student number, Award code

① at least three database tables
①, ①, ① field names
①, ①, ① primary keys
① foreign key (RESULT)
Note: 'Year of award' could be in AWARD or RESULT with or without an underline.

3. (a) (i) SMALLINT / INTEGER / INT (or DECIMAL/NUMERIC with 0 decimal places) 1
CHARACTER / CHAR / BOOLEAN / VARCHAR 1

(ii) not null -> SID, LOC, FEE, OUTOFSER 1×3
unique -> SID
primary key -> SID
foreign key -> LOC
Default (value) -> OUTOFSER
CHECK -> FEE
Index -> SID, LOC, FEE, OUTOFSER

(b)
```
SELECT LOC, COUNT(SBOX.SID) AS AVAILABLE                    ①
FROM SBOX
WHERE OUTOFSER = FALSE AND      (or NOT OUTOFSERV)          ①
      SBOX.SID NOT IN
         (SELECT RENTAL.SID FROM RENTAL WHERE ETIME IS NULL)  } ①
GROUP BY LOC                                                 } ①
HAVING COUNT(SBOX.SID) < 10
```
4

(c) (i) SID should be indexed because 'Rental duration'/'Percentage rented out' will be calculated based on the records of the identity code of each storage box. (STIME / ETIME) 1+1

(ii) sum of (ETIME-STIME) in hours / number of hours in that month 1

(d) 3 appropriate modifications such as: 1×3
- inclusion of fields
- appropriate design features such as use of drop down menu
- user-friendly layout design
- sorting functions

Marks

4. (a)
```
SELECT ENAME, EMPLOYEE.EID FROM EMPLOYEE, DRIVER          ①
WHERE EMPLOYEE.EID = DRIVER.EID AND BID = '1A'            }①
ORDER BY SALARY DESC
```
2

(b)
```
SELECT MAX(SALARY) FROM EMPLOYEE                          ①
WHERE YEAR(DSER) = 2009                                   ①
```
2

(c)
```
SELECT EMPLOYEE.EID, ENAME FROM EMPLOYEE                  }①
LEFT OUTER JOIN DRIVER
ON EMPLOYEE.EID = DRIVER.EID                              }①
WHERE DRIVER.BID IS NULL
```
2

Alternative:
```
SELECT EID, ENAME FROM EMPLOYEE                           }①
WHERE EID NOT IN
    (SELECT EID FROM DRIVER)                              ①
```

(d)
```
CREATE VIEW DRIVERNO AS
SELECT BROUTE.BID, COUNT(*) AS TOTAL  FROM BROUTE, DRIVER  }①
WHERE BROUTE.BID = DRIVER.BID
GROUP BY BROUTE.BID                                       }①

SELECT BROUTE.BID FROM BROUTE, DRIVERNO
WHERE BROUTE.BID = DRIVERNO.BID AND TOTAL < BNO           }①
```
3

Alternative 1:
```
SELECT BROUTE.BID                                         }①
FROM BROUTE, DRIVER
WHERE BROUTE.BID=DRIVER.BID                               }①
GROUP BY BROUTE.BID
HAVING COUNT(BROUTE.BID) < AVG(BNO)          (MAX or MIN) ①
```

Alternative 2:
```
SELECT BID FROM BROUTE                                    }①
WHERE BNO >
            (SELECT COUNT(*) FROM DRIVER                  ①
             WHERE BROUTE.BID=DRIVER.BID
             GROUP BY DRIVER.BID)                         }①
```

(e) (i) Find the average salary of drivers who joined the company before 1/1/2005. 1, 1

(ii)
```
SELECT AVG1 - AVG2                                        1
FROM V1, V2                                               1
```

(f) (i) DRIVERN1A does not exist so that executing (3) cannot produce the expected result. 1

(ii) Executing (3) creates a new value 'N1A' in DRIVER but the corresponding value '1A' does not exist in BROUTE. The foreign key in DRIVER would generate a referential integrity problem. 2*

(Just state the 'referential integrity problem' or the issue on 'N1A' without proper description ①)

Paper 2B

				Marks
1.	(a)	(i)	It is because a switch will not do signal broadcasting most of the time. / multiple networks in classrooms	1
		(ii)	End devices can have higher mobility. / No physical link setup is needed. / End devices may not support a physical LAN connection.	1x2
	(b)	(i)	2.4 GHz: higher penetration ability 5 GHz: less interference by neighbourhood devices	1 1
		(ii)	1.2 Gbps / (32 x 3) = 12.5 Mbps	1 1
		(iii)	Overheads / Poor reception (coverage) / Load balance	1x2
	(c)	(i)	Login authentication User rights control	1x2
		(ii)	Automatic & dynamic IP assignment Assign other static network information (e.g. subnet mask, default gateway, DNS) to devices	1x2
	(d)		Use of headers (Add & remove a header during the transmission between layers) - concept of encapsulation - concept of header / footer An example of the information in a header	2* 1
2.	(a)	(i)	255.255.255.0	1
		(ii)	254	1
	(b)	(i)	It facilitates better network traffic as a router is installed between subnets. Network signals will not be transferred to unrelated subnets. / network management ① example ① reason	1, 1
		(ii)	192.168.0.1 - 192.168.0.62	2
	(c)	(i)	2	1
		(ii)	12	1
		(iii)	① switches interconnected ①, ① numbers of devices correct (< 47 & total = 125) ① show a connection to a router (or a switch with the routing function)	4
		(iv)	It will increase the hardware cost. It will increase the network complexity and it is more difficult to maintain the network. It will increase the loading of the router.	1x2

		Marks
3. (a) (i)	Data are encrypted. Login authentication is required.	1 1
(ii)	A network connection with SSL. / IPSec	1
(b) (i)	Port number	1
(ii)	Enhance the network security. / The original port (Port 80) has been used for another web site.	1
(c)	lower the setup cost lower the technical involvement by users No security issue for such server connection	1x2
(d)	Block ports Block IP of servers packet filtering	1x2
(e) (i)	Use RAID (RAID 1) with an additional hard disk to store a copy of the data in the original hard disk. (Storage and synchronisation)	1+1
(ii)	Avoid unstable electricity supply. Provide electricity for server to shut down the server when power outrage.	1 1
(iii)	UPS should be connected to the database server as the services provided by the database server are more important.	2*

			Marks
4.	(a) (i)	Lower cost (use the existing electricity/telephone network) High data transmission rate / less interference	1 1
	(ii)	No, its valid distance for transmission is too short for the wind farm.	1
	(b)	Duplex: The control centre collects the data such as wind speed from the wind turbines and sends control signals to manage wind turbines. (Simplex with a reasonable answer)	1, 1
	(c)	Advantage: fewer overheads / lower cost Disadvantage: More time delay	1 1
	(d) (i)	Split the data/reassemble the data. / Add sequence numbers to the data packets.	1
	(ii)	Select the best route for signal transmission.	1
	(iii)	Yes: Reduce overheads as missing some data is acceptable. No: Retransmission cannot be triggered for unsuccessful transmission.	2*
	(e) (i)	1110 0000 ---- 1110 1110 ----- 11100 The answer is 1100.	2
	(ii)	Simple parity check can only detect single bit errors while checksum can detect multiple bit errors.	2*

Paper 2C

Marks

1. (a) (i) Many electronic musical instruments directly support MIDI as the output format. / MIDI is a cross-platform file format. 1

(ii) The music is digitised and stored in a MIDI file. 1
Each channel (key, tempo, etc.) can be tuned independently and mixed together directly. 1
① digitisation ① description of the change of an attribute

(b) Add alt-text (alternative text) to each of the thumbnail for the show so that the blind people can use the screen reader to read out the name of the show. 1 1

(c) (i) MP3 is supported by most browsers. 1

(ii) `autoplay / loop / muted / preload / src` 1×2

(iii) MP3 is a lossy compression. (Compression + description of irreversibility) 1

(d) (i) 2 MM / 4 Mbps ① 3
$2\times1024\times1024\times8 / (4000\times1000)$
$= \frac{4.194304}{4.194304} \times 24$ ①
$= 100.66$
So, at least 101 frames should be loaded. (or 96) ①

(ii) $(44.1\times1000\times16\times2+24\times1920\times1080\times24)/8/1024/1024$ 1
$= 142.55$ MB ($142 \sim 150$) 1

(iii) Answer of (d)(ii) / 4 (or 4 / Answer of (d)(ii)) 1
$(142.55\times1024\times1024\times8) / (4\times1000\times1000)$
$= 298.9$ ($297 \sim 300$)
Alternative: ($0.00333 \sim 0.0337$)

			Marks
2.	(a)	The browser sends the client information (e.g. browser name, OS name, screen size) to the server.	1
	(b) (i)	The system checks and compares the usernames stored in the database at server side. ① Interact with a database/server ① Compare usernames	2
	(ii)	The positions of the characters in the partial password shown are random. It avoids hackers using tools to record the keys that subscribers click for logging on to the system. (password leak)	1 1
	(c)	The number of colours used in full-colour photos is very large. (The printer does not support the number of colours.) The colour range / colour depth of the printout will then be reduced to the printer's specification.	1 1
	(d)	Use image map/set up clickable areas and direct to different hyperlinks to the web page.	1 1
	(e)	JPG does not support the layering / transparency feature. PNG	1 1
	(f)	Increase the bandwidth of the servers. Upgrade the processing power of the servers. Increase the buffer size of the servers.	1×2
	(g) (i)	720/1080 represents number of lines used for the display. It is a set of HDTV modes characterised by 720/1080 pixels shown on the screen vertically.	1
	(ii)	Progressive video refreshes all lines on each frame/update line by line. Interlaced video refreshes alternative lines of each frame/change one after another/ after layer.	1, 1

		Marks
3. (a)	Sorting, filtering, grouping, photos, map (brief reasonable description is required)	1×2
(b) (i)	Users are difficult to find their choices as the list is not arranged in a particular order / the list is not in order.	1
	Users have to select a lot of choices as the list groups all the options and it creates a lot of Combinations. / Users cannot remember their choices when selecting the choices.	1
(ii)	Users cannot select a range starting from a higher value. / Users may enter non-numeric data.	1
(iii)	The radio buttons force user to select one option once users click them.	1
(c)	■ decomposed into region, district, dish type, rating ② logical decomposition ① simple decomposition	2
	■ slider / input box for the start value / pull down menu for the end value	1
	■ checkboxes (more options)	1
(d)	The nearby restaurants (or other relevant information) can be shown.	1
	The way to go to a restaurant can be shown in real time. (location of restaurant / Navigation)	1
(e) (i)	Store the layout of the home page last time. / Store personal preferences/setting. / Keep users to remain login.	1
	Count the date users visited last time and the web site can compute how frequent they visit.	1
(ii)	The cookies store users' personal habit. Other users can get the information when accessing their computers. ① Example ① reason (potential threat)	1+1

Marks

4. (a) By adding some popular keywords, search engines can use this data when adding pages to their search index. It can increase the chance of being searched. 2
① Example ① How

(b) (i) Register domain names through a domain name registrar (domain name registration company). 1

(ii) The domain name has been occupied by another web site. 1×2
org domain is intended for communities and entities that serve the public good and the start-up company is not under this scope.
Mr. Wong's company is not a not-for-profit organization. It is not eligible for using org.hk domain.

(iii) Absolute paths with local drives are used in some hyperlinks. 1×2
Hyperlinks to the files/web pages in some external sites are changed/deleted/renamed.
The servers that store the external sites are out of service.
The firewall / proxy server / setting used by the customers blocks the hyperlinks.
Uppercase/lowercase letters are wrongly used in the hyperlinks.
Mr Wong deletes the files / renames the files that are used in those hyperlinks.

(iv) Mr Wong does not need to put much effort to manage the web server / hardware maintenance / software update / data backup / 24-hour technical support. 1

The information security should be observed carefully as it is managed by the third party. / 1
The web site could be affected/lost if the hosting company goes out of business. /
There is an advertising banner given by service providers.
(Other risks caused by web hosting company)

(c) 4

```
SUM ← SUM + N
if SUM = 10 then
      SCORE ← SCORE + 1
if SUM >= 10 then
      SUM ← 0
```

① `SUM ← SUM + N` and `SUM ← 0`
① `SCORE ← SCORE + 1`
① if structure for `SCORE ← SCORE + 1`
(Correct condition, e.g. `if SUM=10`)
① if structure for `SUM ← 0`
(Correct condition, e.g. `if SUM >=10 / if SUM>10 & if SUM=10`)

Alternatives:

```
SUM ← SUM + N
if SUM >= 10 then
    if SUM = 10 then
        SCORE ← SCORE + 1
    SUM ← 0
```

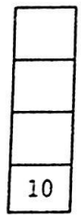
```
SUM ← SUM + N
if SUM = 10 then
      SCORE ← SCORE + 1
      SUM ← 0
if SUM > 10 then
      SUM ← 0
```

✗ `SCORE + 1` or `SUM + N` are not correct assignment statements.
✗ `For / While / when` are iteration statements. They are not conditional (if) statements.

Paper 2D

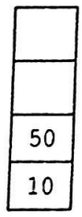
Marks

1. (a) (i)



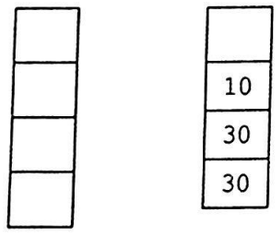
2

(ii)



2

(b)



[① A empty & B not empty]

3

(c)

```
while not empty(X) do
    Push(Y, Pop(X))
```

② Loop structure: a loop stops when stack X is empty
① pop from stack X, and push the pop value to stack Y
Deduct one mark for any mistake
e.g., Using wrong variables (A,B) instead of (X,Y)

3

(d)

```
REV(A, B)
for i ← 1 to N do
   Pop(B)
REV(B, A)
```

① Able to pop the bottom N boxes
① Able to keep the remaining boxes
① Remaining boxes in the original order in stack A
① At least use REV(A,B) instead of REV(X,Y) once

4

(e) ① Understand what breakpoint can do:
e.g., Breakpoint can stop or pause a program in a specific step.
e.g., Breakpoint can separate the program execution into parts.
① Describe how breakpoint can help Peter:
e.g., Peter can check intermediate values of the variables / stacks.

1, 1

Marks

2. (a) 3 — 1

(b) (i) 5

```
left ← 1
right ← N
while (left <= right) do
    mid ← (left + right) / 2
    if Score[mid] = SC then
        return mid
    else if Score[mid] > SC then
            left ← mid + 1
         else
            right ← mid - 1
return -1
```

① Initialise `left` and `right` (Possible answer: `[0,1]` ; `[N-1, N, N+1]`)
① `while` loop with correct an exit condition (<=, =, =)
① Calculate `mid` (divided by 2)
① Assign values to `left` and `right` correctly
① Return correct `mid` values or `-1`

(b) (ii) 3

```
j ← i
while (j < N) and (Score[j+1] = Score[i])      ① , ①
    j ← j + 1                                   ①
return j
```

Alternative:

```
j ← i
while (j <= N) and (Score[j] = Score[i])
    j ← j + 1
return j-1
```

(c) (i) `goLeft` involves the traversal of nodes backward and it is difficult to implement this traversal in the linked list. On the other hand, `goRight` involves the traversal of nodes forward only and it is easy to be implemented. — 2

(ii) NO, it is because `BinSearch` involves random access. — 1

(iii) Yes.
For the array, all the scores have to be moved and it involves more steps to do so. (O(n)) — 1
For the linked list, it only requires to update the head and add a new node. (O(1)) — 1

		Marks
3. (a) (i)	2	1
	4	1
	1	1
(ii)	Eva	1
	She communicates with the users / designs the system based on user's requirements.	1
(iii)	It clarifies the project schedule by illustrating multiple tasks and timelines into a single document. It helps coordinate the work to be done by different stakeholders. It supports critical path analysis. (A detailed explanation about communication, time management, motivation, creativity, accountability, efficiency, flexibility, etc. regarding the attributes of Gantt chart)	1×2
(iv)	Parallel conversion	1
(b) (i)	When integrating units/modules of the system, there might be errors/compatibility issues between them.	1
(ii)	It ensures that the system meets the requirements of end users.	1
(c) (i)	The logic and the flow of the program is easy to understand and trace. / There are fewer restrictions on implementation.	1
(ii)	High reusability / Wide range of libraries are provided / Some implementation details can be hidden.	1
(iii)	The linker links the object files/library files together to form an executable file.	1
	The loader loads the executable files into main memory.	1

Marks

4. (a) (i) 7000 (or 7) 1

(ii) 2, 4 1

(ii) 23000 (or 23) 1

(b) (i) K
K } ① 1

```
i+a-1, j+b-1          (a and b are interchangeable.)
sum
```
1, 1
1

(ii)
```
if (i+a-1 <= 5) AND (j+b-1 <= 6) then
    sum ← sum + R[i+a-1, j+b-1]
```
2

✓ Underlined expressions same as the answers in (b)(i)
Candidates **cannot** assume that cells in `R` outside the WiFi zone store 0.
Therefore, any checking with condition `if R[i+a-1, j+b-1]=0` or `if not (R[i+a-1, j+b-1]=0)` is not acceptable.

① mark will be given for either one of the following:
- Handle ONE boundary (e.g. Not accessible: [5,7], [6,6] ; accessible: [5,6])
- Handle TWO boundaries together (e.g. Not accessible: [6,7])

(c) 9 1

(d) `S[4,5]` 2

(e) `S[2,3]` 2

(f) ① an observation that `SumR` has to sum up many cell values in `R`, and `SumS` only sums up few (only 4) values in `S` 2
① a conclusion that `SumS` is more efficient

Alternative:
① The time complexity of the calculation for `SumS` is lower.
① `SumS` only takes one step to calculate the number of people living in `Z(i,j,K)` but `SumR` takes K^2 steps to do so.

① Execution time / efficient
① Detailed description

* Marking criteria
② Illustrate a comprehensive and logical answer
① Illustrate a relevant answer