

## Marking Schemes

**This document was prepared for markers' reference. It should not be regarded as a set of model answers. Candidates and teachers who were not involved in the marking process are advised to interpret its content with care.**

### General Notes on Marking

1. Teachers are strongly advised to conduct their own internal standardisation procedures using the marking scheme before the actual marking begins. After standardisation, teachers should adhere to the marking scheme to ensure a uniform standard of marking within the school.
2. The marking scheme may not exhaust all possible answers for each question. Teachers should exercise their professional discretion and judgment in accepting alternative answers that are not in the marking scheme, but are correct and well-reasoned.

3. The following symbols are used:

- |   |  |
|---|--|
| ✗ | This symbol indicates a wrong or unacceptable answer.  |
| ◐ | Shaded words, figures or ideas are not essential for the candidate to be awarded the point.  |
| / | A single slash indicates an acceptable alternative within an answer.   |
| + | A plus sign indicates that there are two pieces of information and the second part will be awarded points only when the first part is correct. |

4. In questions asking for a specified number of reasons or examples etc. and a candidate gives more than the required number, the extra answers should not be marked. For instance, in a question asking candidates to provide two examples, and if a candidate gives three answers, only the first two should be marked.

**Paper 1 (Section A)**

Question No.	Key	Question No.	Key
1.	A (39%)	21.	B (49%)
2.	D (72%)	22.	C (55%)
3.	B (39%)	23.	B (93%)
4.	C (54%)	24.	D (49%)
5.	A (39%)	25.	C (70%)
6.	B (43%)	26.	A (83%)
7.	A (83%)	27.	A (81%)
8.	D (49%)	28.	C (27%)
9.	C (72%)	29.	C (69%)
10.	C (74%)	30.	C (67%)
11.	A (25%)	31.	A (48%)
12.	B (93%)	32.	A (74%)
13.	D (82%)	33.	D (53%)
14.	C (48%)	34.	D (72%)
15.	A (72%)	35.	B (46%)
16.	B (74%)	36.	D (75%)
17.	D (95%)	37.	B (78%)
18.	D (84%)	38.	A (94%)
19.	B (85%)	39.	A (90%)
20.	C (7%)	40.	B (85%)

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

**Paper 1 (Section B)**

	<b>Marks</b>
1. (a) (i) It can execute instructions faster (shorter processing time). / It has more computational power. / It performs more tasks simultaneously (distribute the workload)	1
(ii) Clock rate / word length (word size)	1
(b) RAM / Hard disk (SSD) / GPU with a simple but reasonable explanation	1×2
(c) (i) Process management / resource management (memory management / network management / device management) / user interface	1×2
(ii) Advantage: File sharing is simpler / Files can be accessed anywhere without bringing the hard disk. / It can be simultaneously accessed by different devices. / Accessible regardless of OS / It can be available free-of-charge / Easy upgrade	1
Disadvantage: The access time is longer. / Require Internet access.	1
(d) Source code in open source software can be seen / modified / redistributed.	1×2
(e) Example of terms of service: Accept the use of the contact list or photos in users' devices. (Accessing resources [hardware / function / files] of the devices) /  Collect personal information from the users / Collect daily information about the use of the software / Allow to use personal information (Information collection)  Potential risk (echoing the Term of service stated above): Personal information is leaked (info leakage) / Receive unwanted advertisement / spam (spamming)	1+1

2. (a)  $= (\text{sum}(\$D2:\$F2) - \text{min}(\$D2:\$F2)) / 2$  1 + 1
- Alternatives:  
 $= (\text{large}(\$D2:\$F2, 2) + \text{max}(\$D2:\$F2)) / 2$   
 $= (\text{large}(\$D2:\$F2, 2) + \text{large}(\$D2:\$F2, 1)) / 2$   
 $= (\text{small}(\$D2:\$F2, 2) + \text{small}(\$D2:\$F2, 3)) / 2$   
 $= \text{average}(\text{large}(\$D2:\$F2, 2), \text{max}(\$D2:\$F2))$
- ① Functions to find out the max and the second max  
 ① all correct
- (b)  $= \text{vlookup}(\$A2, \text{Sheet1!}\underline{\$A\$2:\$B\$5}, 2, \text{false})$  1 + 1
- ① Correct absolute / mixed address for the range A2 : B5  
 ① all correct
- (c) (i) HOUSE / Column B 1
- Count of HOUSE / Count of HCODE (other reasonable answer) 1
- (ii) Linking: The content is automatically updated whenever a change occurs in the linked chart. / The file size of the document will not increase drastically. 1
- Embedding: There is only one file to manage. 1
- (d) (i) Participant\_Code / Column C 1
- (ii) B 80 1, 1  
 Y 95  
 R 64  
 G 85
- ① GROUP BY (4 rows with correct HCODE)  
 ① Maximum (correct calculation) + others (column order, no extra fields/symbols)  
 \* The row order is not significant.
- (e) Database: generate reports / query / data validation OR 1  
 Spreadsheet: create charts / small data size
- \* No mark without mentioning database or spreadsheet

3. (a) (i) P: switch / hub 1  
 Q: AP / (wireless) Access Point / wireless router 1
- (ii) Route network packets based on their IP addresses to other networks or devices. / 1  
 Manage traffic between networks.  
 Connect different networks / connect LAN to WAN
- (b) are broken into packets 1  
 are transmitted through the Internet via different routes 1  
 are reassembled at Z 1
- (c) No, the public can access the web server using its IP address directly. / the public can access a 2\*  
 DNS in another place (ISP).
- (d) Permit or block data packets based on a set of security rules 1×2  
 Filter intruders  
 block unauthorized access  
 prevent hacking  
 prevent spyware / ransomware attack  
 prevent information leakage  
 log user activity  
 \* prevent virus  
 \* content filtering
- (e) SSL encryption, two-factor authentication, biometric authentication, 1×2  
 one-time password via SMS/email, smartcard, adopt digital certificates / use a private key to  
 verify the user identity
- \* set login name and password  
 \* use a stronger password  
 \* change password regularly  
 \* show last logon time  
 \* validate personal information / identity or enhance server security without further elaboration  
 or illustrating examples

4. (a) (i) The file size of AVI is larger. / The quality of AVI is better. /  
MP4 supports streaming. / MP4 supports subtitle/menu. /  
HTML5 supports MP4 only. /  
More portable devices/operating systems support MP4. 1
- (ii) Audio input / Text to speech / text size / color contrast 1
- (b) Lower the human effort to reply questions. 1×2  
Provide 7×24 service.  
Generate faster responses.  
Generate fewer job opportunities.
- (c) (i) Use meaningless words. 1×2  
Use randomised numbers.  
Use different passwords for different systems.
- (ii) Users need to read and input the characters that a software bot cannot do. 1
- (d) (i) 10 00 11 11 1
- (ii) 😞 😞 😊 1
- (iii) 

	Method 1	Method 2
😊😊😊 😞😞😞	12	12
😞😞😞 😊😊😊	12	18

 2
- (iv) The message contains more 😊. 1

- |         |  |     |
|---------|--|-----|
| 5. (a)  | B = 2      ch = Y  | 1,1 |
| (b)     | 6  | 1   |
| (c) (i) | 3  | 1   |
|         | (ii) ALG2 is more efficient as the number of comparisons / executions with the conditional statement on Line 3 is fewer.                                   | 1   |
| (d)     | 110000 or 110001   | 2   |
| (e)     | i  | 1   |
| (f)     | ALG3. Fewer instructions have to be executed as the conditional statement "if A[i] = 1 then" is removed.   | 2*  |
| (g)     | MDR (memory data register) / MAR (memory address register) / PC (program counter) / ALU (arithmetic logic unit) / CU (control unit) / SR (status register) | 1×2 |

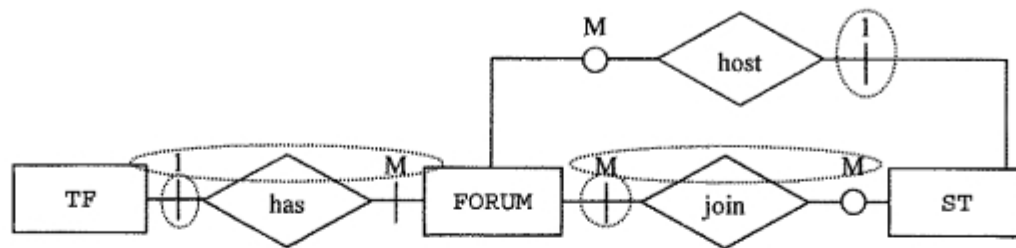
			Marks
1. (a)	SELECT LSTEP, POINT FROM LEV WHERE POINT <=10 AND POINT >= 5	① ① (or between)	2
(b)	SELECT COUNT (*) FROM (SELECT DISTINCT PID FROM READING WHERE STEP >= 10000)	① ①	2
(c)	SELECT SUM(POINT) FROM PAR P, READING R, LEV WHERE P.PID = R.PID AND DEPT = 'Accounting' AND STEP >= LSTEP AND STEP <= HSTEP	① ① ①	3
(d)	SELECT DISTINCT(DEPT) FROM PAR P WHERE PID IN (SELECT R.PID FROM READING R GROUP BY R.PID HAVING AVG(STEP) > 9000 )	① (join) ① ①, ① overall	4
Alternative:			
SELECT DEPT FROM PAR, READING WHERE PAR.PID=READING.PID GROUP BY READING.PID HAVING AVERAGE(STEP) > 9000			
(e) (i)	Find the PID of the participants who have walked more than or equal to <u>the maximum number of steps recorded on 20/3/2021</u> . (more than + date)		1
(ii)	The view can be reused in the system / restrict the access of data to protect the data (information hiding).		1
(iii)	STEP		1
	MYSTEP		1



2. (a)	5 4 or 3 2	1×3
(b)	There might have some logical/data/schema errors found after testing. The project team may need to review and make changes to the design.	1 +1
(c)	The LOC value can be only between 1 - 10000 There are two records in BUS that are inconsistent in BNO (C105)	1 1
(d) (i)	Any BNO number apart from E121 and F123 It violates the referential integrity as the number does not exist in BUS.	1
(ii)	Same BNO, RTIME: F123 13/03/2022 11:00	1
(e)	<div> <div>DRIVER (DNAME, DNO)</div> <div>Primary key: DNO</div> <div>Foreign key: N/A</div> <div>BVIDEO (DNO, VTIME, VFILE)</div> <div>Primary key: DNO + VTIME (VFILE)</div> <div>Foreign key: DNO references DNO of DRIVER</div> </div> <div> <div>}</div> <div>①</div> <div>①</div> <div>①</div> <div>①</div> </div>	4
(f)	There is no consent from driver on releasing the videos for training purpose. Make an agreement before the recording.  Unauthorised persons might access the video. Access rights should be granted to trainees only.	1+1

3. (a) (i) FID, the primary key, should not be integer type, a character type should be used instead. 1
- (ii) PWD may be the same for different forums so UNIQUE is not needed. 1

(b) 4



Host, join ④

④ (4 out of 6)

- (c) The tables in Method 2 are well structured ④ to avoid data redundancy/inconsistency. 2\*  
/ When FID is updated, there is no need to do updating twice. / Less storage space is needed.
- (d) (i) Add a logical field to ST to indicate whether staff members can provide technical support or not. (Structure change) 1  
Update the newly added field (true/false). (data) 1
- (ii) DROP TECH 1
- (e) Select the forum ID / Date 1  
Select the order criteria 1  
Select the ascending / descending order 1  
Design layout and completion of data (e.g. submit button) 1

4. (a) MNAME  
ORDERTIME, MEMBERID (additional fields allowed)  
SHOPADD 1×3
- (b) ORD 4  
ORDERTIME, MEMBERID, SHOPID, PCODE, NUM  
Primary key: ORDERTIME + MEMBERID  
Foreign key: MEMBERID references MEMBERID of MEMBER  
Foreign key: SHOPID references SHOPADD of SHOP
- ① attribute  
 ① PK  
 ① FK  
 2 out of 3
- ① attribute  
 ① PK
- MEMBER  
MEMBERID, MNAME  
Primary key: MEMBERID
- SHOP  
SHOPID, SHOPADD  
Primary key: SHOPID
- (c) (i) CREATE INDEX QIDX ON PROD (QUAN) 1
- (ii) Many records would have the same value, e.g. 1, so the searching may be inefficient. 1
- (d) (i) In searching the information, the data flow can be spread across the servers to ease the traffic congestion. / faster in searching information. 1
- (ii) Data inconsistency among different servers would easily happen. (idea of data inconsistency) 1+1  
QUAN would change frequently, so it's difficult to maintenance the same records among the servers. (example)
- (e) The company can identify the buying habit / relation between various goods. 3  
Deliver promotional messages to members who has ordered any kind of goods through the result of the relation.
- Identify the data to be used ①  
Analyse the data ①  
Use the data ①

		Marks
1.	(a) (i) Router	1
	(ii) Decrease the size of a collision domain to minimise the network jam due to broadcasting. / Increase network security / bandwidth control	1×2
	(iii) It is more difficult to configure the network / increase loading of the router.	1
(b)	210.0.205.237	1
	192.168.2.129~192.168.2.254	1
(c)	192.168.2.2 ~192.168.2.126	1
	255.255.255.128	1
	192.168.2.1	1
(d)	No, the total number of computers in subnet B will be $80+50=130$ which exceeds the limit. ( $2^7-2-1 = 125$ )	1 1
(e)	Use IPCONFIG command (1) to ensure that all settings of NIC, like IP address, subnet mask, DNS server address and so forth, are configured correctly. (1) / Use PING command (1) to ensure that the connection path between computer and router or other network devices, e.g. transmission media and NIC, is working properly. (1)	1+1 1+1
2.	(a) (i) It allows or blocks inbound or outbound packets by closing unnecessary ports. It filters suspicious connections with an access control list.	1×2
	(ii) It translates domain names to IP addresses and vice versa.	1
(b) (i)	It acts as emergency backup power to allow the saving of any unsaved data (1) and the normal shutdown of the server (1) in case of power failure or unstable.	1 1
	(ii) It should be connected to the database server as the data in the server is more important than the others.	1
(c) (i)	Yes, it is because the two URLs are of different domains. <i>bad-price.com.hk</i> is not on the Black List. It can pass the mechanism even though it is checked against two lists.	2*
	(ii) No, it is because <i>b.youstop.com.hk</i> is the sub-domain of <i>youstop.com.hk</i> that is on the Black List.	2*
	(iii) The IP address of <i>selflearning.com</i> is 210.0.177.8 which is on the Black List.	1
	(iv) It can speed up web browsing.	2*
	The proxy server caches the web pages accessed by users. When some other users access the same web pages, they will directly retrieve those web pages from the proxy server without re-downloading from the corresponding web servers on the Internet.	
(d)	The access time is shorter. (better throughput) No backup is required. There is more usable storage space. (or lower cost)	1×2

3. (a) The WiFi network can provide greater bandwidth. (network bandwidth) 1×2  
The mobile phone network provides better coverage. (coverage)
- (b) Backup format / size / time / location + brief description 1×2
- (c) UDP is used in video live streaming. 1  
It is because UDP includes a simpler header which has less overhead. Besides, UDP requires no acknowledgement which makes it faster than TCP. Hence, it is more suitable for real-time applications. (1) 1
- TCP is used in sending results to the school server. (1) 1  
It is because TCP ensures that there is no data packet loss during transmission and that all received packets can be reassembled in order. (1)
- (d) (i) Run22 1
- (ii) Peter, Mary and Principal. 1  
Delete permission is granted from Run22 for Peter and inherited from Sport22 for Mary and Principal. 1
- (iii) Mary 1  
Deny permission in Principal in Swim22 overrides Grant permission in Sport22 and Mary got inherited permission from Sport22. 1
4. (a) It is easy to set up the network because no wiring is required. 1  
The mobility is higher. 1
- (b) Staff: 1+2  
2.4 GHz. With a larger coverage / higher penetration power, it ensures that staff can access the files in different rooms.
- Visitors:  
5 GHz. With a higher data transfer rate, visitors can watch videos smoothly.
- ① correct frequencies
- (c) Relieve the AP workload so as to improve the performance (load balancing) / 2  
The network is still functioning even if one AP is not working (redundancy) /  
The client can automatically connect to the AP with a stronger signal.
- (d) The new NIC has a different MAC address which is required to register again to the AP because the MAC filter is enabled. 2
- (e) (i) Use a more secure encryption method like WPA2. / Use hidden SSIDs. / 1×2  
Use a strong password.
- (ii) 
$$= \frac{20 \times 1024 \times 1024 \times 8}{50 \times 1000 \times 1000}$$
 1  
= 3.36 s 1
- (f) Visitors take their own responsibility for their computers and data loss. 1×2  
Visitors acknowledge that the network may not be uninterrupted or error-free.

	Marks
1. (a) (i) Comment A:	1
<ul style="list-style-type: none"> <li>• A large thumbnail is shown when a mouse is over it.</li> <li>• A flexible control (e.g. slider) to increase the size of all thumbnails for preview</li> </ul>	
Comment B:	
<ul style="list-style-type: none"> <li>• A search function (by keyword, hashtag)</li> <li>• A sorting function (by location, people, code, etc.) in an activity</li> <li>• A filter function (by location, people, code, etc.) in an activity</li> </ul>	1
Comment C:	1
<ul style="list-style-type: none"> <li>• Search or Filter functions by ONE particular date (input: text boxes / calendar / menu)</li> <li>• Arrange the activities in ascending order of date</li> <li>• Sort by date function</li> </ul>	
(ii) • Insert same style sheet / external style sheet in these webpages /	1 × 2
• Write CSS /	
• Apply CSS framework (e.g. Bootstrap, Tailwind CSS, W3.CSS, etc) /	
JavaScript library (e.g. jQuery) / CSS template	
Note: Answers such as 'use template' are too general and not acceptable.	
(b) (i) $(5 \times 600) \times (4 \times 600)$ or $3000 \times 2400$ or 7 200 000	1
(ii) 16-bit	2
① for steps if the answer is wrong	

- (c) Create P2 from P1: 1
- Use a crop function to remove the parts outside the triangle
  - Put a mask layer / a hollow layer with a triangle on the upper layer
- Create P3 from P2: 1
- Flip vertically / Flip up-side-down
  - Reflect vertically / Reflect up-side-down
  - Mirror vertically / Mirror up-side-down
  - Flip horizontally AND Rotate/Turn 180°
  - Flip left-to-right AND Rotate/Turn 180°
  - Reflect horizontally/left-to-right AND Rotate/Turn 180°
  - Mirror vertically/left-to-right AND Rotate/Turn 180°
- Create P4 from P1: 2
- Copy P1 2 times
  - Resize smaller / Decrease the size
  - Rotate them one by 120° and the other by 240°
- ① for 2 points only
- (d) Create 2 or more key frames to store the birds in different positions 1
- Create a motion tween to move the bird's position / 1
  - Create a motion guide / guide layer to move the bird's position
- × Insert tweening
- Create Shape tweening to create the wing action / 1
  - Create a motion tween to rotate the wing
- × Create tweening to move the bird's wing

2. (a) Keywords: This tag is the topic of this web site. 1×2  
 Description: The text here is text that search engines sometimes use as a description for your web page when listing it.
- (b) Border, rowspan 1×2
- (c) 1. Some wordings are difficult to read. 1×4  
 2. The mathematics question is too difficult for children.  
 3. It is difficult to use a mouse or touch screen to move the 'C' at the exact position.  
 4. It is difficult to distinguish objects in the photos.
- (d) (i) `playerA = playerB` 1×4  
`<`  
`round + 1`  
 OR
- (ii) `myRAND(3) + 1` 1
- (iii) Advantage: 1  
 Fully control the access to the web site. (web site setting / hardware & software used) /  
 Manage storage space and web performance more effectively.
- Disadvantage:  
 Needs to provide support 24 hours a day. / 1  
 A stable Internet connection with sufficient bandwidth should be maintained.

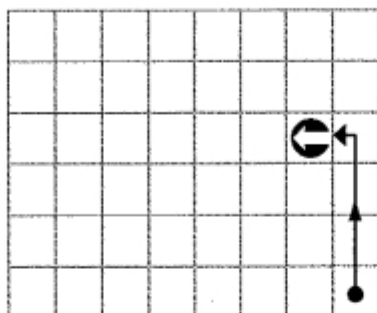


3. (a) (i)  $\frac{3840 \times 2160 \times 24 \times 60 \times 60}{8} / 1024 / 1024 / 1024$  (no mark for including 30) 1  
= 83 GB (~90GB) 1
- (ii) The file size will be larger. / 1  
The CPU loading in encoding is heavy. / Larger power consumption
- (b) (i) To reduce the file size of/compress videos 1  
To change the video into a suitable format 1
- (ii) Better compression (file size) / Support a higher resolution / Reduced the use of GPU/RAM / 1×2  
Support hardware-accelerated / Less bandwidth for streaming / Bug fix
- (c) The video may be stretched. / There are black strips on top and bottom of the video. (aspect ratio) 1  
The reduced frame rate may make the video jerky. 1
- (d) (i) Advantage: Save time to reload the previous web page after closing the pop-up window. 1  
/ Grab people's attention (visibility)  
Disadvantage: Some default settings of browsers may block pop-up windows. 1  
/ Too many pop-up windows caused the browser in a mess.  
/ Visual impaired persons hard to navigate among pop-up windows.
- (ii) Change the font size. / Change the colour scheme. / Add subtitles of the video. / Add alt text 1×2
- (e) Users - Store user preferences / colour schemes / username & password 1  
/ Restore where the video was paused last time.
- Web site owner - Keep track of users' activities/web surfing behaviour/types of videos which are most visited 1

4. (a) (i)	The subject names are preset for users to choose for easier grouping / It can minimize the input error. / There is no need to type in and reduce input time.	1
(ii)	Check box: It allows multiple selections. / Pull-down menu: It can occupy less screen space / allow a single selection. / Reduce input errors (need explanation)	1+1
(iii)	File Size / File format, such as JPG and PNG / Image resolution / The number of files/photos should be limited. / Filename should not contain invalid characters such as special symbols. * photo size	1×2
(b) (i)	Change the [ADD] button to [ADDED] / toggle [ADD] to [REMOVE] / Change the colour of the [ADD] button Show the number of added items / total amount in 'My Cart'. Pop-up/sound notification to show one item is selected. Add one column to the table to show the number of each item added	1×2
(ii)	Level and Subject / Subject and price range	1
(iii)	Add a button to sort by a particular attribute. Create a <u>search</u> engine on the web page.	1×2
(c)	Reduce server workload. The user experience is better as the response of the browsing is faster. * reduce storage needed	1×2
(d)	When a user applies a discount code, the program will check if the code is valid in the database. After the user applied a discount code, it will become invalid / it will be removed / the status of the discount code will be updated.  discount codes in a database/on the server side ① check valid / compare ① update ①	3

1. (a)

2



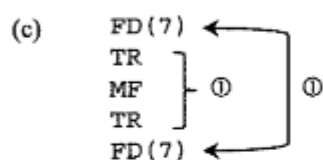
Path ①  
State ①

(b) (i) N

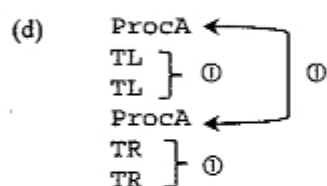
1

(ii) 3

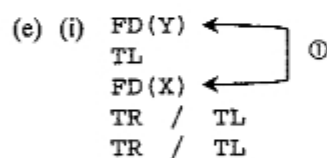
1



2



3



1, 1

(ii)  $\boxed{D \text{ to } 2}$  or  $\boxed{1 \text{ to } 3-D}$   
TR

1 + 1

Alternative:

$\boxed{1 \text{ to } D + 1}$  or  $\boxed{0 \text{ to } D}$   
TL

TL/TR ①  
All correct ①

(f) Low-level language: Faster execution due to direct addressing / Efficient hardware control.  
High-level language: Machine independent / Easy to write, understand, debug, maintain, etc.

1

1

2. (a) (i)  $N = 1$  1  
 $X = 5$  1
- (ii) if  $N = 0$  then ① 1 + 1  

return TRUE  
 else  
 return FALSE

 ①
- Note 1: if  $\text{pop}(S) = 0$  / if  $\text{pop}(S) = \text{null}$  ✕  
 Note 2: "return" is needed
- (b) (i) 6 1  
 (ii) 4 2
- (c) (i) 1 1 + 1 1 or 1 1 1 1 + 2  
           ①   ↑       ↑   ①
- (ii) 1 + +/1 1 1 1
- (d) flag / flag = true 1  
 $N > 1$  /  $N \geq 2$  1
- (e) (i) B should start at 1. (E after B / E should start at 4) 1  
 F should start after E. 1
- (ii) No translation is needed during execution. 1  
 Object code is available.  
 Compiled code runs faster.  
 Compiled code can be run independently and a compiler is not needed for program execution.  
 Only one compilation is needed and the resulting code can be run repeatedly.  
 A compiler processes the whole source code and performs a lot of optimization.

3. (a) 3, 7 1
- (b)  $(i-1)*8 + j$  2  
 $(1+1)$   
 $(i*8) - (8-j)$   
 $(i-1) \times 8 + j$   
 $8(i-1) + j$   
 $(i-1)*8$  ①  $+j$  ①
- (c) integral part of  $(rand*8) + 1$  2  
 $(1+1)$   
 $rand()$  or  $rand$   
 $rounddown(rand*8) + 1$   
 $int(rand*8) + 1$   
 $round(rand*8+0.5)$   
 $0..7$  ①  $+ 1$  ①
- (d) (i)  $SP[i, j] = k$  1
- (ii) A while-loop can be used so it can stop if the location is found, and thus the efficiency can be improved. 2  
- use indefinite loop (while/repeat) correctly ① and exit the loop when found ①  
Only use while-loop without elaboration ①  
Use the while-loop wrongly ②  
Only state 'stop immediately after the student is found' ①  
If found, change i to 5 and j to 8 of the for loop to exit ②
- (iii) The search value is not arranged in order. 1
- (e) 7 ① 4  
4 ① 4
- $abs(SP[i+1, j] - SP[i, j]) = 1$  ②  
 $(SP[i+1, j] - SP[i, j]) = 1$  OR  $(SP[i+1, j] - SP[i, j]) = -1$  ②
- $(SP[i+1, j] - SP[i, j]) = 1$  ①  
 $(SP[i+1, j] - SP[i, j]) = -1$  ①
- (f) Errors are contained in the first-implemented schools only, which limits harmful effects on the other schools.  $1 \times 2$   
The other schools can learn from the experience (maximum user feedback) of these schools, especially in terms of operation.
- Note:  
A smaller scale  $\rightarrow$  easier to manage  
Part of the organization only  $\rightarrow$  lower cost  $\rightarrow$  with relevant elaboration

4. (a)

2

			i	
		1	2	3
1		5	6	7
j 2		4	9	8
3		3	2	1

correct position of 1 ①

all correct ①

(b) (i) Line 8:  $A[Y, X] \leftarrow k$

1

Line 10: Replace  $A[X+DX, Y+DY]$  by  $A[Y+DY, X+DX]$

2

$(A[Y+DY, X+DX] (1) > 0 \text{ ①})$

(ii) Line 7: for k from 9 down to 1 do (without down ①)

2

or

Line 8:  $A[X, Y] \leftarrow 10 - k$  (2)

$(A[X, Y] \leftarrow 9 - k \text{ ①})$

(c) (i) Description of the following criteria:

1×2

Scale and modularity

Reusability

Portability

Execution efficiency

Functional strengths

Readability

Utility libraries and development tools

End-user interaction

Familiarity

Licensing fee for using libraries (other reasonable costs)

(ii) Concept of:

1×2

attributes and methods

Data abstraction (common features of objects & procedures)

Class (modularity and reusability)

Encapsulation

Information hiding (reduction of complexity)

Inheritance (relationship between different classes)

Polymorphism

- (d) (i) A system test is done by developers while a user acceptance test involves ultimate users to test the system with authentic data. 2\*

test the system with authentic data  
ensure the system meets / fulfills the user requirements

- (ii) Users can learn how to use the system through the user manual. 1×2  
Development team members can understand the system quickly for maintenance through the system and technical documents.

Note:  
names of the documents are not required  
describe how to use system documents

\* Marking criteria

- ② Illustrate a comprehensive and logical answer
- ① Illustrate a relevant answer