Marking Schemes

Paper 1 (Section A)

Question No.	Key	Question No.	Key
1.	A (91)	21.	B (61)
2.	A (53)	22.	C (74)
3.	A (77)	23.	B (83)
4.	B (81)	24.	B (60)
5.	D (65)	25.	B (66)
6.	C (63)	26.	C (70)
7.	D (25)	27.	A (76)
8.	D (83)	28.	B (59)
9.	A (76)	29.	D (76)
10.	A (70)	30.	C (75)
11.	B (68)	31.	C (91)
12.	D (77)	32.	D (45)
13.	D (88)	33.	C (81)
14.	D (63)	34.	C (83)
15.	A (82)	35.	B (79)
16.	C (86)	36.	A (81)
17.	A (48)	37.	D (83)
18.	B (72)	38.	A (91)
19.	C (76)	39.	B (53)
20.	A (58)	40.	A (79)

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

General Notes on Marking

1. The marking scheme was prepared for markers' reference. It may not exhaust all possible answers for each question and should not be regarded as sets of model answers. Candidates and teachers who were not involved in the marking process are advised to interpret its contents with care.

2. 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.

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

Paper 1 (Section B)

				Marks
1.	(a)		Notebook computer: hard disk Table computer: flash memory / SSD	1 1
	(b)	(i)	The CPU / storage device / display unit consumes less electricity.	1
		(ii)	The operating system (Android) / storage device (flash memory) supports the shorter startup time. / The tablet computer has fewer peripheral devices to load up and thus its startup time is shorter.	1
		(iii)	Peter cannot keep his eyes / neck / hands in a good ergonomic position. / small keyboard	1
	(c)		USB: The printer has a higher data transfer rate / better data security / less interference (stable). Wi-Fi: The printer is more portable.	1 1
	(d)		(i) FTP (ii) FTP (iii) HTTP (iv) HTTP (v) SMTP (vi) IMAP	1 1 1 1 1 1
2.	(a)	(i)	Minimise the chance that the others use the account when the system is unattended.	1
		(ii)	The data are encrypted. / The identity of the web site can be validated. (trust)	1
	(b)		The company encrypts the data with its private key and Janice decrypts with the company's public key. / The company encrypts the data with Janice's public key and Janice decrypts with her private key.	2
	(c)		The two levels of authentication processes (email & SMS) can enhance the security of password reset. Email / SMS can authenticate Janice's identity. The one-time password can force Janice to use another password to avoid the damage of the leak of the password generated by the system. (explanation of SMS / one-time password ✗)	1×2
	(d)		Someone might peek at her to steal her username and password. Her private information like username and password might be stored in the computer (e.g. cookies). The security of the public computers is not guaranteed because spyware (keylogger, virus, etc.) might be existed. (The security is low. / She may forget to log out the system. ✗)	1×2
	(e)	(i)	Janice owns the copyright of the photos. The company should acquire Janice's permission for the right to use. / The company should pay for the use of the photos.	1 1
		(ii)	No, her friends still need to ask for Janice's permission because non-commercial use of copyrighted works cannot be exempted.	2

		Marks
3. (a)	`1, 2,` ① `3`	2
(b) (i)	`0`	1
	`N + 1`	1
(ii)	`B = 21`	1
	`N = 7`	1
(c)	`A = 4`	1
	`B = 5`	1
(d) (i)	(1) `1000 1110`	1
	(2) `1000 0000`	1
	(3) `1000 1110`	1
(ii)	256 (2^8)	1
4. (a) (i)	No, it is because `CNO` cannot be unique.	1
(ii)	It supports both traditional and simplified Chinese characters.	1
(b)	20114002	2
(c) (i)	`=AVERAGE($F2:$H2)`	1
(ii)	`J2 = A`	1
	`J3 = C`	1
(d) (i) (1)	The mistyped word can be found in the dictionary of the word processor.	1
	For example, 'from' is wrongly typed as 'form'.	1
(2)	The word is not in the dictionary.	1
	For example, Chinese name 'Chan' is typed.	1
	[Example of names, scientific terms, or spelling in UK and US]	
(ii)	grammar check / hyphenation / thesaurus / Capital letters	1

			Marks
5.	(a)	The newsletters are more attractive (multimedia elements). Students can read a number of newsletters with ease. Students can search specific topics with ease.	1×2
	(b) (i)	The newsletters can be opened by browsers in different tablet computers. (portability/popularity) Students can use many simple tools to create their work. (development tools) It supports hyperlinks.	1×2
	(ii)	It contains much information of the original data so that Mr Li can edit and extract necessary audio information. (quality)	2
	(iii)	Some students adopt some uncommon codec that Mr Li has not installed for his video player.	1
	(c)	Presentation file: Work flow (timeline) can be controlled dynamically. (interactive) The preparation time can be shorter. The editing work is simpler. Hard copies can be provided for reference.	1×2
		Video demonstration: The presentation is more vivid and authentic. (more visual effects) The pace of the presentation can be controlled by Mr Li in advance. It is easy for Mr Li's colleague to use.	1×2

Paper 2A

Marks

1. (a)

	Primary key	Foreign key
PER	PID	N/A
RES	PID + SID	PID, SID
SUB	SID	N/A

1
1, 1
1

(b) (i)
```
select distinct CLAS                ①
from PER
order by CLASS DESC                 ①
```
2

(ii)
```
select SID AS 'Subj', count(*) AS 'Num'      ①
from RES
group by SID                        ①
```
2

(iii)
```
select PID from PER, RES
where PER.PID = RES.PID and         ①
YEAR(ENTRY) = 2007                  ①
group by PID
having avg(MARK) <50                ①
```
3

(c) (i) Referential integrity — 1

(ii) The SQL command will show the records of the joined table that the `RES.SID` does not exist in `SUB`. The officer will discover those subjects that are enrolled by students but do not exist in `SUB`. — 2

(iii)
```
select SID                          ①
from RES where                      ①
SID not in                          ①
(select SID from SUB)
```
3

2. (a) It has leading zeros. — 1

(b)
```
SELECT BOOKING.*, VIP, GOLD, ORD
FROM MINFO, BOOKING                 ①
WHERE MINFO.MNO = BOOKING.MNO AND
BNO = '12041901'                    ①
```
2

(c) (i) If the result is not empty, it indicates a violation of the validation rule. — 1

(ii) The third line should be changed to `WHERE VIP=FALSE` ① — 2

(d) (i) There are more backup sites. — 1
When members perform searching, the traffic is localised and it alleviates the network traffic. — 1

(ii) When updating, it is costly to maintain a consistent database among the three sites. — 1

Marks

(e) (i) `BOOKING: VENUE, BDATE` 1
`MINFO: MNO` 1

(ii) The list will show records of member information which is not related to the user. 1
It violates the data privacy. 1

3. (a) (i) Redundancy: `MNAME` such as `Mark` is stored in several records unnecessarily. 1, 1
Inconsistency: Change (`MCODE, MNAME`) and update `MNAME` in different queries may lead to data inconsistency. 1, 1

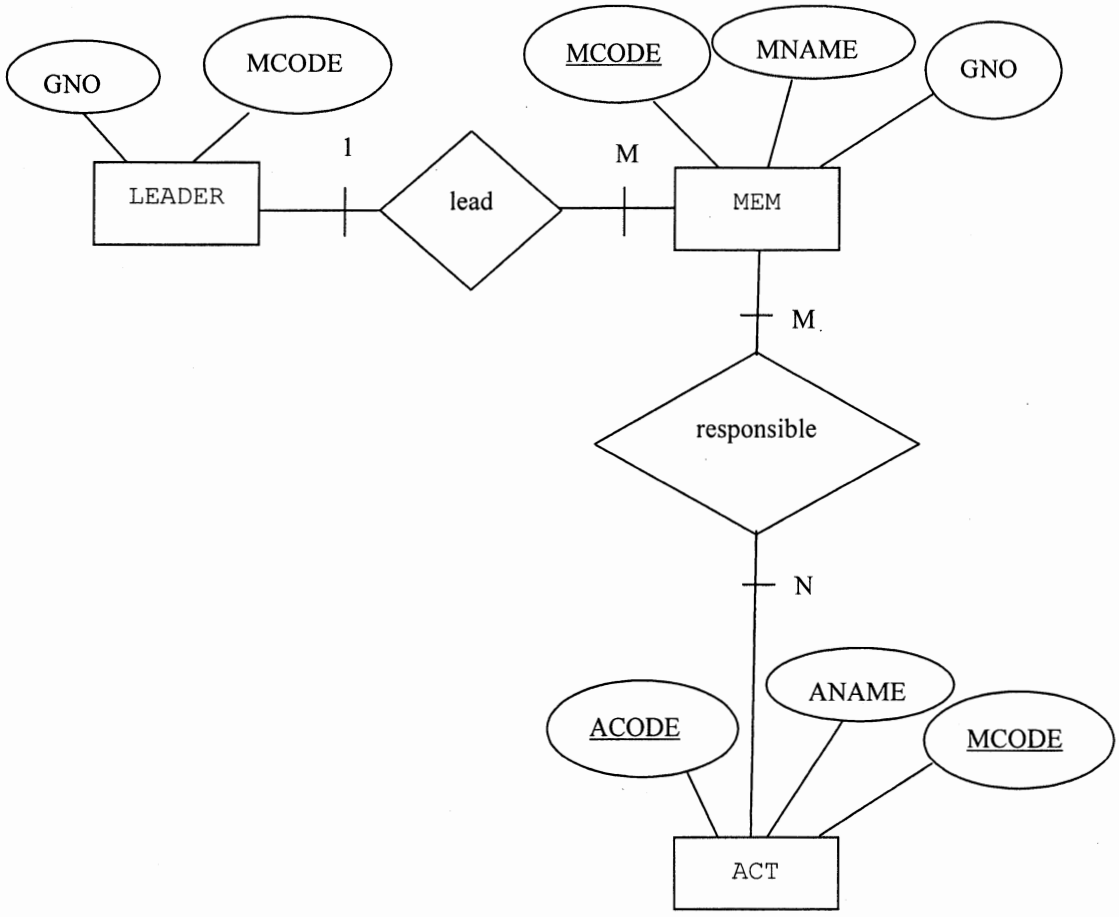
(ii) Store `ACODE` and `MCODE` in `ACT` and 1
create another table to store `ACODE` and `ANAME`. 1

(b) (i) `LIKE` 1

(ii) `(MCODE, MNAME, GNO, LEADER)` 1
`LEADER` contains Y and N to illustrate whether the member is a group leader or not. 1

(c) In Mark's proposal, the suffix characters occupy 1000 bytes. 1
In Lily's proposal, there are 500 records in `LEADER` and their total size must larger than 1000 bytes. 1
Hence, the storage capacity of Lily's proposal is larger. 1

(d) Relationships 1
Key fields 1
1-M 1
M-N 1



Marks

4. (a) Give questionnaires to gather information from customers. 1
Interview the staff who operate the shops. 1

(b) Sub-total column is not necessary because it can be calculated by the other data. 1, 1

(c) (i) It is not in 2NF (1NF). There are partial dependencies in the relation such as 'PRICE depends on FLAV'. 1, 1

(ii) 1×3

CAT	TEMP	ING

FLAV+CAT	PRICE

ING	MANU

(d) It changes the structure of MAIN that the field TEMP will be erased. Tim cannot re-enter the data. 2

(e) Under 'Membership', username and password should be entered and passed to the DBMS. A query with the data is executed and its result will activate the corresponding web pages (either membership web pages or login-failure web pages) for the user. 3

Example of data ①
use of query ①
description of the interaction ①

Paper 2B

				Marks
1.	(a)	(i)	4	1
		(ii)	The network is just a LAN without a direct access path to another network (e.g. Internet).	1
	(b)	(i)	He should use WPA2 as it is more difficult to crack the encryption.	1+1
		(ii)	IPsec (or SSL)	1
	(c)	(i)	IP addresses can be automatically assigned when notebook computers connect to the network. (IP address management) Unused IP addresses can be automatically re-assigned. (re-use)	1 1
		(ii)	The notebook computers can quickly fetch the local copies of web pages cached in the proxy server without the need of download. This can alleviate the loading of the 3G network. ① temporary storage ① network loading	2
	(d)	(i)	Collisions cannot be detected (low signal energy) in the wireless environment (radio frequency).	1
		(ii)	A collision occurring on the sending side can be detected before sending data.	1
	(e)	(i)	Use the same SSID for all APs.	1
		(ii)	The additional AP may interfere with the existing AP with channel 1. These two APs should be separated in a suitable distance.	1 1
2.	(a)	(i)	Concept of encapsulation (header/trailer) ① Function of the header ①	2
		(ii)	Application	1
	(b)	(i)	TCP	1
		(ii)	UDP	1
		(iii)	TCP	1
		(iv)	UDP	1
	(c)	(i)	Noise/interference of signal exists in the communication channel.	1
		(ii)	CRC is better as it can detect multiple error bits (burst errors).	1+1
	(d)	(i)	2^{128}	1
		(ii)	IPv6 supports applications to request handling packets without delay (priority handling/low latency)	2
		(iii)	multicasting: more video data can be streamed as repeated data transmitted to different computers is reduced / Jumbogram: larger packet to reduce packet loss rate	1+1

				Marks
3.	(a)	(i) 3 (ii) 2 (iii) 4 (iv) 1	(① two answers correct)	2
	(b)	A multiplexer combines and converts several TV programmes to one signal and transmits the single signal to a demultiplexer through the transmission medium; the demultiplexer will convert the single signal back to several TV programmes.		1 1 1
	(c)	Example: interactive TV programmes Benefit: two-way communication allows TV programmes and viewers' interactive data to be transmitted simultaneously		1 +1
	(d)	(i)	Coaxial cable has lower capacity but longer transfer distance.	1, 1
		(ii)	Use a repeater/switch to retransmit the signal at a higher level.	1+1
	(e)	(i)	The server loading / bandwidth requirement of the TV station is lowered and hence the network performance is improved.	1 1
		(ii)	There may be a significant delay in receiving TV programmes. They cannot receive any signal if the receivers at the upper end are out of order.	1 1
4.	(a)	(i)	The IP addresses falls between 192.0.0.0 and 223.255.255.255 . (leading bits 110)	2
		(ii)	IP address: 192.168.2.x (x can be any number from 250 to 253) Subnet mask: 255.255.255.0	1 1
	(b)	(i)	Suspected data packets will be filtered.	1
		(ii)	An access control list is configured (hostname + port) to (monitor and) control inbound and outbound communication.	1
		(iii)	It filters data packets (unwanted outside traffic) through idle/nonstandard ports at the application level.	1
	(c)	(i)	Only users authenticated by the domain controller can access the data stored.	1
		(ii)	Allows recovery of data when one drive in the RAID fails.	1
		(iii)	UPS notifies the NAS and provides the NAS sufficient power to shut down itself gracefully during power interruption.	1
	(d)	(i)	Use a Ping program / protocol analyzer to check the network connection between two networking devices. Check the network interface card. Check the IP configuration. Use a cable tester to check connectivity / pin assignment.	1×3
		(ii)	Problem of collision is less serious.	1
	(e)		Set up the network / Design test plan / Documentation / Provide user training	1×2

Paper 2C

				Marks
1.	(a)	(i)	The text will be shown when the web page cannot display the image. / Move the mouse pointer over the image. /	1
		(ii)	For the visually-impaired, the text can be converted to speech / read by software / used for refreshable Braille display.	1
		(iii)	(1) The width is fixed at 600 and the height will remain at 400.	1
			(2) The size is 300×200 and the aspect ratio is kept.	1
			(3) The height is fixed at 200 and the width will be 300.	1
			(The aspect ratio is kept in the three cases.)	
	(b)	(i)	The hyperlink will be opened in another browser.	1
		(ii)	The parent frame (upper one) is the root (full body of the window).	2
	(c)	(i)	The viewable screen size for the target web pages is larger. / More information can be shown. / It is more suitable for mobile devices with a small screen size. / It is print-friendly.	1
		(ii)	Users do not have to press 'back' and 'forward' buttons to visit different pages (navigation).	1
	(d)	(i)	Add anchor tags.	1
			He can put the anchor for every certain number of paragraphs. Clicking the links (buttons) will jump the cursor back to the top of the web page. (usage)	1
		(ii)	Clicking OK button may not result in showing a web page in the right frame.	1
			Web pages with some options may not exist.	1
2.	(a)	(i)	No, it is not directly played by an electronic instrument. / Yes, the piano has a MIDI output. / Yes, MIDI software is used to extract the background music.	1
		(ii)	It only includes an instruction set and notes to instruct a sound card to make different audio effects, and no actual audio play is stored in the file. (storage structure of MIDI & MP3)	1
		(iii)	The file in WAV format contains more information and it facilitates better audio editing. (quality)	1×2
			The file in MP3 format is smaller and it facilitates the web surfing. (size)	
	(b)	(i)	S has more noise because it has a lower sample size. (uses 8-bit sample size)	1+1
		(ii)	Q = 2.5	1
			R = 10	1
			S = 5	1
	(c)		Add transcript of the speech. / Use text-only web pages. / Use video with sign language.	1
			Let the needy students read. (screen reader)	+1
			(① item + ① explanation)	
	(d)		Simplify the layout of the web pages.	1×3
			Compress the audio files further.	
			Reduce the resolution of the images.	
			Remove unnecessary multimedia elements (such as background music).	
			Build a text-only version.	
			Make the font adjustable.	

Marks

3. (a) (i) $8 \times 6 \times 1200 \times 1200 \times 3$ 1
$= 198$ (197) 1

(ii) For 'lossless',
the file size is larger; 1
the file keeps all the information of the image without data loss while the other one does not; 1
the file keeps the colour depth while the other one may diminish the colour depth (colour depth remains unchanged/number of colours decreases) for better compression performance in general. 1

(b) (i) Set no border (table setting). 1×2
Cut the image into small fragments.
Put the fragments of the image with the text into appropriate cells.

(ii) layering (CSS) / graphics editing software
The editing / preparation work is simpler.

(c) (i) It leads to a blinking animation in (2) as a blank frame will show every 0.1s and last for 0.1s. 1, 1
(① blink ① explanation)

(ii) The two animations look the same. For (1), each frame lasts 0.2s. For (3), each frame lasts 0.1s but two identical frames displays consecutively, leading to the same visual effect as (1). 1+1
(or The refresh rate in (3) is higher and the display may lead to blinking.)
(① conclusion + ① explanation)

(iii) It possesses sound feature / user interaction / a higher colour depth / a smaller file size (vector). / Quality remains unchanged after resize. 1×2

4. (a) Benefit (Mr Li): The data verification process is simpler. 1
Benefit (students): They can reduce the input errors. 1

(b) (i) The script will be called when CLASS is set. 1
With this script, only the available class numbers and student names with the selected class will be shown in CLASS NUMBER. 1

(ii) The corresponding student names will be selected and downloaded to the client browser which will increase the loading (server/bandwidth). 2

(c) (i) Write a server-side script. 1
Acquire the 'counter' service from an external service provider. 1

(ii) Add an option like "Please choose:" as the first/default option in each drop-down list. 1×2
Use radio buttons to implement options.
Use OK button to confirm every question.

(d) Assign 1 to `p[i]` (`p[i] = 1`) 1
If `ans[i]` and `choice` are equal, 1
assign 1 to `q[i]`; otherwise assign 0 to `q[i]`. 1
(`if ans[i] = choice then q[i] = 1 else q[i] = 0`)

(e) 2×2

Button	Script
% correct	*DISPLAY(100 * SUM(q)/SUM(p))*
Not attempted	*DISPLAY(n - SUM(p))*

or *n*

Paper 2D

Marks

1. (a) (i) (1)

X[1]	X[2]	X[3]	X[4]	X[5]	X[6]
0	1	1	1	0	1

(−1 for one mistake) 2

(2) 5 1

(ii) N ranges from 0 to 63. 1

When all the 6 elements of X are filled with 0, then the binary number is converted from the smallest value of N, which is 0.

When all the 6 elements of X are filled with 1, then the binary number is converted from the largest value of N, which is 63. 1

(iii) The algorithm is used to convert a decimal number N to binary digits. 1

(b) (i)

Y[1]	Y[2]	Y[3]	Y[4]	Y[5]	Y[6]
1	1	0	0	0	0

(−1 for one mistake) 2

(ii) 6 1

(iii) N = 32 1

When N = 32, after the 1st pass of Step 6 of ALG2, N = 0 and the While loop terminates after execution of 1 pass. 1

For ALG1, it has to execute 6 passes for N = 32. 1

Other possible values of N:

N	Binary	Passes (ALG1)	Passes (ALG2)
8	001000	4	3
16	010000	5	2
20	010100	5	4
24	011000	5	3
28	011100	5	4
32	100000	6	1
34	100010	6	5
36	100100	6	4
38	100110	6	5
40	101000	6	3
42	101010	6	5
44	101100	6	4
46	101110	6	5
48	110000	6	2
50	110010	6	5
52	110100	6	4
54	110110	6	5
56	111000	6	3
58	111010	6	5
60	111100	6	4
62	111110	6	5

(c) (i) "ICT bytecode" can be executed on different platforms (or "ICT bytecode" is portable). 1

(ii) (1) Executable file of machine code has to be generated. 1

(2) Program can be executed at a faster speed. / 1
Require less resource because ICT-VM is not used.

Marks

2. (a) (i) 16 — 1
X = 4 — 1

(ii) (1) Data of arrival time from the 5th day to the 19th day are lost. (data lost) / The stack pointer would point to a wrong element for storing a new arrival time. (wrong index) — 2

(2) Copy the stack to another temporary stack and retrieval of data is to be done on the temporary stack. (storing data for processing) — 1

(iii) The stack will overflow. — 1

(b) (i) staff ID — 1

(ii) A flag (Boolean value) to indicate whether the staff ID is a valid one — 2
(① flag)
(① purpose)

(c) (i) (1) Unit test — 1
(2) User acceptance test — 1

(3) User acceptance test: To ensure the system meets the company's (user) requirements. — 1
System test: Evaluate how well the whole system, after integrating modules, complies with the specification. — 1
Unit test: Ensure that each module performs its function as defined in specification. — 1

(ii) (1) If the new system has any problem, the entire system may be affected. — 1

(2) The cost (money, manpower, time) is the lowest. — 1

3. (a) **[Pascal version]** — 2

```
function call_random(N : integer) : integer;
begin
    call_random := myrand(N) + 1;
end;
```

① call & return
① return value

[C version]

```
int call_random(int N) {
    return (myrand(N)+1);
}
```

[Visual Basic version]

```
Private Function call_random(ByVal N As Integer)
    call_random = myrand(N) + 1
End Function
```

[Java version]

```
static int call_random(int N) {
    return (myrand(N)+1);
}
```

(b) It is easy to change the values in the program. / It makes the program more readable. / The program can be easily adapted in other buildings owned by the company. — 1×2

Marks

(c) **[Pascal version]** 7

```
function closest : integer;
var
    i, cPos, cLift : integer;
begin
    cPos := MAXFLOOR;
    for i := 1 to LIFTTOTAL do
    if LiftPos[i] < cPos then
    begin
       cPos := LiftPos[i];
       cLift := i;
    end;
    closest := cLift;
end;
```

- ① i, cPos, cLift
- ① Initialise cPos
- ① for loop
- ① if condition
- ① Find the closest
- ① Return value
- ① use of MAXFLOOR and LIFTTOTAL

[C version]

```
int closest(void) {
    int i, cPos, cLift;
    cPos = MAXFLOOR;
    for (i=1; i<=LIFTTOTAL; i++)
      if (LiftPos[i] < cPos) {
         cPos = LiftPos[i];
         cLift = i;
         }
    return cLift;
}
```

[Visual Basic version]

```
Private Function closest() As Integer
  Dim i, cPos, cLift As Integer

  cPos = MAXFLOOR
  For i = 1 To LIFTTOTAL
    If LiftPos(i) < cPos Then
      cPos = LiftPos(i)
      cLift = i
    End If
  Next i
  closest = cLift
End Function
```

[Java version]

```
static int closest() {
    int i, cPos, cLift=0;
    cPos = MAXFLOOR;
    for (i=1; i<=LIFTTOTAL; i++)
      if (LiftPos[i] < cPos) {
         cPos = LiftPos[i];
         cLift = i;
         }
    return cLift;
}
```

Marks

(d) (i) Interview with users (management, passengers) 1×2
Questionnaire
Observation (e.g. Observe and gain a first-hand experience of the operation of lifts before a computerized system is implemented)
Review statistical data (such as waiting time of lifts)

(ii) Shorten waiting time for passengers when calling a lift to the Ground floor. 1

4. (a) **[Pascal version]** 1, 4

(i)
```
var A : arraytype;
```

(ii)
```
while not eof(infile) do
begin
    readln(infile, A[i]);
    i := i+ 1;
 end;
```

① Consider end-of-file
① Boolean expression
① read a line
① loop

[C version]

6 is acceptable.

(i)
```
char A[100][7]
```

(ii)
```
while (fscanf(infile, "%s", A[i]) != EOF)
    i++;
```

[Visual Basic version]

(i)
```
ByRef A(100) As String
```

(ii)
```
While item <> Nothing
    A(i) = item
    i = i + 1
    item = infile.ReadLine()
End While
```

[Java version]

(i)
```
String[] A
```

(ii)
```
while (item != null) {
    A[i] = item;
    i+=1;
    item = infile.readLine();
}
```

(b) (i)

	A[0]	A[1]	A[2]	A[3]	A[4]
Second pass	chess	music	sports	art	ict
Third pass	art	chess	music	sports	ict

1
1

(ii) The extra 1st pass (`j = 0`) is redundant. 1
It simply assigns the 1st element (`A[0]`) to `Temp` and then assigns `Temp` back to `A[0]`.
Steps 4, 5 and 6 are in fact skipped. 1

(iii) All the data items are in reverse/descending order. 1

(c) (i) (1) `false.` 1
(2) `B = flute, oboe.` 1
(3) `C = flute, oboe, basketball.` 1

(ii)
```
?- belongsto(art, Y).
```
1

(iii) Logic languages focus on setting the goal ("what to solve") and the problem is solved by relations (associating facts and rules), but not on specifying how to solve. 1