Collegiate Programming Examination(CPE) Manual

2018/5/29

This handbook is provided to examinees who take the CPE exam. The content includes the use of the exam environment and the basics of the I/O used when solving problems.

- 1. To take the CPE exam, please complete the account registration on the CPE website before signing up for the exam. If you already have an account, you can just sign up for the exam without registration. Please carefully select the examination room when you sign up for the exam and go to report for your identity and take the exam at the designated time.
- From 2013/10/1, CPE exam adopts new evaluation system called Coding Frenzy: <u>http://coding-frenzy.arping.me/</u>

Examinees can go to the "Coding Frenzy" to register and practice online. (Note: CPE account is different from Coding Frenzy account. CPE account must be used for CPE exam and Coding Frenzy account must be used for Coding Frenzy exercise.)

3. The CPE website, <u>http://cpe.cse.nsysu.edu.tw/</u>, has more detailed information on "環境與教材".

1. CPE examination environment

1.1 Coding Frenzy: System Registration and Login

Please click "<u>同意以下各授權規定</u>" to enter the login screen of the Coding Frenzy system, as shown in Figure 1.1.1.。



(Figure 1.1.1)

After entering, please complete the "identity card" and "test number" (the test number will be given by the invigilator before the exam) to complete the login action, as shown in Figure 1.1.2



After completing the login screen as shown in Figure 1.1.3, examinees can see the menu, the current time, and the list of exam topics.

📕 🍯 剩151分45秒 🛛 結束評

考生功能(S) 3月11日18:40 ~ 3月11日21:40 考言管理(T) 3月11日19:09:14 我是考生機:使用http://140.117.16.11:63214 (A) Y203072546 (B) 測試一二二八 (C) NSYSU002041 (D) 045212 (A:身分證,B:姓名字,C:准考碼,D:認證碼) ALT + TAB 可以切換不同視窗。 監考機址: http://140.117.16.11:63214
 如果此處題目區未能於適當時間顯示題目資訊,請按FS 更新。
 Java 程式撰寫 請使用 class main,按 ALT+L 選 Java編譯器,CTRL+H 可以觀察雙和範例。
 Java 程式撰寫 操行 請使用 "rra" 不要只使用 "ra"。 •程式通過繳交,請務必按[桌面|考生功能/考場成績](這是及時資料),確認資料是否上傳監考機,確認資料是否有誤。 題目 請慢慢開題!! (點擊之後 請等待!! 正式考題 00B <u>解題</u> 00B1.UVA10019 <u>看題</u> <u>解題</u> 00B2.UVA12503 <u>看題</u> <u>解題</u> 00B3.UVA11639 <u>看題</u> <u>解題</u> 00B4.UVA11475 <u>看題</u> 解題 00B5.UVA10055 看題 解題 00B6 UVA10954 看題 解題 00B7.UVA10090 看題

(Figure1.1.3)

1.2 Menu

Including Clarification Request, Clarification Response, Score board, Dictionary, and some additional tools, such as Figure 1.2.1.





1.2.1 Clarification Request

After clicking, there is a request form. Please fill in the questions you want to ask

and related information (question number, description of the problem), as shown in Figure 1.2.2. After the question is sent out, only the questions which are answered by the invigilator will be displayed, as shown in Figure 1.2.3.

- Chinese Input Method: In the exam room, shortcut keys should already be set
 <u>Alt-Left + Shift +1</u> 、 <u>Alt-Left + Shift +2</u> 、 <u>Alt-Left + Shift +3</u> to switch input methods.
- Chinese Input Method: If the shortcut keys are not set, you need to input through additional windows, hold down the "CTRL" key and left click on the field you want to enter, and use the "new phonetic" input in the resulting window.

On the examination room

02705321005012Kev_90591171115581_910405627839	
C	PE考生發問單
a. Ne faik	
"必項	
校条:姓名:證號*	
(糸統會自動帶入,不需填寫)	
校系:姓名:SKIP:(19:12)	····································
發問相關之靜態 *	諸直接打中文,利用 Shift、Ctrl+Space 進行輸入法切換。
◎ 第一題	
◎ 第二題	
◎ 第三題	403月 10位12
◎ 第四題	
◎ 第五題	
◎ 第六題	
◎ 非關題曰	2
1. 如欲輸入中文 ,請	在输入格中,按CTRL + Click,可以输入中主。
2. 本頁如果無法處理	中文,則請用英文發問。
	· · · · · · · · · · · · · · · · · · ·
發問之內容*	
	^

(Figure1.2.2)



(Figure1.2.3)

1.2.2 Score board(practice)

The current results of the candidates for the CPE exercise (number of questions and the time for solving the questions) are shown. The range includes all candidates for the examination room. This grade is updated every five minutes.

1.2.3 Score board

Show the real-time results (number of questions and the time for solving the questions) of examinees for this CPE exam, as shown in Figure 1.2.4. The scope includes all examinees. This grade is updated every five minutes.

■ 解毒点循環: http://140.117.16.165.63214)															
上一頁	上一頁(8) 下一頁(N) 夏新(R) 授卑(5) 授卑下一偏(D)														
Charas:	の通信の利用があるまたにはないより知道にあった。 の通信の利用がした。対象は、2014年の1月10日の1月1日の1月1日の1月1日の1月1日の1月1日の1日の1日の1日の1日の1日の1日の1日の1日の1日の1日の1日の1日の1														
85	-991x	電得	HH4B	和村	00B1.UVA10019	00B2.UVA12503	00B3.UVA11639	00B4.UVA11475	00B5.UVA10055	00B6.UVA10954	00B7.UVA10090	\$1758	假產	准书码:認證碼	4
															4
1	國立雲林科技大學	測0九	7題	7分	1 ₍₀₊₀₎	1 ₍₀₊₀₎	1 ₍₀₊₀₎	1 ₍₁₊₀₎	1(1+0)	1 ₍₁₊₀₎	1 ₍₁₊₀₎	146		YUNTECH011119-132472	
2	國立雲林科技大學	測の七	7題	10分	1 ₍₀₊₀₎	1 ₍₀₊₀₎	1 ₍₁₊₀₎	1 ₍₁₊₀₎	1(1+0)	1 ₍₁₊₀₎	1 ₍₂₊₀₎	184		YUNTECH005188-896169	
3	國立臺北大學	測O九	7題	15分	1 ₍₂₊₀₎	1 ₍₁₊₀₎	1 ₍₁₊₀₎	1 ₍₂₊₀₎	1 ₍₂₊₀₎	1 ₍₂₊₀₎	1 ₍₃₊₀₎	380		NTPU005080-956328	
4	長庚大學	測の四	7題	16分	1 ₍₁₊₀₎	1 ₍₁₊₀₎	1 ₍₁₊₀₎	1 ₍₂₊₀₎	1 ₍₂₊₀₎	1 (3+0)	1 ₍₃₊₀₎	366		CGU109438-089653	
5	國立臺東大學	測0-±	7題	46分	1 ₍₃₊₀₎	1 ₍₆₊₀₎	1 ₍₆₊₀₎	1 ₍₆₊₀₎	1 ₍₇₊₀₎	1 ₍₇₊₀₎	1 ₍₈₊₀₎	360		NTTU002274-546402	
6	長榮大學	測の四	7題	49%)	1 ₍₆₊₀₎	1 ₍₆₊₀₎	1 ₍₇₊₀₎	1 ₍₇₊₀₎	1 ₍₇₊₀₎	1 ₍₇₊₀₎	1 ₍₆₊₀₎	166		CJCU001172-246972	
7	國立臺中敬育大學	測0八	7題	50分	1 ₍₆₊₀₎	1 ₍₆₊₀₎	1 ₍₇₊₀₎	1 ₍₇₊₀₎	1(7+0)	1 ₍₇₊₀₎	1(7+0)	182		NTCU017081-374512	-
8	國立中興大學	測0九	7題	52分	1 ₍₆₊₀₎	1 ₍₇₊₀₎	1 ₍₇₊₀₎	1 ₍₇₊₀₎	1(7+0)	1 ₍₇₊₀₎	1 ₍₈₊₀₎	168		NCHU092240-752988	-
9	國立臺東大學	測の四	7題	54分	1(1+0)	2(3+20)	1 ₍₄₊₀₎	1 ₍₄₊₀₎	1 ₍₆₊₀₎	1 ₍₆₊₀₎	1(7+0)	966		NTTU007176-589840	-
10	國立中興大學	測の三	7題	70分	3(3+40)	1 ₍₄₊₀₎	1 _(S+0)	706		NCHU091350-310261	-				
11	大同大學	測0零	6題	14分	1(2+0)	1(2+0)	1 ₍₂₊₀₎	1 ₍₂₊₀₎	O(0+0)	1 ₍₁₊₀₎	1(2+0)	726	0	TTU002191-993174	-
12	國立臺北大學	測の七	6題	2257	1(2+0)	1 ₍₄₊₀₎	1 ₍₂₊₀₎	1 ₍₂₊₀₎	1 ₍₅₊₀₎	1 ₍₄₊₀₎	O(0+0)	722		NTPU003380-384079	-
13	國立臺北大學	測の二	50夏	13分	1(3+0)	O (0+0)	1(2+0)	O (0+0)	1(2+0)	1 (2+0)	1 (2+0)	520		NTPU002083-124284 NTPU018033-010759	
14	國立金門大學	測の二	5題	17分	1 ₍₁₊₀₎	2(0+40)	1 ₍₃₊₀₎	1(3+0)	1(4+0)	1(S+0)	1(0+20)	364		NQU001310-214058	
15	國立金門大學	測0零	题	2257	1(2+0)	O(0+0)	1(4+0)	1(4+0)	1(4+0)	1(6+0)	1(0+20)	540		NQU016431-790915	-
16	國立金門大學	測0	题	28分	1(2+0)	O(0+0)	1(4+0)	1(S+0)	1(7+0)	1(9+0)	O(0+0)	162		NQU007281-994375	-
17	國立金門大學	測0	题	32分	1 (3+0)	O(0+0)	1(4+0)	1(6+0)	1(8+0)	1(10+0)	O(0+0)	560		NQU004293-906823	
18	國立金門大學	測の二	题	35分	1(3+0)	O (0+0)	1(S+0)	1(7+0)	1(8+0)	1(10+0)	O(0+0)	948		NQU013275-101949	-
19	國立金門大學	測0六	题	36分	1(3+0)	O (0+0)	1(6+0)	1(7+0)	1(9+0)	1(10+0)	O(0+0)	546		NQU010991-503805	-
20	國立金門大學	測0五	题	41分	1(4+0)	O(0+0)	1(6+0)	1 (9+0)	1(10+0)	1(10+0)	O(0+0)	188		NQU002039-489559	-
-														NCYU081300-180450	-

(Figure1.2.4)

1.2.4 Score board(examination room)

Including only the current results of the candidate's current examination room, this result is updated at any time.

1.2.5 Java Reference

You can query Java syntax, data type, and class member functions, as shown in Figure 1.2.5. Source : <u>http://docs.oracle.com/javase/7/docs/api/</u>

限網:http://docs.oracle.com							
ava™ Platform tandard Ed. 7	Overview Package Class Use	Java™ Platform Tree Deprecated Index Help Standard Ed. 7					
II Classes	Prev Next Frames No Frames	8					
ackages	Java™ Platform, St API Specification	andard Edition 7					
va.awt va.awt.color va.awt.datatransfer	This document is the API specification for the Java™ Platform, Standard Edition.						
I Classes 📋	See. Description						
ostractAction ostractAnnotationValueVisitor6	Packages Package	Description					
istractAnnotationValueVisitor7 istractBorder istractButton	java.applet	Provides the classes necessary to create an applet and the classes an applet uses to communicate with its applet context.					
stractCellEditor stractCollection stractColorChooserPanel	java.awt	Contains all of the classes for creating user interfaces and for painting graphics and images.					
stractDocument stractDocument.AttributeCor.	java.awt.color	Provides classes for color spaces.					
stractDocument.Content stractDocument.ElementEdit	java.awt.datatransfer	Provides interfaces and classes for transferring data between and within applications.					
stractElementvisitoro stractElementVisitor7 stractExecutorService stractInterruptibleChannel	java.awt.dnd	Drag and Drop is a direct manipulation gesture found in many Graphical User Interface systems that provides a mechanism to transfer information between two entities logically associated with presentation elements in the GUI.					
stractLayoutCache stractLayoutCache.NodeDim	java.awt.event	Provides interfaces and classes for dealing with different types of events fired by AWT components.					
stractListModel	java.awt.font	Provides classes and interface relating to fonts.					
tractMap tractMap.SimpleEntry tractMap.SimpleImmutableF	java.awt.geom	Provides the Java 2D classes for defining and performing operations on objects related to two-dimensional geometry.					
stractMarshallerImpl	java.awt.im	Provides classes and interfaces for the input method framework.					
stractmethodError stractOwnableSynchronizer stractPreferences	java.awt.im.spi	Provides interfaces that enable the development of input methods that can be used with any Java runtime environment.					
etrantProneceor	java.awt.image	Provides classes for creating and modifying images.					

(Figure1.2.5)

1.2.6 C++ Reference

You can query C++ syntax, data type, and class member functions, as shown in Figure 1.2.6 \circ Source : <u>http://en.cppreference.com/w/</u>



(Figure1.2.6)

1.2.7 **Dictionary**

You can query the meaning of English words, but the English words in the problem cannot be directly copied and pasted.

1.2.8 Time left

The remaining time of the exam will be displayed in the upper right corner of the window, as shown in Figure 1.2.7.

● 剩187分24秒

(Figure1.2.7)

1.2.9 End the evaluation

End this exam. If you do not press it carefully, please report to the invigilator.

1.3 Exam topics

As shown in Figure 1.3.1, click on "解題" below the "正式考題" to enter the problem solving window. If there are no topics, please refresh the page again.

題目



(Figure1.3.1)

1.4 Exam interface

: 正式評判(I) 福雲(F) 編輯(P) 視室(V) 編講器(L)CCPP-MinGW 編譯表試(D)	7 2小時11分33秒 🍯
Funny Encryption Method The Problem	(1) (A) Y287018748 (B) 決計 (C) NSYSU501196 (D) 994 (A身分證,B姓名字,C:准考碼D認證碼)
1 #include <iostream> 2 using namespace std; 3 Fint main(){</iostream>	2 未評判 59詞,280字元。5
4 int N; cln>>N; 5	2:CORRECT
<pre>7 int b1=0,b2=0; 8 for(int v=m;v;v=2) b1+=v%2; 9 0 for(im:m/=10) {</pre>	Encryption Method : 语法状能 语是状能(0)
<pre>10</pre>	諸意檢測 輸入區跡大 輸入區跡小
13 } 14 return 0:	~ 標準輸入串 111 1234
您的输出 1 3 5	
2 6 3 3 5 5 4	(節) 輸出 3 5-1 振館出 3 5-1 車 6 3-1 単語出 6 3-1
≮ ///////////////////////////////////	▶ ⁺⁺⁺ 5 5 J ⁺⁺⁺ 5 5 J



After entering the topics, the window is shown in Figure 1.4.1, and the functions of each part are as follows:

- (1) Introduction and description of topics.
- (2) Program-writing window (Please write your program here).
- (3) The output of your program and the correct output of using measurement data. \circ

- (4) The examinee's ID, name, and test number are displayed.
- (5) Topic data, grammar specification, language specification, semantic detection. Grammar specification shows compilation error information. The language specification is the syntax that is not allowed in the display code. Semantic detection requires the input of test data.
- (6) According to the input data of the semantic detection and the output data generated by the examinee's code, the left half is the output of the examinee's code and the right half is the correct output of the topic.
- (7) Function Options, and Remaining Time.

The functions of the function options are described below.

1.4.1 Formal judgement (J)

This is the "formal judgement" of the exam. The results of the judgement will be included in the official record of the exam and will also be displayed on the score sheets of all candidates. If the result of the judgement is not passed, penalty points will be applied according to the scoring rules. Examinees should perform "formal judgement" after conducting various tests. After clicking "正式評判(J)", a confirmation window will appear. If you click (Y) in the confirmation window, you can "formal judge" the examinee's program, as shown in Figure 1.4.2.

🖶 00B2.	UVA12	2503評量:R	obot Instr	uctions								
正式評	判(J)	檔案(F)	編輯(P)	視窗(V)	編譯器(L)I	MSVC	C:Microsoft Vi	sual Studio 10	0.0	編譯測試(Q)		
題文												
	_											
	1	批改確認				23						
		批改錯誤)	將罰扣20分	<mark>鐘,您確定</mark>	要批改嗎?			Robot	Ins	tructions		
You ha	ve a						bot will be	given some	instr	uctions. Your ta	sk is to	predi
• L	EFT:		Ę.	M	否(N)		is the positi	ion of the ro	obot b	pefore moving)		
• R	IGHT.	move one	e unn rigi	n (increase	<i>p</i> Dy 1)		-					
1,	//*	_										
2 +	#inc	lude	<iost< th=""><th>ream></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></iost<>	ream>								
3												
4 1	usir	ng nam	espac	e std;								
5												

(Figure1.4.2)

After a formal judgement, if the examinee passes the "Secret Test Data" (unlisted) of this question, the system will show "通過(pass)", otherwise, it will display "未通過暗中測資(not pass)", as shown in Figure 1.4.3.

, 通過 59詞,280字元。	未減過暗中 測資 72詞,543字元。	-(
2:CORRECT	7:WRONG-ANSWER	E
題目資料 (13B1.UVA10019) Funny	题目資料 (13B2.UVA12503) Robot Instructions:	_(
(Figu	re1.4.3)	

1.4.2 File (F)

As shown in Figure 1.4.4, the function of this option is to load file (Ctrl+W), save file (Ctrl+S), and save a new file (Ctrl+N).

檔案(F)		編輯(P)	視窗(⊻)	趪		
	提檔	i續答(₩)	Ctrl+W			
封卷		存檔(<u>S</u>)	Ctrl+S			
另存		新檔(<u>A</u>)	Ctrl+N			
	(Figure 1 4 4)					

(Figure1.4.4)

Save a new file (Ctrl+N): The current code can be saved according to the file name which is input by the examinee, as shown in Figure 1.4.5.

			- • •
請輸入檔名			
CPE_TEST			
取消	j	確認	

(Figure 1.4.5)

Load file: After load the saved file (for example, CPE_TEST), you can continue writing the program, as shown in **Figure 1.4.6**.

	CPE_TEST-(18;58;50)-80c63430@701101b94afe86b06ce3046345662792@main.cpp	
	(18;58;38)-fcaef407@8b6e005ea42010435d5c5129c0e964b2@main.cpp	
1		
1	取消	確認
L		

(Figure 1.4.6)

Save file: Save current code in chronological order. The file name is randomly generated by the system. After that, you can load the file you had saved, as shown in Figure 1.4.7.

時間	檔名	
(14-59-20)	e16bdb01_4416_48e1_abdd_3607006c7180@86943955671fdc7aeef9f2fa5a65c818@main.cpp)34054896-4424_47eb-bd08-49743400b31e@ef8f5ae5641053db459530aad5ed6871@main.cpp	
(14-59-09))5dd0f7c6-7ef7-4b84-a2ef-c5e5ec875529@1583475a2dbd0456d5107ae2ad69de45@main.cpp	
	取消 確認	đ



1.4.3 Edit (P)

This function can enlarge or reduce the font size of the program, or it can attach the sample code to examinee for reference. The sample code will be generated in the form of comments at the bottom of the edit window, such as Figure 1.4.8.

🖳 00B2.UVA12	♀ 00B2.UVA12503評量:Robot Instructions							
正式評判(J)	檔案(F)	編輯(P) 視習	읍(V) 編譯器(L)	MSVC:Microsoft Visual Studio 10.0	編譯測試(Q)			
題文		放大字型	(B) Ctrl +					
		縮小字型	(S) Ctrl -					
		預設字型	(0) Ctrl 0					
		貼上範例	(H) Ctrl+H	Pohot In	atructiona			
					SILUCHOUS			

You have a robot standing on the origin of x axis. The robot will be given some instructions. Your tas

LEFT: move one unit left (decrease p by 1, where p is the position of the robot before moving)
RIGHT: move one unit right (increase p by 1)



(Figure 1.4.8)

1.4.4 View (V)

According to your preferences, you can close the current information window, such as topics, build tests, correct output, and your output. To restore the associated window, just click it again, as shown in **Figure 1.4.9**.

視窗(V)	編譯器(L)CCPP:Mir	٦GV
顯示	全部(A)		
顯示	題目(P)	Ctrl+P	
您的	小黑(B)	Ctrl+B	
標準	小黑(T)	Ctrl+T	
顯示	結果(G)	Ctrl+G	
您的	輸出(J)	Ctrl+J	
正確	輸出(K)	Ctrl+K	

(Figure 1.4.9)

1.4.5 Compiler (L)

Examinees can choose the language compiler they are familiar with to compile the code in this option, but the prerequisite must be the language allowed by the topic, as shown in **Figure 1.4.10**.

編創	羇器(L)MSVC:Microsoft Visual Studio 10.0	編
~	MSVC:Microsoft Visual Studio 10.0(0)	_
	CCPP:MinGW(M)	_
0	CCPP:WatCom	
<u>199</u>	CCPP:C	
	JAVA:jdk1.7.0_25(7)	
0	MSCS:v2.0.50727	
0	MSCS:v3.5	
•	MSCS:v4.0.30319	
0	MSVB:v2.0.50727	
	MSVB:v3.5	
0	MSVB:v4.0.30319	
•	MSJS:v2.0.50727	
0	MSJS:v4.0.30319	

(Figure 1.4.10)

1.4.6 Compile and test

編譯測試(Q)
題目預設測試資料(₩)
一組隨機測試資料(E)
十組隨機測試資料(C)
使用自訂測試資料(D)
人工公開測試資料(S)

(Figure 1.4.11)

The compile test is to examine the functions of the candidate's code, as shown in **Figure 1.4.11**. The functions are described as follows:

(1) Topic preset test data :

Candidates can use this function to execute and validate the code, and the test data is generated by the system (less difficulty). This test is not included in the test score record.

(2) Use custom test data :

Examinees can use this function to execute and validate the code. The test data is entered by yourself as shown in **Figure 1.4.12**. This test is not included in the test score record.

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Funny Encry	使用自打电标答书(0)	1.1	(A)	SKIP	(B)	姓名
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student from IIESM Campus Monterrey plays with a new encryption method for num	abers. These method consist of the following steps:	-	-	59首	•285字	元。
. //*		-				
<pre>#include<iostream></iostream></pre>			1:COR	RECT		
using namespace std;			-			
<pre>int main() {</pre>			題目清	(13B1.UV	A10019)	Funny
int N; Cin>>N;			Encryp	tion Method :		_
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(Figure 1.4.12)

(3) Manually open test data :

Examinees can use this function to execute and verify the code. The test data is selected by the proposition teacher according to the questions. The difficulty level is about the same as the "hidden test data" in the system.

1.4.7 Change the topic

Candidates who want to return to the initial window to select a topic can narrow or close all the topic windows to return to the selection window, as shown in **Figure 1.4.1**.

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	₽ × 建置測試(G)
Funny Encryption Method	 (A) Y205072124 (B) 測試一四八 (C) NSYSU096441 (D) 061357 (A-身分證B姓名字.C/准考碼D:認證碼)
bers. These method consist of the following steps:	未辭判 59詞,280字元。
	1:CORRECT 週間資料 (13B1.UVA10019) Funny Encryption Method: 週点状報 注意批判() 道意地報 注意批判() 道意地報 施入區跋大

(Figure 1.4.13)

1.5 Result of testing data

After testing or formal judgement, the system will display relevant information as follows:

COMPILER-ERROR	The code did not compile successfully. (Click on the link to check the error message generated by
	the compiler)
CORRECT	The program is correct and passes the test.
NO-OUTPUT	The program did not output any data.
PENDING	The code is still in progress.
PRESENTATION-ERROR	The output is correct, but the format is incorrect,
	such as not following a specified space or line
	feed (multiple spaces or fewer spaces, multiple
	line feeds, or fewer line feeds).
RUN-ERROR	The execution of the program could not be
	completed successfully. That is, an error
	occurred during program execution, such as a
	memory access error.
TIMELIMIT	The execution time of the program exceeds the
	problem limit. The program may fall into
	endless loops, or it must need improving the
	solution method.
WRONG-ANSWER	The result of the output is wrong. (This may also
	be caused by an error in the output format.)

2. C/C++ basic input and output

In the CPE exam's programming, all inputs and outputs take the standard input (stdin) and the standard output (stdout). Reading and writing file are not allowed. When writing programs, you can use functions such as scanf and printf in the C language; in C++, you can use objects such as cin and cout. The input and output data are all pure text data. The program must be written according to the input and output formats of the questions. Moreover, the format of "hidden test data" of is guaranteed to follow the format described by the question, so examinees do not have to check the correctness of the input data.

It would be a pity if candidates don't know how to read the data and further tried to write the functions required by the question. Here will introduce some common types of test data, reading methods, and attach examples of actual questions, hoping to lead you quickly to the problem-solving situation. After each sub-section, there are related exercises. Try to do some exercises that will definitely help the CPE test scores.

2.1 C scanf and printf

When it comes to input and output, there are two functions scanf and printf in the C language. Among them, the writing format of scanf is as follows:

```
int scanf(const char *format, ...);
```

The first parameter of the function is a string where you describe how to read the next input. For the format and type of data that you intend to read, fill in the corresponding symbols, as shown in the following table:

Character	char*	%с	String	char*	%s
		int	Unsigned int	Octal	Hexadecimal
(unsigned) char*		%hhd	%hhu	%hho	%hhx
(unsigned) short*		%hd	%hu	%ho	%hx
(unsigned) int*		%d	%u	%0	%x
(unsigned) long	*	%ld	%lu	%lo	%lx
(unsigned) long long*		%lld	%llu	%llo	%llx
Floating point	float*	%f	float	double*	%lf

The next parameter is the address of the corresponding data variable, which is preceded by the & symbol. Note that the string variable name itself represents an

address, so only the string does not need to be followed by an ampersand.

For example, the following program:

```
char ch,str[64];
int num;
float value;
scanf("%c%s%d%f",&ch,str,&num,&value);
```

Excepting for %c, all input methods ignore the extra whitespace in front of them, such as space, tab, and enter. Therefore, it is actually indifferent no matter how many the space or the gap is if the sequence of the data is the same. For example, the following conditions can be correctly read as scanf("%d%f%f%f", ...).

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1.10 \		1.10.2.20.3.30	\downarrow
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3.30			

2.2 C++ cin and cout

For C++, the input and output functions are cin and cout. Cin will read the appropriate data based on the variables you have given by using the operands to point to the variable >>.

2.3 Reading n data

The most common type of test data is this type. The way to deal with this is to read in this n and run n times.

C language

```
int main() {
    int n;
    scanf("%d",&n);
    while (n--) {
        /* read each data */
    }
```

return 0;

C++

}

```
int main() {
    int n;
    cin>>n;
    while (n--) {
        /* read each data */
    }
    return 0;
}
```

Example :

UVA10406: Vito's family

Boss Vito moved in and lived in the street. He hoped that the distance with each relative would be the shortest.

C Language

```
#include <stdio.h>
#define MAX_R 100
int num[MAX_R];
int main() {
    int n,r,s,i;
    int sum;
    scanf("%d",&n);
    while (n--) {
        scanf("%d",&r);
        for (i=0;i<r;i++) {
            scanf("%d",&s);
            num[i]=s;
        }
        //The rest is left for you to complete, hint: median</pre>
```

```
printf("%d\n",sum);
}
return 0;
}
```

C++

```
#include <iostream>
#include <vector>
using namespace std;
vector<int> num;
int main() {
    int n,r,s;
    cin>>n;
   while (n--) {
       cin>>r;
       num.clear();
       for (int i=0;i<r;i++) {</pre>
           cin>>s;
           num.push_back(s);
        }
       //The rest is left for you to complete, hint: median
       cout<<endl;</pre>
    }
   return 0;
}
```

In fact, there may be many layers of "reading n data" for different questions.

Practice :

UVA10401: <u>Fibonaccimal Base</u> UVA10403: <u>Funny Encryption Method</u> UVA10408: <u>What is the Probability?</u>

2.4 Reading to the end of the file

This kind of test data will not tell you how many inputs are there. You must keep dealing until there is no data.

C language

Check the scanf function's return value to see if the data ends. Scanf will return the number of elements it successfully read; when the end of the file is read, scanf returns EOF. To integrate it in the while condition, it becomes the following program:

```
int main() {
    int x;
    while (scanf("%d",&x)!=EOF) {
        /* Process current data */
    }
    return 0;
}
```

C++

If you put cin into the while condition, cin will automatically convert to void*. When the file ends, its value becomes NULL which represents 0 and false. So we write the following program:

```
int main() {
    int x;
    while (cin>>x) {
        /* Process current data */
    }
    return 0;
}
```

Example :

UVA10407: Hashmat the brave warrior

Calculate the difference between the number of enemy troops and ours.

C Language

[#]include <stdio.h>

Please note that scanf uses %lld for long long.

C++

Prcatice :

10400: <u>The 3n + 1 problem</u>

10405: Jolly Jumpers (Mixed two ways)

10411: Back to High School Physics

2.5 End until read 0

This type is also a frequently occurring pattern. Simply add a condition for jumping out of the loop.

C language

```
int main() {
    int n;
    while (scanf("%d",&n)!=EOF) {
        if (n==0) break;
            /* ... */
        }
        return 0;
}
```

C++

```
int main() {
    int n;
    while (cin>>n) {
        if (n==0) break;
        /* ... */
    }
    return 0;
}
```

Examle :

UVA10404: Primary Arithmetic

Calculate the number of times to carry out the addition.

```
C Language
```

```
#include <stdio.h>
int main() {
    int a,b;
    while (scanf("%d%d",&a,&b)!=EOF) {
        if (a==0&&b==0) break;
        /* ... */
    }
    return 0;
}
```

C++

```
#include <iostream>
using namespace std;
int main() {
    int a,b;
    while (cin>>a>>b) {
        if (a==0&&b==0) break;
        /* ... */
    }
    return 0;
}
```

Practice :

10416: Last Digit

10418: Minesweeper

2.6 Read a list of data at a time until the end of the file

A row of data may contains blanks and cannot be handled as normal strings, so an entire row of data needs to be read at a time. You can use fgets in C, or getline in C++.

C language

```
C++
```

```
#include <cstring>
int main() {
    string s;
    while ( getline(cin,s) ) {
```

```
/* ... */
}
return 0;
}
```

Example :

UVA272: <u>TEX Quotes</u>

Replace paired double quotes " and " with `` and " $\,\circ\,$

C language

```
int main() {
    char s[100005];
    while ( fgets(s,100005,stdin) != NULL ) {
        /* ... */
    }
    return 0;
}
```

C++

```
int main() {
    string s;
    while ( getline(cin,s) ) {
        /* ... */
    }
    return 0;
}
```