CAMBRIDGE IGCSE (0478)

Module P: Languages and IDEs

Workbooklet · 4 parts · 81 marks

Contents

Part	Topic	Marks
P1	High-level and low-level languages	20
P2	Assembly language and assemblers	20
P3	Translators: compilers and interpreters	20
P4	IDE tools and how they help a programmer	21
	Total	**81**

MODULE P LANGUAGES AND IDES · P1

High-level and low-level languages

Original practice questions · 20 marks · ~25 minutes · Cambridge 0478 syllabus 4.2.1

Name _____ Date _____

Instructions. Answer all questions in the spaces provided. The marks for each part are shown in brackets [ ]. The total for this worksheet is **20 marks**.

1

Total: 4 marks

Computer programs can be written in a high-level language or a low-level language.

(a) Explain what is meant by a **high-level** language. **[2]**

(b) Explain what is meant by a **low-level** language. **[2]**

2 **Total: 3 marks**

Three extracts of program code, **A**, **B** and **C**, are shown.

Extract A	Extract B	Extract C

`Count ← 0`
`WHILE Count < 10 DO`
`  OUTPUT Count`
`  Count ← Count + 1`
`ENDWHILE`
	`LOAD  40`
	`OUT`
	`INC`
	`STORE 40`
	`JUMP  6`
		`11100100`
		`01110001`
		`10100010`
		`00011011`
		`11000110`

(a) Identify the extract that is written in a high-level language. **[1]**

(b) Give **two** reasons why the code in extract A is easier for a programmer to read and write than the code in extract C. **[2]**

1

2

3 **Total: 6 marks**

A factory uses a robotic arm to lift parts onto a conveyor belt. The arm has its own processor. Sensors tell the processor the position of the arm, and the processor sends signals to the motors that move it. The section of the program that reads the sensors and controls the motors is written in a low-level language.

(a) Explain **two** advantages of writing this section of the program in a low-level language. **[4]**

(b) Describe **one** disadvantage to the programmers of writing this section of the program in a low-level language. **[2]**

4 **Total: 5 marks**

A delivery company is writing a route-planning program. The program will be used on the desktop computers in the company's office and on the tablet computers in its vans. The desktop computers and the tablet computers have different types of processor. The program is written in a high-level language.

(a) Explain why **machine independence** is an advantage for this program. **[2]**

(b) Give **one other** advantage of writing this program in a high-level language. **[1]**

(c) Explain **one** disadvantage of writing a program in a high-level language instead of a low-level language. **[2]**

5 **Total: 2 marks**

A programmer is finding and correcting the errors in a long program.

(a) Explain why this is usually easier when the program is written in a high-level language than when it is written in a low-level language. **[2]**

Total for this worksheet: 20 marks

MODULE P LANGUAGES AND IDES · P2

Assembly language and assemblers

Original practice questions · 20 marks · ~25 minutes · Cambridge 0478 syllabus 4.2.2 (with 4.2.1 and 3.1.4)

Name _____ Date _____

Instructions. Answer all questions in the spaces provided. The marks for each part are shown in brackets [ ]. The total for this worksheet is **20 marks**.

1

Total: 5 marks

A heating controller in an office building is programmed by an engineer. Three short pieces of code, **A**, **B** and **C**, from the engineer's work are shown. Each one is written in a different type of language.

Program	Code

A	`if temperature < 18 then`
	`  heaterLevel = 3`
	`endif`

B	`0001 0000 0110`
	`0110 0000 0111`
	`0011 0000 1000`

C	`LDA 6`
	`ADD 7`
	`STO 8`

(a) Tick (✓) **one** box in each row to show the type of language each program is written in. **[3]**

Program	High-level language	Assembly language	Machine code
A			
B			
C			

(b) State what is meant by a **mnemonic**. Give **one** example of a mnemonic from the programs shown. **[2]**

Meaning

Example

2 **Total: 4 marks**

(a) Tick (✓) **one** box in each row to show whether each statement is true or false. **[4]**

Statement	True	False
Assembly language is a form of low-level language.		
A compiler is used to translate an assembly language program into machine code.		
Assembly language allows a programmer to directly manipulate the hardware.		
An assembly language program written for one type of processor will run on any other type of processor without being changed.		

3 **Total: 2 marks**

(a) Describe **two** differences between assembly language and machine code. **[2]**

1

2

4 **Total: 3 marks**

The engineer finishes a program for the heating controller in assembly language. The CPU in the controller cannot run the program as it is written.

(a) Explain why the program must be translated before the CPU can run it. Identify the translator that is needed in your answer. **[3]**

5 **Total: 6 marks**

A different engineer is writing a device driver for a new label printer. The design notes say the driver must:

- fit into a very small amount of memory
- control the printer's print head hardware directly
- respond quickly to signals from the printer.

The engineer decides to write the driver in assembly language instead of a high-level language.

(a) Explain how writing the driver in assembly language helps it to meet **two** of these requirements. **[4]**

Requirement 1

Requirement 2

(b) Give **two** drawbacks, for the engineer, of writing the driver in assembly language instead of a high-level language. **[2]**

1

2

Total for this worksheet: 20 marks

MODULE P LANGUAGES AND IDES · P3

Translators: compilers and interpreters

Original practice questions · 20 marks · ~25 minutes · Cambridge 0478 syllabus 4.2.3, 4.2.4

Name _____ Date _____

Instructions. Answer all questions in the spaces provided. The marks for each part are shown in brackets [ ]. The total for this worksheet is **20 marks**. All organisations and programs on this sheet are made up.

1

Total: 2 marks

(a) Identify the **two** types of translator that can translate a program written in a high-level language into machine code. **[2]**

1

2

2

Total: 5 marks

(a) Tick (✓) **one** box in each row to show whether each statement applies to a compiler, an interpreter, or both. **[5]**

Statement	Compiler	Interpreter	Both
Produces an executable file			
Translates one line of code, executes it, then moves on to the next line			
Translates high-level language into machine code			
Gives one error report listing every error it detects in the code			
Halts when it reaches an error, then continues from that point once the error is corrected			

3 **Total: 4 marks**

A team of programmers at an engineering company is writing a program to control a robotic arm on a factory production line. When the program is finished, it will be loaded onto 200 robotic arms.

(a) Complete the table to show the most suitable type of translator for each stage, and give a reason for each choice. **[4]**

Stage	Translator	Reason
Writing and testing the program		
Translating the final program to load onto the 200 robotic arms		

4 **Total: 5 marks**

A gardener has written this algorithm to log greenhouse temperatures. It contains **two** errors: on line 05, `OUTPUT` is misspelt as `OUPTUT`, and on line 07, the identifier `Fahrenheit` is misspelt as `Farenheit`.

```
01 DECLARE Reading : REAL
02 DECLARE Fahrenheit : REAL
03 OUTPUT "Greenhouse log started"
04 INPUT Reading
05 OUPTUT "Reading stored"
06 Fahrenheit ← Reading * 1.8 + 32.0
07 OUTPUT "Temperature in Fahrenheit: ", Farenheit
```

(a) Describe how the errors are reported when the program is translated using an **interpreter**. **[3]**

(b) Describe how the errors are reported when the program is translated using a **compiler**. **[2]**

5 **Total: 4 marks**

A software company sells a stock-control program to shops. It can supply the program as a compiled executable file, or as source code that each shop runs with an interpreter.

(a) Explain **two** advantages of supplying the program as a compiled executable file. **[4]**

1

2

Total for this worksheet: 20 marks

MODULE P LANGUAGES AND IDES · P4

IDE tools and how they help a programmer

Original practice questions · 21 marks · ~25 minutes · Cambridge 0478 syllabus 4.2.5

Name _____ Date _____

Instructions. Answer all questions in the spaces provided. The marks for each part are shown in brackets [ ]. The total for this worksheet is **21 marks**.

A programmer at a city museum is writing a program that counts the visitors to each of the museum's six galleries. The program is written in a high-level language using an integrated development environment (IDE). All the questions on this worksheet are about this program.

1

Total: 1 mark

(a) Tick (✓) **one** box to show which statement describes an IDE. **[1]**

A translator that converts the whole program into an executable file	
Software that provides the functions needed to write, translate, run and test program code in one program	
System software that manages the memory and hardware of the computer	
A low-level language that uses mnemonics in place of binary	

2 **Total: 5 marks**

The list shows seven common functions of an IDE.

auto-completion | auto-correction | code editor | error diagnostics | prettyprint | run-time environment | translator

(a) Complete the table by writing the IDE function from the list that matches each description. Each function is used once at most. Not all functions are needed. **[5]**

Description	IDE function
The programmer types `REP` and the IDE offers `REPEAT` so the keyword can be finished with one key press	
The programmer types `OUPTUT` and the IDE changes it to `OUTPUT`	
The code is displayed with keywords, identifiers and strings in different colours and with consistent indentation	
The high-level code is converted into machine code so that it can be executed	
The program is run inside the IDE and its outputs are shown so the programmer can test it	

3 **Total: 5 marks**

The screenshot shows part of the program in the IDE. The code is shown in pseudocode. When the programmer tries to run it, the message at the bottom appears.

IDE – GalleryCount

```
01  Total ← 0
02  FOR Gallery ← 1 TO 6
03      OUTPUT "Visitors in gallery , Gallery
04      INPUT Visitors
05      Total ← Total + Visitors
06  NEXT Gallery
07  OUTPUT "Total visitors today: ", Total
```

Messages

⚠ Line 03: syntax error – string is not closed (closing " missing)

(a) Identify the IDE function that displayed the message. **[1]**

(b) Describe how this function helps the programmer to correct the program. **[2]**

(c) Explain how prettyprint can help the programmer to spot the error on line 03 while typing the code. **[2]**

4 **Total: 4 marks**

(a) Explain why the IDE provides a translator. **[2]**

(b) The programmer corrects line 03. Describe how the run-time environment helps the programmer to test the visitor-counting program. **[2]**

5 **Total: 6 marks**

Another programmer at the museum writes code in a plain text editor that has no extra functions. He then uses a separate translator program to translate it and run it.

(a) Explain how using an IDE instead would help him to write and test his programs. Refer to **three** different functions of an IDE in your answer. **[6]**

Total for this worksheet: 21 marks