

Week 11

IGCSE Computer Science

Homework bundle for this week

本周作业合集

exercises.lol

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4. Software

Starter Quiz · 课前小测

IGCSE Computer Science

Name: _____ Score: _____

1. Which is system software?
 - ☐ the operating system
 - ☐ a word processor
 - ☐ a web browser
 - ☐ a spreadsheet
2. A high-level language (like Python):
 - ☐ reads like English and runs on different types of computer
 - ☐ is written in binary
 - ☐ only runs on one CPU
 - ☐ is the same as machine code
3. Which is a role of the operating system?
 - ☐ managing memory and files
 - ☐ spraying ink onto paper
 - ☐ storing data magnetically
 - ☐ displaying pixels
4. A compiler:
 - ☐ translates the whole program at once, then it runs fast without the compiler
 - ☐ translates and runs one line at a time
 - ☐ stops at the first error
 - ☐ must be present every time the program runs
5. An interrupt is:
 - ☐ a signal telling the processor something needs attention now
 - ☐ a permanent stop of the computer
 - ☐ a type of file
 - ☐ a network cable
6. A compiler translates the whole program once so it then runs fast without the compiler, whereas an interpreter translates and runs line by line, stopping at the first error — handy while testing.
 - ☐ True ☐ False

7. A hardware interrupt comes from a device (e.g. a printer out of paper), while a software interrupt comes from a program (e.g. dividing by zero) — both make the CPU pause and service the event.

☐ True ☐ False

8. Which is a feature of an IDE?

- ☐ auto-completion and error diagnostics in a code editor
- ☐ a magnetic hard disk
- ☐ a network cable
- ☐ a CPU socket

4. Software

IGCSE Computer Science

1. the operating system

The OS (and drivers, utilities) is system software; the others are application software.

2. reads like English and runs on different types of computer

High-level languages are easy to read/write and portable; low-level languages are CPU-specific.

3. managing memory and files

The OS manages files, memory, peripherals, multitasking, interrupts, the UI and security.

4. translates the whole program at once, then it runs fast without the compiler

A compiler translates everything once into a fast stand-alone program; an interpreter goes line by line.

5. a signal telling the processor something needs attention now

An interrupt makes the CPU pause, service the event, then resume — for quick reactions.

6. True

Compiled code is faster and stand-alone; interpreted code is easier to debug because it stops where the error is.

7. True

Interrupts can be hardware, software or user-triggered; in every case the CPU saves state, handles it, then resumes.

8. auto-completion and error diagnostics in a code editor

An IDE bundles an editor, translator, run-time, diagnostics, auto-complete and prettyprinting.

4.1 Types of software and interrupts

Name: _____ Class: _____ Date: _____ Total: 29 marks

KEY WORDS interrupt 中断 • operating system 操作系统 • system software 系统软件
• application software 应用软件 • system vs application software 系统

Objective

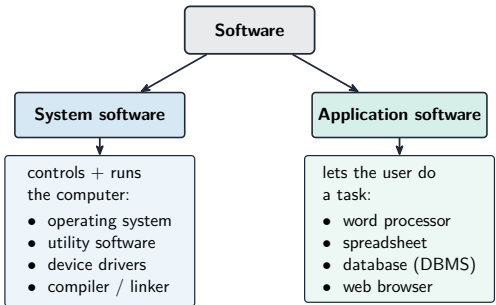
Build the skills to answer exam questions on **software and interrupts** 软件与中断 — **system vs application software** 系统/应用软件, the **operating system** 操作系统, and **interrupts** 中断.

You must be able to:

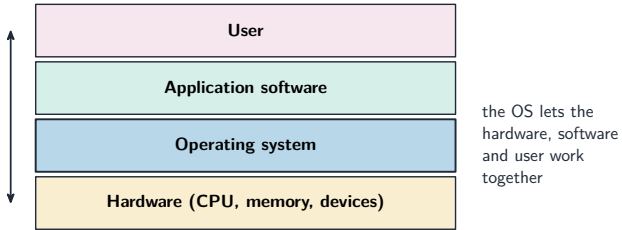
- classify software as system or application
- give the roles of the operating system
- describe an interrupt and how the processor handles it

1 Worked examples

■ Software and the OS



System software runs the computer; application software lets the user do a task



OS roles: manage files, memory, peripherals, multitasking, security; handle interrupts; provide a UI

- an **interrupt** tells the processor something needs attention now.

■ Naming the threats, and matching each to its prevention

Learn each threat as a pair: what it does, and what stops it.

Threat	What it does	Prevention
brute-force attack 暴力破解	tries every combination until a password works	strong passwords, a limit on log-in attempts, two-step verification
data interception 数据拦截	uses a packet sniffer to read data as it travels	encryption, a wireless network key (WPA)
DDoS attack 分布式拒绝服务	floods a server with requests so real users cannot get through	firewall, a proxy server, filtering traffic
hacking 黑客攻击	gains unauthorised access to a system	firewall, strong passwords, access rights
malware 恶意软件	virus, worm, trojan horse, spyware, ransomware, adware	anti-malware software, do not open unknown attachments
phishing 网络钓鱼	a fake email or message tricks the user into giving details	do not click links in unexpected mail, check the address, anti-spam filters
pharming 域名劫持	malicious code redirects the user to a fake website	anti-malware, check the site's certificate and the URL
social engineering 社会工程	manipulates a person into breaking security (a fake phone call, tailgating)	staff training, verify who is asking, clear procedures

Malware, distinguished. A **virus** attaches to a file and needs the user to run it; a **worm** copies itself across a network without help; a **trojan horse** is disguised as a useful program; **spyware** records keypresses; **ransomware** encrypts files and demands payment.

Phishing or pharming? Phishing starts with a message the user must act on. Pharming needs no message: code on the computer or the DNS server sends the user to a fake site even when they type the correct address.

Worked example. A user types the correct bank address and reaches a page that looks right but is not the bank. Identify the threat and give two preventions. The threat is pharming, because no message was involved and the correct address was used. Preventions: run anti-malware to remove the redirecting code, and check the site's security certificate and the padlock before entering any details.

2 Practice

2.1 State whether a web browser is system or application software. [1]

2.2 State two roles of the operating system. [2]

2.3 Identify the threat in each case: an email says your account will close unless you confirm your password; a server is flooded with requests until it stops responding. [2]

2.4 Give one difference between a virus and a worm. [2]

2.5 Name two ways to prevent a brute-force attack. [2]

3 Exam-style questions

3.1 Which is system software? [1]

- A spreadsheet
- B device driver
- C word processor
- D web browser

3.2 A printer runs out of paper while printing.

(a) State the type of interrupt this is. [1]

(b) Describe what the processor does when an interrupt arrives. [3]

3.3 An online shop is worried about security.

(a) Complete the table by naming the threat described and giving one way to prevent it. [6]

Description	Threat	Prevention
customers are sent an email asking them to confirm their card details		
data is read by a packet sniffer as it travels over the wireless network		
the site is flooded with requests until real customers cannot connect		

(b) Explain the difference between phishing and pharming. [3]

(c) The shop installs a firewall. Describe two tasks a firewall performs. [2]

(d) The shop also uses two-step verification. Explain how it protects an account even if the password is stolen. [2]

(e) An employee receives a phone call from someone claiming to be from the IT department, asking for their password. Identify this threat and state one way staff can be prepared for it. [2]

Solutions

2.1 application software.

2.2 any two of: managing files; managing memory; handling interrupts; providing a user interface; managing peripherals; multitasking; security.

2.3 Phishing; a DDoS (distributed denial of service) attack.

2.4 A virus attaches itself to a file and needs the user to open or run it; a worm copies itself across a network on its own, without any user action.

2.5 Any two of: use a strong password with a mix of characters; limit the number of log-in attempts; use two-step verification; add a delay after failed attempts.

3.1 B. A device driver is system software.

3.2 (a) a hardware interrupt.

(b) the processor stops what it is doing and saves its place; it runs the interrupt service routine to deal with it; then restores its place and carries on.

3.3 (a) Phishing, prevented by not clicking links in unexpected email, checking the sender's address, or using an anti-spam filter; data interception, prevented by encrypting the data or using a wireless network key; DDoS attack, prevented by a firewall, a proxy server or filtering the incoming traffic.

(b) Phishing sends the user a message, and the user must click a link or reply for the attack to work; pharming needs no message: malicious code on the computer or the DNS server redirects the user to a fake site; so in pharming the user can type the correct address and still arrive at the fake site.

(c) Any two of: it examines the traffic entering and leaving the network; it checks that traffic against a set of criteria and blocks what fails; it keeps a log of traffic; it can block access to named sites or IP addresses.

(d) A second code is sent to a device the real user holds, such as their phone; the attacker with the password still cannot log in without that code.

(e) Social engineering; staff training, so employees know never to give a password over the phone and always verify who is asking.

5 A computer system has a mouse.

An interrupt is sent to the CPU every time a button on the mouse is clicked.

(a) Identify the name of this type of interrupt.

..... [1]

(b) The interrupt is placed in a queue.

Explain how the interrupt is serviced after it is placed in the queue.

.....

 [4]

(c) The mouse is connected using a universal serial bus (USB) connection.

(i) Explain how data is sent using the USB connection.

.....

 [2]

(ii) Give **two** benefits of using a USB connection for this purpose.

1

 [2]

(iii) Give **one** drawback of using a USB connection for this purpose.

.....
 [1]

4 A computer has an operating system.

One function of the operating system is handling interrupts.

(a) Describe the role of the operating system in handling interrupts.

.....

 [2]

(b) Give **two** other functions of an operating system.

1
 2 [2]

(c) Hardware and software interrupts are two types of interrupt.

(i) Give **one** example of a hardware interrupt.

..... [1]

(ii) Give **one** example of a software interrupt.

..... [1]

7 A computer has an operating system.

(a) The operating system provides several functions.

(i) Tick (✓) **one** box to show which of these is **not** a function of the operating system.

A managing files

☐

B providing an interface

☐

C handling interrupts

☐

D loading the bootstrap

☐

[1]

- (ii) Identify **one** other function of an operating system.

Describe the purpose of this function.

.....

.....

.....

..... [2]

- (b) Give the name of the set of instructions that are provided to the operating system to allow it to run.

..... [1]

- 1 Different types of software can be run on a computer.

- (a) State what is meant by software.

.....

..... [1]

- (b) Utility software is one type of software that can be run on a computer.

Tick (✓) **one** box to show which software is an example of utility software.

- A** spreadsheet ☐
- B** anti-virus ☐
- C** web browser ☐
- D** database ☐

[1]

- (c) Identify the type of software that manages inputs and outputs for the computer.

..... [1]

- 6 A computer needs firmware and system software to operate.

- (a) State the purpose of firmware.

.....

..... [1]

- (b) Give **one** example of firmware.

..... [1]

- (c) Give **two** examples of system software.

1

2 [2]

- 4 A student uses both system software and application software on their computer.

- (a) Give **one** example of system software.

..... [1]

- (b) Give **two** examples of application software.

1

2 [2]

- (c) Describe the difference between system software and application software.

.....

.....

.....

.....

..... [2]

9 A printer runs out of ink and needs a new ink cartridge. An interrupt is sent and a message is generated to notify the user that the ink cartridge is empty.

(a) Complete the paragraph about the use of an interrupt in this process.

Use the terms from the list.

Some of the terms in the list will **not** be used. You should only use a term once.

- binary clock computer data error
- fetch–decode–execute cycle hexadecimal higher interrupt queue
- interrupt service routine (ISR) lower printer priority level
- secondary storage sorting transmission

The sends an interrupt to the
..... . The interrupt is given a
..... . The processor completes its current
..... and checks the
..... to see if there is an interrupt with
..... priority than the current task. If there is, it stores
the current task and fetches the interrupt. It then calls the
..... , which is a sequence of instructions that
handles the interrupt. The interrupt is handled, which generates a message to the user to
notify them that the ink cartridge is empty.

[7]

(b) Handling interrupts is one function of an operating system.

Give **two** functions of an operating system that relate to memory.

- 1
- 2

[2]

3 A computer has an operating system (OS).

(a) Complete the table by writing each missing OS function name and description.

Function name	Description
managing memory	
.....	allows application software to run on the computer
managing peripherals	

[3]

(b) The OS handles interrupts.

(i) State the purpose of an interrupt.

.....
..... [1]

(ii) Identify **one** input device and **one** example of an interrupt that it can generate.

Input device

Interrupt

[1]

- (iii) A processor is currently executing a program. The processor receives an interrupt.

Explain how the processor manages the current program and the interrupt.

[5]

9 An interrupt is a type of signal that is used in a computer.

(a) State the name of the type of software that manages interrupts.

..... [1]

(b) Describe how interrupts are used when a key is pressed on a keyboard.

[5]

(c) Interrupts can be hardware based or software based.

A key press is one example of a hardware interrupt.

(i) Give **two** other examples of a hardware interrupt.

1

2

[2]

(ii) Give **two** examples of a software interrupt.

1

2

[2]

4 Complete the statements about different types of software.

Use the terms from the list.

Some of the terms in the list will **not** be used. You should only use a term once.

- application
- assembly language
- bootloader
- central processing unit (CPU)
- firmware
- hardware
- operating
- output
- system
- user

..... software provides the services that the computer requires; an example is utility software.

..... software is run on the operating system.

The system is run on the firmware, which is run on the

[4]

4.2 Types of programming language, translators and IDEs

Name: _____ Class: _____ Date: _____ **Total: 25 marks**

KEY WORDS high-level language 高级语言 • machine code 机器码 • interpreter 解释器
• low-level language 低级语言 • compiler vs interpreter 编译器

Objective

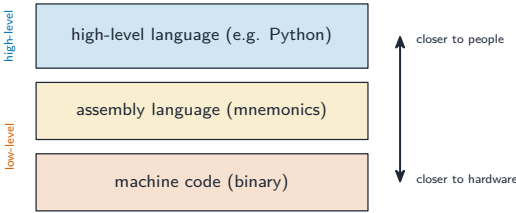
Build the skills to answer exam questions on **programming languages, translators and IDEs** 编程语言、翻译程序与集成开发环境 — **high/low-level** 高级/低级 languages, **compiler vs interpreter** 编译器/解释器, and IDE tools.

You must be able to:

- compare high-level and low-level languages
- compare a compiler and an interpreter
- list the tools in an IDE

1 Worked examples

■ Translators



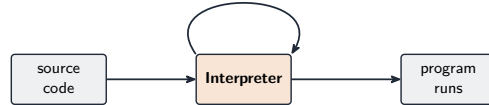
High-level: easy, runs on any computer. Low-level (assembly, machine code): tied to one CPU

Compiler — translate the whole program once



translated once; the machine code then runs many times

Interpreter — one line at a time



reads, translates and runs one line at a time (every run); stops at the first error

Compiler: translates all at once, finished program runs fast. Interpreter: line by line, stops at first error

■ The two internet-security measures the syllabus names

A **firewall** 防火墙 sits between the network and the outside. It examines the traffic entering and leaving, compares it with a set of criteria, blocks anything that fails, keeps a log of the traffic, and can block named sites or IP addresses. It can be software, hardware, or both. It cannot stop a threat carried in by an authorised user on a memory stick, and it cannot help if a user gives their password away.

A **proxy server** 代理服务器 sits between the user and the internet and passes requests on. The web server sees the proxy's address, not the user's, so it hides the user's identity; it can filter traffic and block unwanted sites; it keeps a **cache** of pages so a repeated request is served quickly; and it can act as a firewall.

Privacy settings 隐私设置 control what other people and companies can see: who can view a profile, whether location is shared, whether the history is used for advertising. **Secure sockets layer (SSL) and TLS** encrypt the connection to a website, shown by **https** and a padlock.

Worked example. A school worries about students reaching unsuitable websites and about attacks from outside. Which measure answers which worry? The proxy server filters requests and blocks the unsuitable sites by address, and caches pages that many students open, which also saves bandwidth. The firewall answers the attacks from outside, by examining incoming traffic against its criteria and blocking what does not match, while logging what it sees.

2 Practice

2.1 State one advantage of a high-level language. [1]

2.2 State two tools found in an IDE. [2]

2.3 Identify two tasks performed by a firewall. [2]

2.4 Describe how a proxy server hides a user's identity from a website. [2]

2.5 Give one threat a firewall cannot protect against, and say why. [2]

3 Exam-style questions

3.1 A compiler translates: [1]

- A one line at a time
- B the whole program at once
- C only the errors
- D nothing

3.2 A programmer is writing and testing a new program.

(a) State whether a compiler or an interpreter is more useful while testing, and why. [2]

(b) State two differences between a compiler and an interpreter. [2]

3.3 A company protects its network and its employees' privacy.

- (a) Describe three tasks performed by a firewall. [3]

- (b) Describe two tasks performed by a proxy server that a firewall does not do. [2]

- (c) Explain why a firewall alone cannot keep the network safe, giving one example of a threat it cannot stop. [2]

- (d) Employees use a website that shows **https** and a padlock. Explain what this tells them about the connection. [2]

- (e) Give one privacy setting an employee should check on a social-media account, and explain the risk if it is left open. [2]

Solutions

2.1 any of: easy to read/write/fix; independent of the computer (runs on any type).

2.2 any two of: code editor; run-time environment; translator; error diagnostics; auto-completion; prettyprinting.

2.3 Any two of: it examines the traffic entering and leaving; it compares that traffic with criteria and blocks what fails; it keeps a log; it blocks named sites or IP addresses.

2.4 The user's request goes to the proxy first, and the proxy sends it on to the website; the website sees the proxy's address instead of the user's, so the user's own IP address is hidden.

2.5 A virus brought in on a memory stick, or a user giving away their password to a phishing message; the firewall only inspects traffic crossing the network boundary, so it never sees these.

3.1 B. A compiler translates the whole program at once.

3.2 (a) an interpreter; because it stops at the first error, which helps find mistakes while testing.

(b) any two of: compiler translates all at once / interpreter line by line; compiler reports all errors at the end / interpreter stops at the first; the compiled program runs faster; the interpreter is needed each time the program runs.

3.3 (a) Any three of: it examines traffic entering and leaving the network; it compares that traffic with a set of criteria; it blocks traffic that fails the criteria; it logs traffic for later inspection; it blocks access to named sites or IP addresses.

(b) Any two of: it caches web pages so repeated requests load faster and use less bandwidth; it hides the user's IP address from the web server; it filters requests to block unwanted websites.

(c) A firewall only inspects traffic crossing the network boundary; it cannot stop malware carried in on a memory stick, nor a user who gives their password to a phishing email.

(d) The connection uses SSL or TLS, so the data between the browser and the server is encrypted; anyone intercepting it would see only ciphertext, so log-in and payment details are protected.

(e) Any one of: who can see the profile or posts; whether location is shared; whether the account appears in search. If left open, strangers can gather personal information to use in social engineering or identity theft.

3 A programmer uses assembly language to create a program for a coffee machine.

(a) Describe what is meant by assembly language.

.....

 [2]

(b) Identify the translator needed for assembly language.

..... [1]

(c) Tick (✓) **one** box to show which statement is an advantage of using assembly language.

- | | | |
|----------|--------------------------------|--------------------------|
| A | It is close to human language. | ☐ |
| B | It is memory efficient. | ☐ |
| C | It is easy to debug. | ☐ |
| D | It is machine independent. | ☐ |

[1]

7 Programs can be written in a high-level language or a low-level language.

(a) Machine code is one type of low-level language.

Identify **one** other type of low-level language.

Identify the translator that is needed for the type of low-level language you have identified.

Type of low-level language

Translator

[2]

(b) A high-level language can be translated into a low-level language, using a compiler or an interpreter.

Describe the advantages of using an interpreter instead of a compiler during software development.

.....

 [4]

(c) Integrated development environments (IDEs) provide translators.

Identify **three** other common functions of an IDE.

1

 2

 3
 [3]

6 A computer programmer uses assembly language to create a computer program for an embedded system in a washing machine.

(a) State what is meant by an embedded system.

.....
 [1]

(b) Give the name of the translator that will be used for the program.

..... [1]

(c) The washing machine needs to display error codes on a small screen if there is a problem with the washing machine.

The error codes are stored as binary. The binary numbers are too long to be displayed on the washing machine.

State how the error codes could be reduced in length to be displayed on the screen.

..... [1]

(d) Give **one** benefit to the programmer of using assembly language to write the program.

.....
 [1]

(e) The programmer uses an integrated development environment (IDE) to write the program.

A built-in translator to convert the program into machine code is one way that the IDE helps the computer programmer.

Describe **three** other ways the IDE can help the programmer.

.....

 [6]

7 A computer programmer uses an integrated development environment (IDE) when creating a computer program.

Explain the purpose of the IDE.

.....

 [4]

7 A programmer uses a low-level language to write a computer program for a vending machine.

(a) Describe what is meant by a low-level language.

.....

.....

.....

..... [2]

(b) Give **two** reasons why the programmer would choose to write the computer program in a low-level language instead of a high-level language.

1

.....

2

..... [2]

5 A programmer writes a computer program using a high-level language.

(a) Tick (✓) **one** box to show which statement is correct about writing computer programs in a high-level language.

- | | | |
|---|--|--------------------------|
| A | Mnemonics are used to create instructions. | ☐ |
| B | The computer program is harder to debug than a low-level language program. | ☐ |
| C | The computer program is machine independent. | ☐ |
| D | The hardware of the computer can be directly manipulated. | ☐ |

[1]

(b) The programmer uses a compiler to translate the computer program.

(i) Describe how the compiler translates the computer program.

.....

.....

.....

.....

..... [3]

(ii) Describe how the compiler reports errors.

.....

.....

.....

..... [2]

(c) The programmer uses an integrated development environment (IDE) to create the computer program.

One function of the IDE is that it has the built-in compiler.

Give **three** other common functions of an IDE.

1

2

3

[3]