Week 13

IGCSE Computer Science

Homework bundle for this week

本周作业合集

exercises.lol

Contents 目录

IGCSE Computer Science Name: _____ Score: _____

1. What is the difference between the internet and the world wide web?
   - ☐ the internet is the network; the web is the websites you view on it
   - ☐ they are exactly the same
   - ☐ the web is the network; the internet is the websites
   - ☐ the web replaced the internet
2. A digital currency is:
   - ☐ money that exists only in electronic form
   - ☐ a special kind of coin
   - ☐ a paper banknote
   - ☐ a type of cookie
3. A brute force attack works by:
   - ☐ trying many passwords very quickly until the right one is found
   - ☐ flooding a server with requests
   - ☐ sending a fake email
   - ☐ listening in on a network
4. A web browser's job is to:
   - ☐ render a page's HTML and display it
   - ☐ store the website permanently
   - ☐ assign IP addresses
   - ☐ route packets between networks
5. A blockchain is:
   - ☐ a shared digital ledger of transactions, copied across many computers
   - ☐ a single private database
   - ☐ a type of web browser
   - ☐ a physical chain
6. Phishing tricks you with fake messages into giving away details, while pharming silently redirects you to a fake site even when you type the correct address.

   ☐ True ☐ False

7. A persistent cookie is saved on the device and remembers you between visits, whereas a session cookie is deleted when you close the browser.

   ☐ True ☐ False

8. A shared, tamper-resistant digital ledger of transactions is called a _____.

   _____

9. A DDoS attack:

   ☐ floods a server with so many requests that it cannot respond

   ☐ steals a password by guessing

   ☐ installs a virus

   ☐ redirects you to a fake site

10. The domain name service (DNS) is used to:

    ☐ find the IP address that matches a web address

    ☐ store all the web pages

    ☐ encrypt the connection

    ☐ block adverts

IGCSE Computer Science

1. **the internet is the network; the web is the websites you view on it**

   The internet is the worldwide infrastructure; the WWW is one service (websites) running on it.

2. **money that exists only in electronic form**

   Digital currency has no physical coins/notes; it is stored and moved by computers.

3. **trying many passwords very quickly until the right one is found**

   Brute force tries password after password until it gets in.

4. **render a page's HTML and display it**

   The browser fetches the HTML and renders it into the page you see.

5. **a shared digital ledger of transactions, copied across many computers**

   Being shared across many computers means no one controls it and it is hard to alter.

6. **True**

   Both aim to steal credentials, but phishing needs you to click; pharming poisons the address lookup itself.

7. **True**

   Persistent cookies store logins/preferences across visits; session cookies last only for the current visit.

8. **blockchain**

   It underpins digital currencies.

9. **floods a server with so many requests that it cannot respond**

   A distributed denial-of-service overwhelms a server so genuine users can't reach the site.

10. **find the IP address that matches a web address**

    DNS turns the human-readable domain name into the numeric IP address the browser needs.

IGCSE COMPUTER SCIENCE • EXERCISE SHEET

5.1 The internet and the world wide web

Name: _____ Class: _____ Date: _____ **Total: 30 marks**

KEY WORDS web browser 浏览器 • cookies 小型文本文件 • internet 互联网 • persistent 持久 • session 会话

Objective

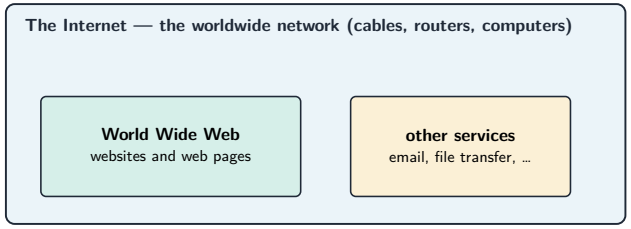
Build the skills to answer exam questions on **the internet and the world wide web** 互联网与万维网 — the difference, **URLs** 统一资源定位符, the **web browser** 浏览器, **DNS** 域名服务, and **cookies**.

You must be able to:

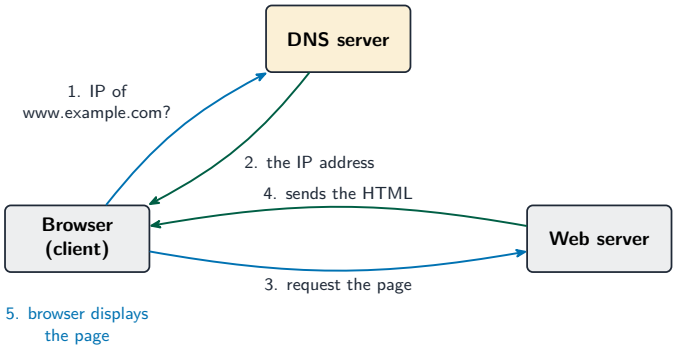
- distinguish the internet from the world wide web
- describe how a web page reaches the browser (DNS, web server)
- describe session and persistent cookies

1 Worked examples

Internet, web and DNS



The internet is the worldwide network; the web is one thing you use on it



DNS turns the URL into an IP address; the web server returns the page's HTML

- **session cookie:** deleted on closing the browser; **persistent:** saved between visits.

The words the exam wants, in the right order

Internet or web? The **internet** 互联网 is the worldwide network of interconnected computer networks, the infrastructure itself. The **world wide web** 万维网 is the collection of web pages and other resources that is accessed using that infrastructure. The internet came first and carries email, file transfer and streaming as well as the web.

Reading a URL 统一资源定位符. In `https://www.example.com/notes/topic5.html` the parts are: the **protocol** (`https`), the **domain name** (`www.example.com`) and the **file path or web page name** (`/notes/topic5.html`).

How a page reaches the browser, in the order the marks are given:

1. The user types the URL into the browser.
2. The browser sends the domain name to a **DNS** 域名系统 server.
3. The DNS server looks up the matching **IP address** and returns it (if it does not hold the name, it passes the request to another DNS server).
4. The browser sends a request to the **web server** at that IP address.
5. The web server returns the page's **HTML**.
6. The browser **renders** the HTML into the page you see.

Cookies 小型文本文件. A **session cookie** is stored only in memory and is deleted when the browser is closed; it is used for things like the contents of a shopping basket during one visit. A **persistent cookie** is stored on the hard disc and stays until it expires or is deleted; it is used to remember log-in details, language and site preferences, or items saved between visits.

Digital currency and blockchain. A digital currency exists only electronically. A

blockchain 区块链 is a shared digital ledger: each transaction is stored in a block with a **hash** of the previous block, so changing one block changes every hash after it and the tampering is obvious to everyone holding a copy.

2 Practice

2.1 State the difference between the internet and the world wide web. [2]

2.2 State the purpose of a DNS. [1]

2.3 Identify the three parts of the URL `https://www.school.org/exams/paper1.html`. [3]

2.4 Give two uses of a persistent cookie. [2]

2.5 Explain how a blockchain makes it hard to change a past transaction. [2]

3 Exam-style questions

3.1 A cookie deleted when you close the browser is a: [1]

- **A** persistent cookie
- **B** session cookie
- **C** firewall
- **D** proxy

3.2 A user types a URL and presses enter.

(a) Describe the steps that load the web page. [3]

(b) State one use of a persistent cookie. [1]

3.3 A student uses a browser to visit an online shop.

(a) Complete the table by identifying each part of the URL `https://www.shop.co.uk/cart/checkout.`

Part	Value
protocol	
domain name	
web page or file path	

(b) Describe how the web page is retrieved and displayed, from the moment the student presses enter. [5]

(c) The shop stores the contents of the basket in a session cookie. Explain why a session cookie is suitable, and state one thing the shop should use a persistent cookie for instead. [3]

(d) The student notices the protocol is `https` and not `http`. Explain the benefit of `https` for this website. [2]

(e) Explain the difference between the internet and the world wide web. [2]

Solutions

2.1 the internet is the worldwide network (infrastructure); the web is the collection of websites you view on it.

2.2 it stores the IP address for each web address (turns a URL into an IP address).

2.3 Protocol: `https`; domain name: `www.school.org`; web page or file path: `/exams/paper1.html`.

2.4 Any two of: remembering log-in details; storing site preferences such as language; saving items in a basket between visits; targeted advertising.

2.5 Each block stores a hash of the previous block; changing one block changes its hash, so every later block no longer matches and the tampering is visible to everyone holding a copy.

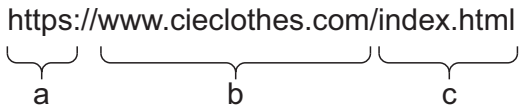
3.1 B. A session cookie is deleted when the browser closes.

3.2 (a) the browser asks a DNS for the site's IP address; it then contacts the web server using that IP address; the server returns the HTML, which the browser renders.
(b) remembering you / your details between visits.

3.3 (a) Protocol: `https`; domain name: `www.shop.co.uk`; web page or file path: `/cart/checkout.html`.
(b) The browser sends the domain name to a DNS server; the DNS server returns the matching IP address, passing the request on to another DNS server if it does not hold the name; the browser sends a request to the web server at that IP address; the web server sends back the HTML of the page; the browser renders the HTML to display the page.
(c) A session cookie is deleted when the browser closes, which suits a basket that only needs to last for one visit; a persistent cookie should be used for the customer's log-in details or preferences, which must survive between visits.
(d) The data sent between the browser and the server is encrypted, so payment and log-in details cannot be understood if they are intercepted.
(e) The internet is the worldwide network of connected networks, the infrastructure; the world wide web is the collection of pages and resources accessed using it.

6 An online clothing company has a homepage at the uniform resource locator (URL) https://www.cieclothes.com/index.html

(a) Write down the **three** different parts of the URL shown by the labels a, b and c.



a ..... b ..... c .....

[3]

(b) The web pages are stored on a web server. A proxy server is used to stop distributed denial of service (DDoS) attacks on the web server.

Describe how the proxy server can stop a DDoS attack reaching a web server.

.....

.....

.....

.....

.....

..... [3]

(c) Customers use the website to buy clothing from the company.

Complete the table with the missing terms and descriptions about retrieving and displaying web pages.

Term	Description
hypertext markup language (HTML)	....
domain name server (DNS)	....
.....	It is a numerical address used to locate the web server.
.....	It is a secure protocol that can be used to transmit data sent to and received from a web server.
.....	It is a piece of software that is used to display web pages.

[5]

(d) The clothing company uses cookies to store customer details.

Complete the statements about cookies.

Use terms from the list. **Not** all terms need to be used. You should only use a term once.

asymmetric DNS dynamic persistent session

static symmetric user utility software web browser

Cookies are stored and managed by the ..... .

..... cookies are temporary files that are created when a user visits a web page.

..... cookies are permanent files that are created when a user visits a web page.

[3]

7 A student enters the uniform resource locator (URL) for a web page into their tablet computer.

(a) State what is meant by a URL.

.....

..... [1]

(b) Identify **two** different parts of a URL.

1 .....

2 .....

[2]

(c) The student enters the URL into a piece of software that then displays the web page.

Identify the name of this software.

..... [1]

(d) Draw and annotate a diagram to show how the web page is located and retrieved to be displayed on the student's tablet computer.

[5]

(e) The data for the web page is transmitted using the secure socket layer (SSL) protocol.

Complete the paragraph about the SSL protocol.

Use only terms from the list.

Not all terms need to be used. Some terms may be used more than once.

encrypted file server hypertext markup language (HTML)

hypertext transfer protocol (HTTP) operating system search engine

unencrypted URL web browser web server

The ..... asks the .....

to identify itself. The ..... sends back its digital

certificate. The ..... authenticates the digital certificate.

If it is authentic, ... data transmission begins.

[5]

4 Complete the table to give the missing term or description for the internet terms.

Internet term	Description
.....	the collection of web pages accessed using the internet
.....	the address given to a device when it connects to the internet
web browser	....
.....	the hardware that stores a database of matching website and IP addresses
.....	a type of hardware that can be used to prevent a distributed denial of service (DDoS) attack
hacking	....

[6]

6 **(a)** Complete the statements about cookies.

Use only terms from the list.

Not all terms need to be used. Some terms may be used more than once.

binary close denary expire

hexadecimal image malware operating system

permanent persistent session sound

temporary web browser

Cookies are small text files that are stored by a ..... .

..... cookies are ..... text files that are deleted when the ..... is closed.

..... cookies are ..... text files that are stored on a user's secondary storage device until they are manually deleted or they ..... .

[7]

(b) Give **three** examples of the use of cookies.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

11 A company has a website. Users use the internet and the world wide web to access the website.

(a) Describe the difference between the internet and the world wide web.

.....

.....

.....

..... [2]

(b) The website has a uniform resource locator (URL). The URL has three different parts.

Identify the **three** different parts that are included in the URL.

1 .....

2 .....

3 .....

[3]

(c) One function of a web browser is to provide an address bar for a user to enter a URL.

Give **three** other functions of a web browser.

1 .....

2 .....

3 .....

[3]

4 A student enters a uniform resource locator (URL) into their web browser.

Draw and annotate a diagram to show the process from the user entering the URL to the web browser displaying the web page.

[5]

8 A computer is connected to a network and assigned an IPv4 address.

(a) Tick (✓) **one** box to show which device would assign the IPv4 address to the computer.

A Domain name server (DNS) ☐

B Network interface card (NIC) ☐

C Router ☐

D Web server ☐

[1]

(b) Describe the characteristics of an IPv4 address.

.....

.....

.....

.....

.....

.....

.....

..... [4]

IGCSE COMPUTER SCIENCE • EXERCISE SHEET

5.2 Digital currency

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

KEY WORDS digital currency 数字货币 • digital ledger 数字账本 • blockchain 区块链 • transaction 交易 • electronic form 电子形式

Objective

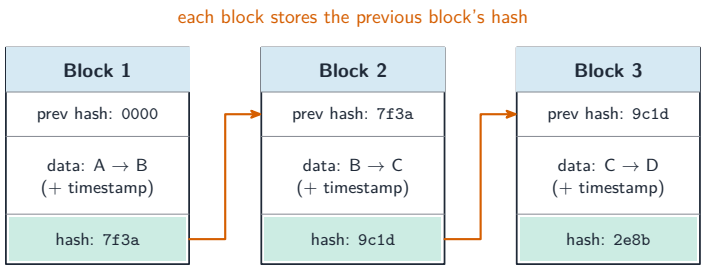
Build the skills to answer exam questions on **digital currency** 数字货币 — what it is, and how **blockchain** 区块链 keeps it secure.

You must be able to:

- describe digital currency
- describe a blockchain (a digital ledger of transactions)
- explain how the hash chain detects tampering

1 Worked examples

■ Blockchain



Each block stores data, a timestamp and a hash, plus the previous block's hash — chaining them

- **digital currency:** money in electronic form only (no coins/notes).
- changing an old block changes its hash, so it no longer matches the next block — the change is spotted.

2 Practice

2.1 Define digital currency. [1]

2.2 State the three things stored in a blockchain block. [3]

3 Exam-style questions

3.1 A blockchain is best described as a: [1]

- **A** single private record
- **B** shared digital ledger copied across many computers
- **C** type of cookie
- **D** web browser

3.2 Blockchain makes records hard to change.

(a) Explain how the hash links the blocks together. [2]

(b) Explain why changing one old block is detected. [2]

Solutions

2.1 money that exists only in electronic form (no physical coins or notes).

2.2 the transaction data; a timestamp; a hash value.

3.1 B. A blockchain is a shared digital ledger copied across many computers.

3.2 (a) each block stores the hash of the block before it, linking the blocks into a chain. (b) changing a block changes its hash; so it no longer matches the next block's stored hash, breaking the chain.

8 Draw and annotate a diagram to show how a payment transaction is made using digital currency and blockchain.

[4]

Name: IGCSE Computer Science: **m24 12**

5 Complete the description of digital currencies using the terms provided.

blockchains changed datachains decentralised
deleted encryption passport physical address
physically records time-stamp traced
transaction-chains virtually

A digital currency does **not** exist ....., it can only be accessed electronically.

Some digital currencies have digital ledgers called ..... These are decentralised databases where each transaction is stored as a new set of data with a ..... and is linked to the previous set of data. This means that transactions cannot be altered, only new transactions added, which allows the location of the data to be .....

[4]

IGCSE Computer Science: **w23 12**

12 Digital currency can be used to pay for products and services.

Digital currencies are often tracked using digital ledgers.

(a) Give **two** other features of digital currency.

1 .....

.....

2 .....

.....

[2]

(b) Identify the process that uses a digital ledger to track the use of digital currency.

..... [1]

IGCSE COMPUTER SCIENCE • EXERCISE SHEET

5.3 Cyber security

Name: _____ Class: _____ Date: _____ **Total: 28 marks**

KEY WORDS cyber security 网络安全 • malware 恶意软件 • firewall 防火墙 • phishing 网络钓鱼 • proxy server 代理服务器

Objective

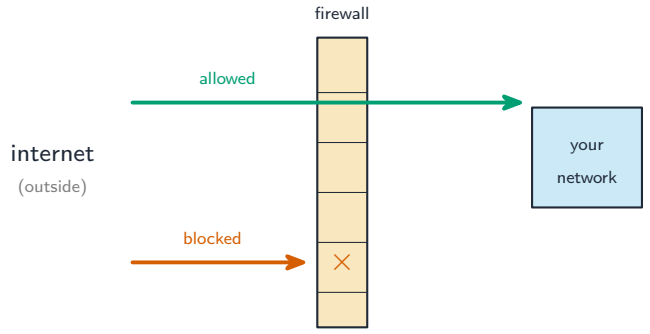
Build the skills to answer exam questions on **cyber security** 网络安全 — the threats, types of **malware** 恶意软件, and methods to keep data safe.

You must be able to:

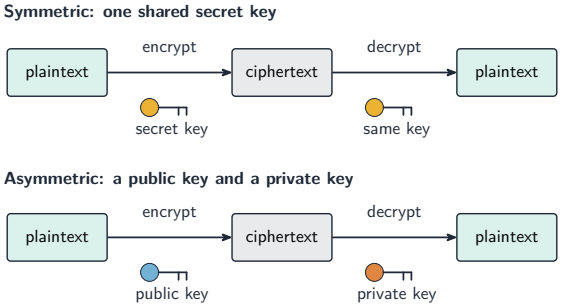
- describe threats (brute force, DDoS, phishing, pharming, social engineering)
- describe the types of malware
- describe security methods (firewall, authentication, anti-malware)

1 Worked examples

Threats and protection



A firewall checks data in/out of a network and blocks anything not allowed



Encryption is a key security measure against interception

- **threats:** brute force, data interception, DDoS, hacking, malware, pharming, phishing, social engineering.
- **malware:** virus, worm, Trojan, spyware, adware, ransomware.

■ **Keeping data safe: which measure answers which risk**

Encryption 加密 scrambles data with a key so that an interceptor gets **ciphertext** 密文 they cannot read; the plaintext is recovered with the key. It does not stop the data being taken, it makes what is taken useless. **Symmetric encryption** uses the same key to encrypt and decrypt, so the key itself must be exchanged safely; **asymmetric encryption** uses a public key to encrypt and a matching private key to decrypt, so nothing secret has to be sent.

Secure sockets layer (SSL) and its successor TLS encrypt the traffic between a browser and a web server. The browser checks the site's **digital certificate**, then the two agree a session key. You can tell it is in use because the address begins `https` and a padlock appears.

Firewall 防火墙: examines traffic entering and leaving the network, compares it with a set of criteria, blocks what fails, logs traffic, and can block named sites or addresses.

Proxy server 代理服务器: sits between the user and the internet, so the web server never sees the user's own address. It can filter traffic, keep a cache of pages so they load faster, and act as a firewall.

Access rights 访问权限: each user gets only the permissions their role needs (read, read-and-write, none), so a person who is not authorised cannot see or change a file even after logging in.

Authentication 身份验证: passwords, biometrics (fingerprint, face, iris), and two-step verification, which sends a one-time code to a device the real user holds.

Worked example. A hospital keeps patient records on a server used by doctors and receptionists. Suggest measures. Encrypt the records so a stolen copy is unreadable; use access rights so receptionists see only appointment details while doctors see the

medical notes; use biometrics or two-step verification, so a stolen password alone is not enough; put a firewall between the server and the internet to block unauthorised traffic.

2 Practice

2.1 State what a brute force attack is. [1]

2.2 State what ransomware does. [1]

2.3 Give the name of the data before and after encryption. [2]

2.4 Identify two tasks performed by a proxy server. [2]

2.5 Explain why encryption does not stop data being intercepted. [2]

3 Exam-style questions

3.1 A firewall protects a network by: [1]

- **A** scanning for viruses
- **B** checking data in/out and blocking what is not allowed
- **C** encrypting files
- **D** hiding the IP address

3.2 A company wants to protect its data.

(a) Describe what a phishing attack is. [2]

(b) State two methods (other than a firewall) to keep data safe. [2]

3.3 State the difference between a virus and a worm. [2]

3.4 An online bank protects its customers' data.

(a) Explain what happens to data when it is encrypted, using the terms plaintext and ciphertext. [2]

(b) Identify the protocol that encrypts the connection between a customer's browser and the bank's server, and give one way the customer can tell it is being used. [2]

(c) Describe two tasks a firewall performs for the bank's network. [2]

(d) Bank staff have different access rights. Explain how access rights protect customer data even from someone who has logged in successfully. [2]

(e) The bank adds two-step verification. Describe how it works and explain why it is safer than a password alone. [3]

(f) Explain one advantage of asymmetric encryption over symmetric encryption when a customer first connects. [2]

Solutions

2.1 trying many passwords very quickly until the right one is found.

2.2 it locks your files and demands payment to unlock them.

2.3 Plaintext before, ciphertext after.

2.4 Any two of: it filters traffic; it keeps a cache of web pages so they load faster; it hides the user's IP address from the web server; it acts as a firewall.

2.5 Encryption only scrambles the data; an interceptor can still take a copy, but without the key the ciphertext is meaningless to them.

3.1 B. A firewall checks data in/out and blocks anything not allowed.

3.2 (a) fake emails/messages that trick you into giving away private details.
(b) any two of: authentication (password/biometrics/two-step); anti-malware; access levels; automatic updates; proxy server.

3.3 a virus attaches to a file and copies itself when the file is opened; a worm copies itself across a network on its own, without a file being opened.

3.4 (a) The readable plaintext is scrambled using a key so that it becomes ciphertext, which cannot be understood without the matching key to decrypt it.
(b) SSL, or its successor TLS; the address begins with `https` or a padlock is shown in the address bar.
(c) Any two of: it examines the traffic entering and leaving the network; it compares that traffic with a set of criteria and blocks anything that fails; it keeps a log; it blocks named sites or IP addresses.
(d) Each user is given only the permissions their job needs, so a receptionist who logs in cannot open or change files reserved for doctors.
(e) After the password is accepted, a one-time code is sent to a device the real user holds, such as their phone; the user must enter that code to complete the log-in; a thief who has only the password still cannot get in without the device.
(f) With asymmetric encryption the bank publishes a public key that anyone may use to encrypt, so no secret key has to be sent over the internet where it could be intercepted, unlike symmetric encryption.

4 A computer game development company are reviewing their current security solutions.

The company wants employees to be aware of how they can identify phishing.

(a) Describe the process of phishing.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(b) Give **two** ways an employee could identify phishing.

1 .....

.....

2 .....

..... [2]

(c) The company has installed anti-malware software on all employees' computers.

Give **three** examples of malware that anti-malware software can detect.

1 .....

2 .....

3 ..... [3]

(d) The computer game developers use a high-level language to create a computer game.

(i) State what is meant by a high-level language.

.....

..... [1]

(ii) One benefit of using a high-level language is that the code is easy to debug.

Give **two** other benefits of using a high-level language.

1 .....

.....

2 .....

..... [2]

(iii) One drawback of using a high-level language is that it must be converted to a low-level language before it can be run.

Give **one** other drawback of using a high-level language.

.....

..... [1]

(iv) The computer game developers use an interpreter instead of a compiler when developing the computer game.

Explain why an interpreter would be more appropriate for developing the computer game.

.....

.....

.....

.....

.....

..... [3]

4 A cyber security company specialises in security solutions that help prevent hackers being successful.

(a) Identify **two** security solutions that can be provided to help prevent hackers being successful.

Explain how each solution helps prevent hackers being successful.

Solution 1 .....

Explanation .....

.....

.....

.....

Solution 2 .....

Explanation .....

.....

.....

.....

[6]

(b) The company also has a web page that provides information to improve people's awareness of social engineering.

Describe what is meant by social engineering.
Include an example of social engineering in your answer.

.....

.....

.....

.....

.....

..... [3]

(c) The company's website uses both session cookies and persistent cookies.

(i) State **one** similarity between session cookies and persistent cookies.

.....

.... [1]

(ii) Explain **one** difference between session cookies and persistent cookies.

.....

.....

.....

..... [2]

8 A company has a website that is suffering a distributed denial of service (DDoS) attack.

(a) Draw and annotate a diagram to show the process of the DDoS.

[5]

(b) Identify a solution that can be used to help prevent the DDoS attack being successful.

..... [1]

6 Draw and annotate a diagram to demonstrate how a firewall works.

[4]

1 Malware can be used to corrupt data stored on a computer.

(a) Tick (✓) **one** box to show which cyber security threat is **not** a type of malware.

A Phishing ☐

B Ransomware ☐

C Virus ☐

D Worm ☐

[1]

(b) Identify **one** other example of malware than those given in **part 1(a)**.

..... [1]

(c) Identify the type of software that is used to find and remove malware from a computer.

..... [1]

8 **(a)** Draw and annotate a diagram that demonstrates the cyber security threat of data interception.

[4]

(b) Identify **one** security solution that will help keep data safe from data interception and state why it will help keep the data safe.

.....

.....

.....

[2]

8 A manager at a company is concerned about a brute-force attack on its employee user accounts.

(a) Describe how a brute-force attack can be used to gain access to the employee user accounts.

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..... [3]

(b) One possible aim for carrying out a brute-force attack is to install malware onto the company network.

(i) State **two** other aims for carrying out a brute-force attack to gain access to the employee user accounts.

1 .....

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2 .....

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[2]

(ii) Identify **three** types of malware that could be installed.

1 .....

2 .....

3 .....

[3]

(c) Give **two** security solutions that could be used to help prevent a brute-force attack being successful.

1 .....

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2 .....

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[2]

10 A student uses the internet for their schoolwork to research what is meant by pharming.

(a) State the aim of pharming.

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..... [1]

(b) Draw and annotate a diagram to represent the process of pharming.

[4]

(c) The student uses a web browser to access data on the internet.

Explain the purpose of the web browser.

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..... [2]

(d) Storing cookies is one function of the web browser.

Give **three** other functions of the web browser.

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2 .....

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3 .....

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[3]

(e) A student visits a website that uses session cookies, instead of persistent cookies.

Explain the difference between session cookies and persistent cookies.

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1 Computers can be infected with malware. Spyware is one example of malware.

(a) Tick (✓) **one** box to show a correct definition of spyware.

A Software that activates a webcam and transmits the video to a third party that outputs it live on a website. ☐

B Software that detects when a password is being entered and then emails the password to a third party. ☐

C Software that records all data entered into a computer, analyses this data to find email addresses and passwords, then posts these to a website. ☐

D Software that records all key presses and transmits these to a third party. ☐

[1]

(b) Complete the table by identifying and describing **two** other examples of malware.

	Malware	Description
1	....	....
2	....	....

[6]

(c) Proxy-servers and firewalls have some similar functions.

Identify **two** similarities and **one** difference between proxy-servers and firewalls.

Similarity 1 .....

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Similarity 2 .....

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Difference .....

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[3]