

Week 17

A-Level Computer Science

Homework bundle for this week

本周作业合集

exercises.lol

Contents 目录

Topic 7 quiz	2
Exercise sheet 7.1	5
Past-paper questions 7.1	11

7. Ethics and Ownership

Starter Quiz · 课前小测

A-Level Computer Science

Name: _____ Score: _____

- Why are ethics especially important for computing professionals?
 - ☐ their work affects people who often cannot judge it themselves, so trust is essential
 - ☐ because software is always free
 - ☐ because computers never make mistakes
 - ☐ only to win awards
- Copyright applies automatically to an original work (including code) and controls how it is copied and modified — but a general idea or algorithm needs a patent instead.
 - ☐ True ☐ False
- Machine learning differs from traditional programming because it:
 - ☐ learns patterns from data instead of being programmed step by step
 - ☐ never makes mistakes
 - ☐ needs no data at all
 - ☐ is written entirely in assembly
- The two professional bodies named in the syllabus are the BCS and the _____.

- Why should a programmer rely on copyright for a program? Select **all** that apply.
 - ☐ to be identified as the owner and author
 - ☐ so there are legal consequences if someone copies it
 - ☐ to stop competitors selling the same work
 - ☐ to earn money by licensing it
 - ☐ to make the program run faster

Tick every correct option.
- Which is an everyday application of AI?
 - ☐ a recommendation system suggesting videos
 - ☐ a paper notebook
 - ☐ a mechanical lever
 - ☐ a printed dictionary
- Which are benefits of joining a professional ' ' al body? Select **all** that apply.

- ☐ a code of conduct to follow, so decisions are not left to personal judgement
- ☐ training, conferences and publications
- ☐ recognised professional status and a network of colleagues
- ☐ exemption from the law when following the code

Tick every correct option.

8. A general idea or algorithm is NOT covered by copyright, but may be protected by a:
- ☐ patent
 - ☐ password
 - ☐ firewall
 - ☐ checksum
9. A benefit of AI is:
- ☐ spotting patterns in huge datasets to support decisions (e.g. fraud detection)
 - ☐ guaranteeing every decision is fair
 - ☐ removing the need for any data
 - ☐ always being fully explainable
10. Training and running large AI models has no significant environmental cost.
- ☐ True ☐ False

7. Ethics and Ownership

A-Level Computer Science

1. **their work affects people who often cannot judge it themselves, so trust is essential**
Software runs critical systems and users can't easily verify it, so professionals are trusted to act honestly and competently.
2. **True**
Copyright protects the specific expression; ideas/inventions are protected (if at all) by patents.
3. **learns patterns from data instead of being programmed step by step**
ML algorithms improve at a task by learning from large amounts of data, rather than following hand-written rules.
4. **IEEE**
The British Computer Society and the Institute of Electrical and Electronics Engineers; both publish a code of conduct that members follow.
5. **to be identified as the owner and author; so there are legal consequences if someone copies it; to stop competitors selling the same work; to earn money by licensing it**
Ownership, legal protection, market protection and income are the four reasons the scheme lists. Copyright has nothing to do with performance.
6. **a recommendation system suggesting videos**
Recommendation systems (and speech/image recognition, translation, self-driving) are common AI applications.
7. **a code of conduct to follow, so decisions are not left to personal judgement; training, conferences and publications; recognised professional status and a network of colleagues**
A body offers guidance, development, status and support. It cannot place its members above the law.
8. **patent**
Copyright protects the specific expression (the code/text); ideas and inventions may be protected by a patent.
9. **spotting patterns in huge datasets to support decisions (e.g. fraud detection)**
AI excels at finding patterns in large data (decision support). Fairness and explainability are concerns, not guarantees.
10. **False**
Large models consume a great deal of electricity and cooling water, and their hardware becomes e-waste. AI also helps cut energy use elsewhere, so both directions belong in an answer.

7.1 Ethics and Ownership

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

KEY WORDS software licence 软件许可证 • shareware 共享软件 • copyright 版权 • ethics 伦理
• open source / foss 开源

Objective

Build the skills to answer exam questions on **ethics and ownership** — professional ethics, copyright, and software licensing.

You must be able to:

- explain why a computing professional must act **ethically** 伦理, and the impact of acting ethically or not
- explain the need for **copyright** 版权 legislation
- describe the types of **software licence** and justify a licence for a given situation

1 Worked examples

Study these first. Each one shows the method for a question type used later — follow the steps and you can do the Practice and Exam-style questions yourself.

■ Professional ethics

```
graph TD; A{sell it / keep control?} -- yes --> B([commercial]); A -- no --> C{share the source code?}; C -- yes --> D([open-source]); C -- no --> E{free forever?}; E -- yes --> F([freeware]); E -- "no (trial)" --> G([shareware]);
```

Software ownership is governed by the type of licence granted

A computing professional's work (software, data, networks) affects people who often cannot judge it themselves, so the profession follows shared **ethics**. Key principles: put the **public interest first**, be **honest** about your competence, keep data **confi-**

dential, avoid **conflicts of interest**, and respect **intellectual property** 知识产权 and privacy.

Acting **ethically** protects users and builds trust; acting **unethically** (skipping testing, hiding bugs, misusing data) can harm users and lead to dismissal, legal action and lost trust.

Many professionals join a **professional body** 专业团体 (such as the BCS) and follow its **code of conduct** 行为准则. Belonging shows a commitment to high standards, gives access to training and up-to-date guidance, and reassures employers and the public; **not** belonging can mean missing this guidance and being trusted less.

■ Copyright

Copyright is the creator's automatic legal right to control how an original work (code, images, music, documents) is **copied, distributed, modified and performed**. It rewards creators so more software is made. It does **not** cover a general idea or algorithm — those may be protected by a **patent** 专利.

■ Software licences

Licence	You may...	Source code	Cost
proprietary 专有	use under strict terms	hidden	paid
open source / FOSS 开源	use, view, modify, share	available	usually free
freeware	use for free	hidden	free
shareware	try free, then pay to keep	hidden	trial then paid

Justify by need: a company protecting its product → proprietary; a school wanting to install and adapt software freely → open source.

2 Practice

Now apply the methods above.

2.1 State **two** reasons ethics matters for a computing professional. [2]

2.2 State what **copyright** protects. [1]

2.3 Name the licence type where the **source code** is available to view and modify.[1]

2.4 Give one ethical principle a computing professional should follow. [1]

3 Exam-style questions

3.1 Explain one impact of a software developer acting **unethically**. [2]

3.2 (a) State one thing copyright **does** protect, and (b) one thing it does **not** protect. [2]

3.3 Compare **proprietary** and **open-source** software licences. [3]

3.4 A school wants software it can install free on all its PCs and adapt for its own use. State a suitable licence type and justify your choice. [2]

3.5 Explain **two** reasons a computing professional might join a **professional ethical body** (such as the BCS). [2]

3.6 A school introduces an AI tool that marks students' essays and suggests improvements.

(a) **Describe** two **social** impacts of students using AI to complete their homework. [4]

(b) **Describe** one **ethical** impact of the school using AI to mark work. [2]

(c) **Give** three ethical considerations for a student using their **personal** computer to connect to the school network. [3]

(d) The AI was trained on essays from one country only. **Explain** why this could make its marking unfair, and **state** what the developers should do about it. [3]

(e) A teacher argues that the school should publish how the AI reaches its decisions. **Explain** one benefit and one drawback of doing so. [2]

Solutions

Each answer shows the steps, then the **result**.

2.1

- any two of: software affects people's safety/money; users must be able to **trust** professionals; poor/dishonest work can cause real harm

2.2

- the right to control how an **original work** (code, images, music, documents) is copied, distributed, modified and performed

2.3

- open source** (FOSS)

2.4

- any one: public interest first; honesty about competence; confidentiality; avoid conflicts of interest; respect intellectual property

3.1

- any one impact, explained, e.g. hiding a bug could **harm users** (a medical/banking system fails)
- the developer may face dismissal or legal action and lost trust

3.2

(a) e.g. the actual program code / an image / a document (an original work)

(b) a general **idea or algorithm** (which may instead be patented)

3.3

- proprietary: source code hidden, used under strict paid terms
- open source: source available to view, modify and share, usually free
- so open source allows adaptation while proprietary protects the developer's product

3.4

- open source** (FOSS)
- it is free to install on every PC and the school may legally modify it for its own needs

3.5

- any two of: to follow a shared **code of conduct** / ethical standards; access to **training** and up-to-date professional guidance; recognition and **trust** from employers and clients; networking with other professionals

3.6

(a) any two, developed: students may stop developing their **own** writing and reasoning skills, because the tool does the difficult part for them

- it can widen inequality: students who can afford the better tools gain an advantage over those who cannot
- also acceptable: teachers can no longer tell what a student actually knows, so support is misdirected; students may pass work off as their own, which is plagiarism

(b) any one, developed: the AI may be **biased** against certain writing styles or dialects and mark them down unfairly

- or a student has no way to appeal to a human if the reasoning behind the mark is hidden

(c) any three: obtain **permission** before connecting a personal device; do not attempt to access other people's files or accounts; keep antivirus and operating system up to date so the network is not put at risk; do not install or share unlicensed software; respect the school's acceptable-use policy

(d) essays written in another country will use different conventions, vocabulary and cultural references, which the AI has not learned to reward

- so equally good work is marked lower — the model is **biased** by its training data
- the developers should train and test it on a **representative** range of student writing and check the marks it gives across those groups

(e) benefit: students and teachers can see **why** a mark was given, challenge it, and trust the system more

- drawback: publishing the method lets students **write to the algorithm** rather than write well, and may expose commercially sensitive details of the model

8 One ethical consideration for a student connecting their personal computer to the school network is the risk of spreading malware on the network.

(a) Viruses and pharming are examples of malware.

Explain what is meant by a virus and pharming.

Virus
.....
.....

Pharming
.....
.....

[2]

(b) Give **three** other ethical considerations for a student using their personal computer to connect to the school network.

1
.....
.....
2
.....
.....
3
.....

[3]

(c) Describe **two** social impacts of students using Artificial Intelligence (AI) to complete their homework.

1
.....
.....
.....
.....
2
.....
.....
.....

[4]

2 (a) Complete the table by describing each term.

Term	Description
Copyright	
Open Source (Initiative)	
Shareware	
Software Licence	

[4]

(b) Describe the purpose of a code of conduct.

.....
.....
.....
.....

[2]

3 A computer program uses a digital camera to read the words on an item.

The program can read the words that are written on the item, translate the words to a chosen language and then output the words as audio. For example, when used in a supermarket, the program can output the words written on the labels on products.

The program uses Artificial Intelligence (AI).

(a) Explain how AI is used in the computer program described.

[4]

(b) State **two** social benefits of the use of AI in the computer program described.

1

2

[2]

(c) The computer program is released under a commercial software licence.

(i) Describe the features of a commercial software licence.

..... [3]

(ii) Explain the reasons why an open source software licence might **not** be appropriate for the computer program described.

[3]

7 Software is distributed with a licence.

(a) Give **two** benefits of distributing software using a shareware software licence.

1

.....

2

.....

[2]

(b) Give **two** benefits of distributing software using a commercial software licence.

1

2

[2]

- 5 A computer programmer is learning about the importance of acting ethically at work.
- (a) Explain the reasons why the computer programmer needs to act ethically towards colleagues and the public.
- Colleagues
-
-
-
- The public
-
-
-
- [4]
- (b) The programmer writes a program to be used in a business. The source code of the program can be modified by the business. The business pays the programmer for the maintenance and security updates.
- (i) Identify **one** suitable type of software licence for the program **and** describe the reasons for your choice.
- Type of software licence
- Reasons for choice
-
-
-
- [3]
- (ii) Explain the reasons why the programmer should copyright their program.
-
-
-
-
- [2]

- 5 A computer programmer writes programs that are distributed with a software licence.
- (a) Complete the table by writing the type of software licence each statement describes.
- | Statement | Software licence |
|--|------------------|
| A fee is charged for the software. The source code cannot be accessed. Users do not get a free trial. |
..... |
| Users can try the software before buying it. Users may not be able to access all features during the trial. |
..... |
| Software is usually free of charge. Users can access the source code and alter the program to their needs. |
..... |
- [3]
- (b) Explain the reasons why it is important for the computer programmer to join a professional ethical body.
-
-
-
-
-
-
- [3]